Cambodian Post-Secondary Education and Training in the Global Knowledge Societies

Eam Phyrom, Leng Phirom, Khieng Sothy, and Song Sopheak (Eds.)

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Cambodian Post-Secondary Education and Training in the Global Knowledge Societies

Edited By

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CDRI – Cambodia Development Resource Institute

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Secondly, we would like to thank all the authors for their intellectual contribution and efforts to this volume. Most of the authors are former full-time researchers at the Education Unit (EDU) (now renamed as the Centre for Educational Research and Innovation – CERI) of Cambodia Development Resource Institute (CDRI), while others have been affiliated with CDRI in different ways and capacities over the years. We also wish to state our sincere appreciation to the continuous support from our talented interns, CDRI's non-research staff and CDRI's researchers from other units. All of them have always shown a high level of team spirit in performing their roles in all cross-unit projects and in this edited book project in particular.

Thirdly, we would like to express our profound thanks to the collegial and financial support of the development partners of CDRI, which has resulted in a body of new knowledge and resources for policy makers, scholars, researchers and practitioners on Post-Secondary Education and Training (PSET) in Cambodia and beyond. We would like to acknowledge DFAT (Department of Foreign Affairs and Trade) of Australia, TAF (The Asia Foundation) through its Ponlok Chomnes Program, SDC (Swiss Agency for Development and Cooperation), Sida (Swedish International Development Cooperation Agency), and LMC (China's Lancang-Mekong Cooperation Special Fund).

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Last but not least, we thank Dr Eng Netra, CDRI Executive Director, for her keen interest in promoting research products by early-career researchers and for her support in the final stage of this publication. Her success in research career and principle of professional excellence have inspired many young researchers.

Foreword by Dr Eng Netra

"Cambodian Post-Secondary Education and Training in the Global Knowledge Societies" is the second book on education published by the Centre for Educational Research and Innovation of CDRI. This new volume is written by a team of experienced researchers and promising young researchers who were or have been based and professionally groomed at CDRI. The team has selected some key research studies that have been conducted at CDRI in the past five years to showcase main policy and scholarly priorities of higher education and post-secondary technical and vocational education and training in Cambodia. They have performed rigorous analyses of policy documents; scholarly research papers; evidence from empirical data; and insights from dialogues with students, faculty members, universities leaders, policy makers, and representatives of the private sector. Most chapters in this edited book are grounded in primary data collected and accumulated through the implementation of CDRI's major research projects on education and training.

CDRI is working to generate high-quality policy research outputs on key development areas in Cambodia and the region and to build research capacity and promote professionalism of relevant stakeholders. It is my great honor to present this book to you. Having been at CDRI for more than 15 years, I am pleased to witness the strong commitment of our researchers on original research and peer-reviewed publications as well as their constant pursuit of learning and contribution to knowledge sharing with peers. All CDRI's works and outputs are guided by this pursuit of excellence in research and professional development.

The book covers some of the most relevant and timely issues in Cambodian post-secondary education and training, including research function and academic profession at higher education level, vocational and professional education for the changing world of work, STEM education and the 21st-century competencies, new approaches to learning, and Cambodian integration into the global knowledge societies. I believe the discussions by the authors and editors on these themes and topics are relevant not only for the current period of COVID-19 pandemic but also for years ahead as they are very much in line with the national and international development momentum of post-secondary education and training. Such a potentially lasting piece of work further reflects the core CDRI's mission to contribute to sustainable development and positive growth of Cambodia and the region through sincere exchanges, mutual respect, and inclusive partnerships with all local and international stakeholders. I hope this work is useful in one way or another for all readers and stakeholders, especially students, faculty members, researchers, human resource managers in the private sector, and policy makers.

Dr Eng Netra
Executive Director
Cambodia Development Resource Institute

Foreword by Dr Chhem Kieth Rethy

This book is an anthology that aims at reviewing the numerous aspects of post-secondary education and training (PSET) systems in fast growing Cambodia – occurring in a unique and historical demographic window, where the youth represents the largest group of the population. The general themes cover various dimensions of the education system that include the typologies of PSET institutions, their administrative and financial governance, the academic profession, the emergence of STEM education, research, curriculum, and education technology. A new trend observed in those institutions is the appearance of university-industry linkage and entrepreneurship as a major innovation undertaking. The editors' declared intention was to discuss ways to: improve knowledge creation, transform the professional work ethics and culture, develop a robust STEM curriculum guideline, and promote effective learning habits within a culture of lifelong learning. The overall book reflects a thorough study of PSET using constructivist, positivist, hermeneutical, and interpretivist approaches.

Reading through the chapters, readers may discover the interactions and overlap between higher education and vocational training systems. In the context of the strong economic growth of Cambodia, one observes the emergence of a middle class with higher educational aspirations for their children. This social ascension has triggered a strong academic drift with vocational training institutions aimed at functioning as a university that offers academic degrees that include a PhD. In the meantime, some universities, driven by the need to produce graduates able to enter the market in a fast-growing economy, take the opposite approach by embracing active vocationalisation of their curricula. These phenomena reflect two opposing teaching traditions: the university aims at providing systematic knowledge, while the vocational education institution offers training for specific occupations.

This book is a product of an exceptional Khmer team of education scholars animated by passion to explore the patterns of PSET in Cambodia. All four editors have been trained and educated abroad (Canada, Holland, Japan, and USA). Dr Khieng Sothy was the founding head of the education unit of the Cambodian Development Resources Institute (CDRI). Equipped with his in-depth knowledge of organisational sciences acquired during his doctoral study at the Free University of Amsterdam, he successfully brought this "startup" policy research unit to the highest level in no time. Dr Khieng left CDRI to lead the Cambodia University of Technology and Science (CamTech) as its Founding President, after a tenure as Vice President at the Kirirom Institute of Technology. Dr Leng Phirom, a graduate from the prestigious Ontario Institute for Studies in Education, succeeded Dr Khieng and ran the CDRI education unit before joining the Kirirom Institute of Technology as Founding President. Dr Song Sopheak, an educationist trained at Hiroshima University is the current Director of the Center for Educational Research and Innovation at CDRI. Dr Eam Phyrom, also an educationist

trained at Hiroshima University and a fierce independent thinker, left CDRI to become a freelance researcher. This cluster of mighty young minds, driven by a passion for policy research and abiding to the highest standards of intellectual integrity, has made CDRI the unmatched education policy research unit in the country. In fact, the migration of education scholars out of CDRI to lead local universities and the return of others to conduct policy research at their alma mater are the testimony to the success of CDRI, in her mission to build both individual and institutional capacity. CDRI should indeed take pride for the achievement of this exceptional talent building endeavor. With many grants to coordinate research at regional level, CDRI's reputation has shone far beyond the boundaries of Cambodia.

From another angle, with colleagues from the other departments, these scholars have engineered a triumphant Cambodianisation of CDRI, a turning point for this respected institution. As a former Executive Director of CDRI, I owe this exceptional team and other colleagues a deep gratitude for their resilience and commitment to drive CDRI successfully through its growing pains that come with any critical transition. All together, this team brings decades of teaching experience at post-secondary levels that provide them with real life exposure to the myriad challenges faced by PSET institution.

They are also fully aware of the various influences of western scholarship and foreign technical assistance for higher education and TVET in Cambodia: many are positive, while a few others are dubious. With this unique ethos, the editors were able to synthesize a large amount of data collected from the fields and interpret them within a rigorous scientific framework of PSET scholarship, while prioritizing a proper localisation of knowledge constructed to inform national policy. Despite the implicit pressure, through conditions that are inherently included in each grant, I must recognise that almost all funding provided to support education projects are relatively non-directive, which creates a space for critical and determined researchers to remain quite independent in term of "academic freedom". All authors are or had been at one point of their career researchers at CDRI. The most heartening news is that all of them either left the think tank to lead another educational institution, or departed to further study abroad, returning later to CDRI to undertake research on education policy.

In sum, this is the very first book edited by Cambodian educationists with deep expertise in Cambodian PSET. Never in the history of modern education in Cambodia has such a book been conceived and written! The editors and authors have taught in local institutions, studied abroad, conducted thorough policy research at a think tank based in Phnom Penh, or led new founded local universities with bold innovations to meet the demands of digital transformation while attending to the learning trends of the Generation Z. Above all, the authors have attempted not only to learn from the philosophy of eminent foreign scholars but also to draw on experience from the best local methods of teaching and learning that had been experimented, applied, and monitored locally by home-grown educators.

I have no doubt that, for years to come, this remarkable anthology will become the best reference book for readers, both Cambodians and foreigners, who are genuinely interested in undertaking a thorough journey through the complex PSET system in Cambodia. Finally, I would like to warmly congratulate the editors for their passionate endeavor to produce such a fantastic opus on Cambodian education.

Chhem Kieth Rethy, MD, PhD (edu), PhD (his)
Asian Vision Institute

Preface

This edited book on Cambodian Post-Secondary Education and Training (PSET) collects, analyses, and synthesises key research studies conducted by the Centre for Educational Research and Innovation (CERI), Cambodia Development Resource Institute (CDRI). Knowledge, experiences, and insights from almost a decade of rigorous research, reflection, training, exchanges, and policy dialogues on the selected topics are deemed valuable for sharing among Cambodian PSET policy makers, academics, researchers, and practitioners.

This book is the second edited volume on Cambodian education of CDRI. The first volume titled "Cambodia Education 2015: Employment and Empowerment" was published in 2015. It covers all levels of education in Cambodia, from early childhood to higher education. After that first comprehensive volume, educational research projects of CDRI have concentrated mostly on the issues of PSET – i.e. higher education (HE) and post-secondary Technical and Vocational Education and Training (TVET) – given their fundamental significance and relevance for Cambodian economic, cultural, social, and human development. Most of the research topics are both guided by policy and shaped by scholarly literature and clearly reflect concerns of Cambodian PSET stakeholders. Between 2016 and 2021, the PSET-related topics of CDRI include:

- governance and finance of Cambodian HE,
- typology of HEIs and HE systems,
- perception and measurement of internationalisation of HE,
- science, technology, engineering, and mathematics (STEM) education and major choice,
- research promotion in HE and academic profession,
- accountability in HE,
- TVET models,
- Public-Private Partnership (PPP) in TVET,
- policies and practices of Cambodian internship and apprenticeship,
- competency-based education and training in Cambodian TVET,
- education and training integration and hybridisation,
- vocational training and skills development for occupational mobility,
- ICT for teaching and learning in HE,
- entrepreneurial intention of Cambodian university students, and recently
- technology adoption in HEIs during the COVID-19 pandemic.

As we work on these topics, we have observed fascinating developments of Cambodian HE and the post-secondary TVET and an increasingly intricate relationship between the

two sub-sectors as both strive to develop in a more industrial, digital, and knowledge-driven economy. The two sub-sectors have served both different and overlapping roles. The emerging trends of vocationalisation in academic HE and academisation in post-secondary TVET are obvious phenomena and have been highlighted in previous studies.

We also observe through literature and best practices that a right PSET model with clear directions, a well-coordinated system, functional policies, and well-organised institutions can support and enrich all emerging human development agenda, such as Industry 4.0, 21st-century competencies, life-long learning, digital transformation, smart governance, decent employment, green economy, climate resiliency, and obviously the global agenda of Sustainable Development Goals (SDGs). With PSET as the central supporting platform, these various agenda will allow countries with different levels of wealth and from different corners of the world to function interdependently in a more knowledge-based and knowledge-empowered society at the global level.

Aims

The main aim of the publication is to envision Cambodian PSET in the emergent global knowledge societies by drawing lessons from CDRI's research outputs. When discussing the relationship between PSET and the global knowledge societies, emerging themes such as academic and intellectual resources; vocational decency and resiliency; scientific and information-related literacies; and lifelong learning capability are among the most important themes mentioned in the literature. So this edited volume explores and examines four main aspects of Cambodian PSET: (1) the academic HE dimension of PSET; (2) the TVET dimension of PSET; (3) the educational dimension of STEM and STEM major; and (4) the learning dimension of PSET. The four main sections of this edited book provide updates, give insights, and raise critical questions on various selected topics of internationalisation of HE, academic identity, research education and training, university accountability, Public-Private Partnership (PPP) in TVET, talent development, Cambodian workplace training environment, development of apprenticeship, factors influencing STEM major choice, relationship between financial support and STEM major choice, students' perceptions on learning science and mathematics, learning and teaching science subjects, and learning (how) to learn.

Approaches

This edited book does not emerge out of a one-shot conference or a particular research project, but through continuous and collaborative activities of diagnosis, research, dialogue, reflection, and projection among CDRI researchers and multiple PSET stakeholders who have engaged actively in this intellectual excursion since 2015. The first meeting of CDRI researchers that led to the decision to craft this edited book took place in late 2018. It has taken us more than three years to bring the book into its final completion.

By compiling different topics into one single volume, this work is anthological by nature, with diverse conceptual and methodological frameworks as well as writing styles. The authors employ varying perspectives and conceptual lenses in their investigation in each chapter (from development theories to adult education theories); use different research approaches, methods, datasets, and information sources (from literature review to regression analysis); and embrace distinctive writing styles (either a more scientific-analytical style or a more narrative-synthetical style). Both the social scientific research approach of the positivist tradition and the social constructive research approach of the hermeneutic and interpretivist tradition are used in this volume. Such a consolidative methodological practice has been proven efficient and effective for exploring and explaining complex research issues in the field of PSET and in the context of developing countries where either quantitative or qualitative data alone may not provide a clear and full picture of the problems. It should be noted that throughout these years of knowledge generation and mobilisation, CDRI has gathered different sets of data related to the above-mentioned educational topics – i.e. documentary data, primary quantitative data, primary qualitative data, secondary quantitative data, and other important information generated through multiple dialogues, workshops, and training sessions.

The editors and authors have chosen to balance between empirical evidence from the field data and ideological values arising from researchers' collective intellectual exercises. Thoman (2007, 2)[1] asserted that policy making should be based on a realistic assessment of evidence as well as on appropriate values or ideologies. Values can be partially considered an important framework to guide institutional strategies and human actions. The principle of balancing between the use of empirical data and the acknowledgement of subjective values is very important and almost inevitable for researchers in developing countries in discovering and constructing knowledge, especially in the social sciences and humanities.

The book can be considered half policy-oriented and half scholarly. On the one hand, the editors and authors align their studies with the current policy themes and approaches of Cambodian PSET which aim to address urgent institutional needs, practical situations, and specific local conditions. On the other hand, the editors and authors demonstrate an intellectual stance that shows how useful it can be to also look at PSET issues from a more scholarly and holistic perspective. A growing amount of educational literature has already proven that scholarly knowledge and know-how are necessary for policy decision making and guiding practices, especially in the interdisciplinary field of PSET whose global and international agenda are generally projected, planned, and led by experts serving at leading universities and/or international organisations. Hence, this volume has served as a bridge, in many instances, between scholarly research and policy and practices, and between local and global knowledge.

1 See Thomas, Alan. 2007. "Introduction." In *Research Skills for Policy and Development: How to Find out Fast*, edited by Alan Thomas, and Mohan Giles, 1–23. London: Sage.

Target audiences and expected uses

This edited book is not a solution-focused guidebook or a problem-solving manual that lists down exact steps to be taken or introduces any specific program or particular policy to be adopted. It is impossible to do that in such a topically diverse and anthological craft. Rather, it addresses specific issues, offers relevant conceptual explanation, and generates a broader perspective to comprehend the underlying patterns of issues and challenges of Cambodian PSET and its developments.

This book appeals to (1) general audiences, academic or non-academic, who wish to learn more about the system, process, and status of Cambodian PSET; (2) PSET policy makers and institutional leaders and managers who would like to revisit the bigger picture and critical issues of PSET in Cambodia and globally; (3) enterprise-based human resource managers or training leaders who want to promote workplace training and improve learning and productive capability of their trainees and workers; and (4) students with scholarly interest in the field of HE, post-secondary TVET, and/or PSET.

While we want to inform policy and practices, we also seek to instigate scholarly discussion on Cambodian PSET, including both her ancient and contemporary HE and post-secondary TVET, with a special focus on knowledge, academia, profession, talent, science, and learning. This book, therefore, invites its readers to jointly imagine the path for Cambodian PSET in the emerging global knowledge societies as it proclaims the vitality and centrality of PSET roles in such societies.

Organisation of the edited book

This edited book is organised into an introduction section; four main thematic sections; and a conclusion and implications section. The four main thematic sections include:

- **Section I** focusing on the HE and academic sector through the lens of the Changing Academic Profession (CAP) and the global HE. This section constitutes four chapters.
- **Section II** focusing on the post-secondary TVET and vocational sector in the rapidly changing and connected world of work and also comprising four chapters.
- **Section III** offering perspectives on STEM majors and education in the context of the 21st-century competencies and containing three chapters.
- **Section IV** discoursing the learning dimension of the 21st-century Cambodian PSET from a lifelong learning perspective and consisting of two chapters.

The whole book consists of 16 chapters. Following is a brief explanation of each:

- ***Chapter 1*** is in the introduction section. It sets the scene for the whole book by first scoping, defining, and differentiating the concepts of PSET, HE, and post-secondary TVET. The chapter discusses the historical development of

Cambodian PSET, slightly extending what was discussed in the literature by attempting to hypothesise some possible characteristics of ancient Cambodian higher learning. The chapter also revisits obvious major challenges facing the developments of the present Cambodian HE and its post-secondary TVET. This first chapter ends by briefly highlighting new contexts and discourses of the Cambodian PSET.

- In light of the background discussed in *Chapter 1*, ***Chapter 2*** situates Cambodian PSET into the conceptual discourses surrounding the global knowledge economies and societies. By discussing the relationship between PSET and the emerging global knowledge economies and societies, some critical issues of Cambodian HE and post-secondary TVET unfold. Those issues shape specific chapters of this edited volume.
- In ***Chapter 3***, which begins the first main thematic section of this edited book, the author analyses the overall trend and challenges of internationalisation of Cambodian HE. The author employs various related theories of HE development to discuss how Cambodian HE internationalisation has unfolded from a historical perspective. Then, he elaborates on the current approaches and status of internationalisation and pinpoints key challenges obstructing Cambodian HE from drawing benefits from internationalisation. The author draws on qualitative interviews, together with documentary data and scholarly literature.
- ***Chapter 4*** explores and explains what shapes the identities of academic professionals in HE. The author comprehensively reviews existing international literature on academic identities and academic profession as well as local literature related to Cambodian academic profession. The author synthesises and discusses various extrinsic and intrinsic dimensions that shape and/or define academic professional identities: academic revolution, academic culture, academic career structure, the knowledge centrality of the academia, the substance of scholarship, the idea of professionalism, and the intellectual basis of higher learning. In an essay style of writing, the author situates his understanding from the review into current concerns on Cambodian academic profession, academic work environment, and HE functions.
- ***Chapter 5*** examines existing models of research education, training, and development in HE, particularly at the graduate education level. Readers are expected to gain insights into two major questions: what areas of competencies an academic researcher should develop and on what basis a quality research training program should be designed. The author employs a literature review method and a reflection on his research and research-instructing experiences. He examines existing literature, focusing particularly on content knowledge and program design of previous research training models. Then the author discusses some research-centric principles underlying quality research training programs.

- ***Chapter 6*** specifies what constitutes the concept of accountability in HE at both the system and institutional level. The study uses literature and relevant secondary data to demystify core conceptual attributes and practical principles of accountability in HE. The authors further highlight the need for policy makers and researchers to have a clear understanding of accountability concepts, instruments, principles, histories, and discourses in HE in order to ensure that adopting the concept is feasible and meaningful for Cambodian HE system and institutions and for Cambodian HE teaching and/or research personnel.
- ***Chapter 7*** starts the second main thematic section. It focuses on the Cambodian post-secondary TVET sector which has been working to improve its network, partnership, communication, and coordination within the changing world of work. In the 21st century, these missions translate into necessary roles of TVET system designers and institution leaders everywhere. This chapter aims to gain perspectives on how key TVET stakeholders in Cambodia experience the current practices of PPP. The study identifies various conceptions, reasons, and forms of PPP in the Cambodian post-secondary TVET arena. Also, it reveals main challenges faced by different TVET stakeholders in operating PPP programs and how they (the stakeholders), in the absence of clear guideline, expect each other to contribute to promoting the PPP platform in Cambodia in the future.
- In ***Chapter 8***, the authors conduct a literature review on talent development in the context of Industry 4.0. By doing that, the authors generate a collective insight on how Cambodian TVET should approach its human development mission. The authors highlight the human-centric approach to talent development and offer a number of macro-level suggestions for policy reforms.
- ***Chapter 9*** explores the developments and meanings of different types of apprenticeship and explains a generic model for measuring and understanding costs and benefits of apprenticeship. Based on the literature review and the available secondary data of Cambodian apprenticeship, the authors briefly discuss the current situation of apprenticeship in Cambodia. The authors then suggest different perspectives on developing different types of apprenticeship (especially, quality apprenticeship) at different levels (i.e. national system level and work organisation level) in Cambodia.
- In ***Chapter 10***, the authors bring audiences a fresh perspective on the idea of learning organisation and the possibility of embedding the idea of learning into the current workplace training and development functions of Cambodian work organisations. The authors review existing literature and synthesise workplace learning and organisational learning frameworks as well as relevant concepts and movements. Rather than making any solid arguments or offering specific recommendations, the authors use their nascent research knowledge in this area to arouse thinking on the future of training, development, and learning at workplaces in Cambodia.

- ***Chapter 11*** introduces the third main thematic section of this edited volume, focusing on factors influencing STEM major choice of Cambodian senior-year university students. This empirical study examines relationships between a number of selected independent variables and the Cambodian senior-year university students' choice of STEM major, using logistic regression analyses. The variables detected to be significant factors of STEM major choice in this study re-emphasise the importance of students' individual characteristics and experiences with STEM-related subjects at secondary school as well as their prospects and perspectives towards STEM-related careers.
- ***Chapter 12*** is another empirical study that answers a similar research question of the preceding *Chapter 11*. But rather than observing the multiple factors, the authors specifically examine the finance-related variables and how those variables determine the choice of pursuing a certain major at the post-secondary level. The researchers discuss the differences in financial resources (particularly, scholarships) available for Cambodian students who choose STEM majors and those who do not and further offer perspectives on gender differences. The study draws on quantitative descriptive analyses and linear regression analyses.
- ***Chapter 13*** offers another STEM-related perspective. The study measures perceived experiences, self-efficacy, and interest towards learning mathematics and sciences of Cambodian upper secondary school students. The authors employ descriptive statistics and classical tests of differences to analyse the data of 2,891 grade 12 students in the 2017/18 academic year. Cambodian upper secondary school students generally exhibit a moderate level in the sub-constructs of the perceived experiences, self-efficacy, and interest in learning mathematics and sciences. The magnitude of these sub-constructs, however, varies significantly according to their grade 9 exam result, grade 12 stream choice, time spent on learning mathematics and science subjects, intended major at university, and future career prospects.
- *Chapter 14* and *Chapter 15* are grouped into the fourth main thematic section of this edited volume and focus on the dimension of learning at the post-secondary level. ***Chapter 14*** employs an adult learning theory as a framework to observe the teaching and learning practices of chemistry major at a public university in Cambodia. This study answers three research questions: (1) what is the current practice of post-secondary science teaching and learning in the contexts of resource-constrained Cambodia?; (2) how does the practice conform to good principles of adult education?; and (3) what are the factors that influence such current practices? Using primary qualitative data collected through interviews and observation, the study makes some critical remarks on the students-centred approach of Cambodian adult learners at the post-secondary level of education. The authors explain their findings using multiple justifications from policy-related, institutional, and cultural factors.

- ***Chapter 15*** explores learning experiences of participants in an informal learning platform, called RadClub, which happens outside of the formal school/university setting. Through in-depth interviews with the participants, the study reveals that the RadClub engages participants in knowledge sharing, allows them to lead their own learning, and guides them to understand learning opportunities and directions surrounding their professional major and future career. The study further explores the roles of mentors/advisors and the idea of learning space in developing a learning culture beyond formally-structured educational settings in Cambodia.
- Finally, ***Chapter 16*** is the only chapter of the conclusion and implications section. It summarises and synthesises key insights from the two chapters in the introduction section and all chapters in the four major thematic sections of this edited book. This last chapter then concludes the whole edited volume by broadly discussing some core perspectives and principles necessary to direct the development of Cambodian PSET in the emerging global knowledge societies.

Editors
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Introduction

Chapter 1

Cambodian Post-Secondary Education and Training: Conceptual Scope, Historical Context, Present Realities, and New Discourses

Leng Phirom, Eam Phyrom, and Khieng Sothy

1.1. Conceptual scope of PSET

The terms "Post-Secondary Education and Training (PSET)" and "Higher Education (HE)" are sometimes used interchangeably in the literature as both terms refer to education above the secondary level of education. However, the two concepts should not be treated as synonymous or equivalent in essence. Clarifying the difference between the two terms might prove useful prior to the discussion of Cambodian education and training at the post-secondary level.

The main difference is that the original concept of HE is basically academic and scholarly, excluding the post-secondary "Technical and Vocational Education and Training (TVET)" pathway, whereas the concept of PSET is more inclusive, constituting both the post-secondary TVET and the HE pathway. HE is rooted in the traditional idea of liberal university and the pursuit of higher learning characterised by deep intellectual inquiries and advanced scholarly and scientific works that generate academic knowledge, virtue, and wisdom (Humboldt 1976; Barnett 1990; Oakeshott 2004). Even scholars whose idea of HE (or university) incorporates the function of professional training or employment-oriented educational activities (e.g. Geiger 1993; Kerr 2001) hardly equate the idea of HE with that of the post-secondary TVET.

The HE pathway is generally represented by university or academy while the post-secondary TVET pathway is generally characterised by such institutions as polytechnic or technical institutes. In principle, the higher education institutions (HEIs) and their programs are more academically oriented and aim to produce academic scholars or scientists to continue the intellectual tradition of formal knowledge creation and dissemination as well as cultural preservation and refinement. Its educational approaches and the resulting qualifications are more intellectual, liberal, theoretical, and cultural (and sometimes religious). On the other hand, the post-secondary TVET

institutions (TVETIs) and their programs are vocationally or technically oriented (i.e. training for work or employment) and basically designed to produce professionals, practitioners, and skilled technicians to serve in positions related to state affairs and/or in occupations related to the market and industrial production system to boost the economic growth of the nation. Its educational approach is more practical, applied, technical, and occupation- or work-situation-specific. The post-secondary TVET training programs are generally short-term, or relatively shorter compared to the academic HE programs. At the national level, this way of differentiating between the HE and the post-secondary TVET pathways is considered a binary view, which however does not apply to all countries equally.

In this edited volume, we prefer to employ the term "PSET". We use it to refer broadly to the level of education which is a direct continuation from the upper secondary school (or senior high school) level and to cover both the HE and the post-secondary TVET pathway. In this sense, PSET is closest in meaning to tertiary education which means the third level of education. Placing both the HE and the post-secondary TVET pathways in the label "PSET" is an appropriate and safe way to cover the two extremes, avoiding an incomplete representation of the whole PSET epistemic and pragmatic meanings. Using the term "higher education" alone or other terms such as "further education", "continuing education" or "post-compulsory education" may not fully represent the diversities (as well as the overlaps) between the academic HEIs and their programs and the TVETIs and their programs at the post-secondary or tertiary level.

Furthermore, in a deeper conceptual sense, even the terms "education" and "training" are differentiable. The former focuses on the development of intellectual or liberal knowledge whilst the latter more on skill practices and vocational development. So, rather than merely using "post-secondary education" (as in UNESCO 2012; Varghese 2014), we use "post-secondary education and training" as an overarching term. By doing that, we highlight the importance of both the education sector and the training sector in the knowledge-based economies and societies.

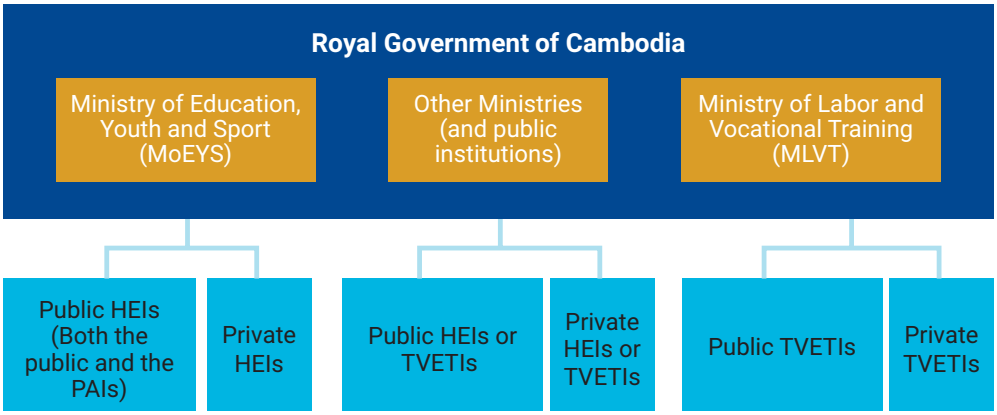
The idea of PSET is highly applicable in the current Cambodian context of education. The Cambodian National Qualification Framework (CNQF) indicates clearly that the Cambodian PSET system is broadly divided into the HE sector and the post-secondary TVET sector and that the system officially begins with the level 5 of education (out of the eight levels) (NTB 2014, 2-3). The "associate degree" is set as the lowest level qualification granted by the HE sector while the "higher diploma" is set as the lowest qualification granted by the post-secondary TVET sector (NTB 2014, 3). The arrangement is more complicated when we take into consideration the lower-level TVET in Cambodia, but this matter is not relevant to the current edited volume as we focus only on the post-secondary or tertiary level.

There is another practical reason why we prefer the term PSET to HE for this edited volume and think it proves more relevant to discuss both the HE and the post-secondary

TVET pathways together. As we engage in research in this field, we notice that policy and research discussions on Cambodian HE and the post-secondary TVET have been disconnected while in practices they tend to converge in many aspects (Chea, Hun and Song 2021). Thus far, relatively few studies, other than Sloper (1999), have documented and discussed Cambodian HE and the post-secondary TVET together.

The disconnection is due in part to the national governing structure of PSET. In Cambodia, the HEIs and the post-secondary TVETIs are currently governed by different ministries – i.e. the Ministry of Education, Youth and Sport (MoEYS) in principle governing the academic HEIs while the Ministry of Labour and Vocational Training (MLVT) in principle governing the post-secondary TVETIs; some other ministries have their own sector-based PSET institutions (see Figure 1.1). As of 2020, there are 16 Cambodian ministries reportedly having at least one PSET (or a similar kind of) institution under their auspices (to be discussed in a later part of this chapter).

Figure 1.1: Stylised structure of Cambodian PSET system governance and types of institutions



Source: Authors
Note: PAIs = Public Administrative Institutions

Our concern is that the lack of collective scholarly and policy discussions on the HE pathway and the post-secondary TVET pathway may create further fragmentation in terms of understanding the whole system of PSET as the phenomena of acadamisation of TVET and vocationalisation of HE have been observed (see Hun, Song and Chea 2020; Chea, Hun and Song 2021). Through our research studies, we have become more confident that the scholarly and policy discussions of the two sub-sectors should be done in a more collective and integrated way, especially at the system level and when we look at the two sub-sectors of PSET from a disciplinary and educational perspective. The disciplinary knowledge, skills, and competencies of the 21st century start to become more connected and integrated in many aspects. TVET students are increasingly required to develop their soft skills. Bridging academic and vocational learning has been an emerging advocacy introduced by a number of international researchers of TVET (see Mclean and Wilson 2009).

Similarly, the partnerships and connection between HEIs and TVETIs in Cambodia are growing in a thought-provoking way. In terms of education, the paths for educational transfer between TVETIs and HEIs have become increasingly flexible. In terms of career, the paths for employment and career transfer of graduates between the two sub-sectors have also become more common in the changing world of work. Such growing interconnectedness is partly a result of the explosion of information and knowledge that are more shareable (by being translated, borrowed, or copied) and accessible through digital technologies. This has also been driven by the increased intention and a more proactive attitude of Cambodian HEIs and TVETIs to be entrepreneurial as the PSET market becomes highly competitive. In this age of learning and networking, both the HEIs and the post-secondary TVETIs have become more active and innovative in how they form partnerships to add value to their existing programs. By discussing the two sub-sectors together, we do not mean to add ambiguities to their roles, but we want to promote a clear understanding on identities and characteristics of both sub-sectors as they grow together in the knowledge-driven societies.

1.2. Historical context of Cambodian PSET

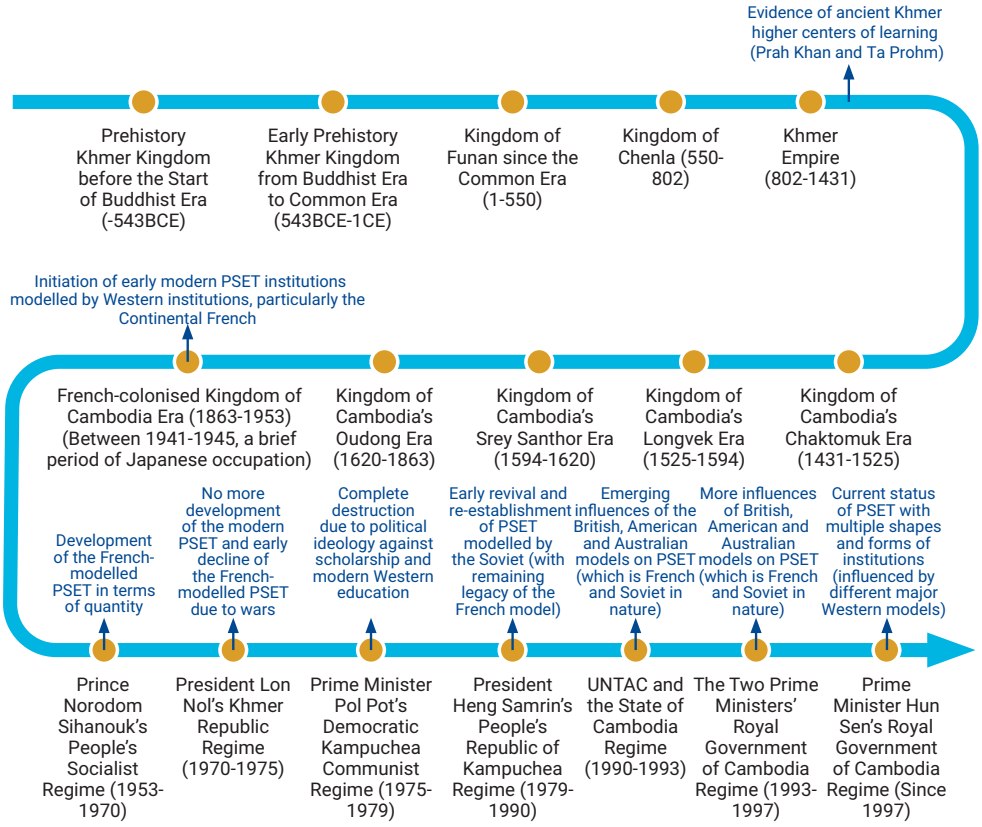
Recently, researchers in the area of Asian HE development have attempted to characterise Asian universities with their own identities and approaches. Hawkins, Neubauer and Shin (2013, 1-6) proposed four hypotheses for the Asian higher education: Western dominance, economic determinism, Asian values transformation, and global inclusion. The first two characteristics obviously apply to the current Cambodian HE. The other two are less obvious. In particular, the extent to which Cambodian HE has transformed on the path of Asian values or endorsed its own Khmer traditional values of higher learning, and how deliberate and strategic the country is trying to move into the international and global core of HE have not been well examined. Hence, the attempts to characterise the Asian HE shall encourage Cambodian HE policy makers and academic researchers to retrace and re-examine the country's intellectual basis of HE as well as the vocational foundation of its post-secondary TVET.

In the current backdrop of active internationalisation, regionalisation, and globalisation of PSET, a nation needs to recognise and understand the nature, current position, and future directions of its intellectual and vocational systems and institutions. Likewise, in the discourse of sustainable development and knowledge societies, the historical perspective of PSET and its knowledge functions are highly relevant. Countries need an appropriate "knowledge policy" to preserve their indigenous, local, and traditional knowledge while continuing to promote codified scientific and technological knowledge to ensure sustainable and inclusive development (UNESCO 2005).

1.2.1. The ancient Khmer knowledge foundation

For the two Asian giants (India and China), evidence of their ancient centres of learning exists. Despite Western influences and dominance, Ancient Chinese higher learning institutions (such as the *shi yuan* colleges) and Indian university-like centres of learning (such as *vihara*, *pathashalas*, *mandrasahs*, with names such as Taxila and Nalanda) (Dutt 1988, 328-348; Altbach 2004, 15; Chan 2013, 31) have been well acknowledged and progressively explored in academic literature. The ancient higher learning places in the South-East Asian region in general, and in Cambodia in particular, also exist (Altbach 2004). However, as Altbach (2004) emphasised, these institutions were "largely destroyed or abandoned as Asian countries began the process of modernisation beginning in the 19th century" (p. 15).

Figure 1.2: Historical line indicating existence of higher centres of learning in ancient Cambodia



Source: Authors

Certain educational research studies based on historical, cultural, and/or archaeological analyses offer some insights into the ancient higher centres of learning of Cambodia (see Clayton and Yuok 1996; Chhem 1997; 2000; 2006; Ayres 2000; Pit and Ford 2004; Sam, Zain and Jamil 2012). According to Chhem (2006), a well-structured system of

HE has been established in the Khmer Empire since the 10th century CE in a form of small colleges. The author claimed further that those small colleges transformed to be large Buddhist monastic universities in the late 12th century during the reign of King Jayavarman 7 (see the whole timeline in Figure 1.2). There are multiple Cambodian Buddhist monasteries which are believed to be the "true centres of higher learning" (Chhem 1997, 1). Ta Prohm (1186) and Prah Khan (1191) universities hosted thousands of students and professors, living and studying at these large campuses that were located at the heart of Angkor Thom, the capital of the empire (see Chhem 2006; Sam, Zain and Jamil 2012).

One clear hypothesis of the Khmer ancient centres of learning is that they have connections with those of ancient India. Those ancient Khmer centres of learning are similar to the ancient Indian Buddhist monastic universities (*vihara*). Chhem (2000, 24) related the Khmer cosmological conception with Indian science and claimed further that:

> these [Khmer] monasteries became the centre of learning and teaching of basic knowledge like writing, reading and counting… Finally, these monasteries became the centre for advanced learning of medicine, astronomy, religion, literature and philosophy for the most gifted students, functioning almost as universities (p. 26).

In fact, the names of famous Indian *vihara*, such as *Nalanda* (in modern day Bihar near Bangladesh), *Taxila* (in the northern part of current Pakistan), and *Valabhi* (in modern day Gujarat) (see, for example, Dutt 1988, 328-348; Daswani 2006, 198-208; Chan 2013, 31) are well acquainted in Khmer language, literature, and arts.

The political, economic, cultural, and educational connection between ancient India and Cambodia is not trivial. Stark (2006, 417) claimed that the ancient South-East Asian states' relationship with South Asia is more "benign", compared to the relationship with East Asia, with the "urban landscape" as one of the obvious forms of influence of the South Asian concepts and practices on the South-East Asian region. Educational exchanges must have been implemented among ancient kingdoms along the ancient Maritime Silk Route that connected ancient China to India and onto Europe (see Dutt 1998; Daswani 2006). From a political perspective, Dah (2020, 1) went further to claim that a Cambodian 12-year-old king – named Pallavamalla – came to the throne in the ancient Pallava Kingdom in the 8th century A.D. Although this study is relatively recent, with more supporting evidence required, it doesn't change the fact that the ancient Cambodian society and that of the ancient Indian subcontinent were well connected. Cambodian arts and literature also indicate that Cambodian elites must have been sent to pursue advanced knowledge at the Indian monastic universities. However, we are not sure whether the ancient Khmer kingdoms also hosted foreign students themselves, which requires further studies. It should be noted that historical and archaeological research and evidence have continued to uncover that the ancient Cambodian city of Angkor was one of

the world's largest, cosmopolitan, and advanced cities of its time (see, for example, Stark, Carter, Heng, Chhay and Evans 2018).

Even though the Buddhist monastic higher learning is influential in the region, the ancient higher educational practices in both India and Cambodia are not solely Buddhist. "With the gradual lapse of time Buddhist monasteries became centres for the dissemination not only of Buddhist teaching but also Brahmanical studies and secular branches of learning" (Daswani 2006, 195). *Hence, it can be hypothesised secondly that the Ancient Cambodian centres of learning may also receive influences from the Brahminic knowledge.* It is true that in Cambodian culture the Brahminic knowledge and methods have been practised until recently, as evident in some ritual traditions of Cambodian royal and aristocratic families, even before the arrival of Buddhism in Cambodia. As mirrored in the Cambodian legend of the birth of the Funan kingdom (*Nokor Ph'nom,* the earliest Khmer kingdom) as well, early contacts either for trade, political, or cultural reasons between ancient Indian and ancient Cambodians may have happened long before the written history and the Buddhist influences (see, for example, Sarkar 1968; Ayres 2000; Chhem 2000).

In fact, besides the Brahminic roots, Cambodian culture and education could be heavily influenced by other Vedic traditions and Hindu religions (including Shaivism, Vaishnavism, and perhaps certain kinds of Tantric traditions) during the pre-Angkorian era. Vedic texts (*Sutra* and *Sastra*) and ancient Indian literature based on different religious sects and sub-sects may have been brought, translated, and taught somewhere in ancient Cambodian territory during the pre-Angkorian era.

As a third hypothesis, the educational approaches of Cambodian higher learning are not merely religious but also practical. It should be noted that the Buddhist monastic university education, mixed with the Brahminic practices, is not only religious and elitist but also professional and secular (Daswani 2006). Chhem (2000, 26) noted that, in the ancient monastic education of Cambodia, "the Buddhist monks taught professional skills to laymen from neighbouring villages". Chhem (2006) further explained that the vast and splendid architecture and engineering of the archeological remains of craftsmen prospered alongside with elite education offered by the monastic universities, which shows that both HE and vocational education flourished during the Angkor time.

Altogether, before the Western influences on Cambodian PSET in the 1950s, the Vedic cultures, the Hindu (particularly, the Brahminic) religions, and/or the Buddhist knowledge may have either consciously or non-consciously become parts of the foundation of Khmer knowledge system in different dimensions – spiritual, cognitive, emotional, attitudinal, cultural, social, and practical. They may have been adopted, localised, and practicalised into different levels of Cambodian social fabric. Both the higher learning and the vocational training substances exist in the ancient time.

1.2.2. Decline of the ancient Khmer knowledge system

There have been very few records and literature discussions of HE, post-secondary TVET, or PSET of Cambodia within the period that followed the collapse of the Khmer empire in the 15th century. This was partly due to the continuous warfare between Cambodia and its neighbouring states throughout the period between the fall of the Angkor and the colonisation by the French. Such warfare tends to lead to either a serious destruction of the written records or relocation of those records out of Cambodian ruled zones.

It is still presumable that the Indian-modelled monastic education that focuses on the teaching of Buddhist and Brahminic knowledge and skills (both religious and secular) necessary for state and social affairs may have remained influential and were practised at Buddhist monasteries throughout Cambodia at that time. "In pre-colonial times, the *wat* [pagodas] had served as a cultural, religious, and educational focal point of the village" (Ayres 2000, 41).

When Cambodia was in its most devastated condition, caused by wars during the mid-19th century, the Cambodian king at that time sought patronage from France. It was within the French colonisation period (1863-1953) of Cambodia that the Western education tradition sprouted its presence in the country, along with the traditional hitherto-followed Khmer Buddhist education at monasteries. It is the form of HE since that time that scholars refer to as the modern Cambodian HE (see Pit and Ford 2004).

So, the foundational model of the modern Cambodian HE system can be considered basically as French. In later years of its colonisation, the French created the first two professional education institutions in Cambodia in 1949: the School for Health Officers (later on becoming the Royal School of Medicine) and the Institute of Economic, Political and Legal Studies (Chhem 1997, 44, citing UNESCO 1967). Before that time, "higher education [during the French colonisation period] had been provided exclusively by Lycée Sisowath, the country's only secondary school" (Clayton and Yuok 1996, 23).

Upon its full independence from France in 1953, Cambodia had nine universities and/or PSET institutions established and operating throughout the period between 1954 and the overthrow of Prince Norodom Sihanouk in 1970 (i.e. within the reign of the People's Socialist government of the prince, also known as the *Sangkum Reastr Niyum* era). Among them were Buddhist University Preah Sihanouk Raj, Royal Khmer University, National School of Commerce, Royal School of Administration, National School of Public Works, Royal University of Agriculture, Royal University of Fine Arts, The People's University, Khmer-Soviet Technical Institute, Takeo-Kampot University, University of Kampong Cham, and University of Battambang (Clayton and Yuok 1996; Chhem 1997). These universities were mostly modelled after the French system.

The development of the French-modelled PSET in Cambodia did not last long. After the overthrow of Prince Norodom Sihanouk in 1970 by President Lon Nol, the Cambodian

PSET declined subsequently until the collapse of the Khmer Republic regime (1970-1975) in April 1975, and the whole education system regressed further to a complete annihilation between April 1975 and January 1979 under the Khmer Rouge regime.

After the collapse of the Khmer Rouge regime, Cambodian PSET fell into the period of Soviet and Vietnamese influences. The Soviet model heavily influenced the system, institutions, programs, and courses of PSET in Cambodia in all dimensions onto the remnant French modelled system and institutions. HEIs at that time were fully brought under the government control and were designed to serve the planned economy of the country destructed by wars. Experts and scholars from the Soviet Union, Vietnam, and other Eastern Bloc countries were sent to lead institutions, develop academic resources, and instruct at Cambodian HEIs.

During that period, all HEIs were brought under the control of ministries. The same practice is also seen in countries whose HE is influenced by the Soviet model, such as China (see Min 2004, 60). Most Cambodian ministries generally have a number of HEIs and/or the so-called "national institute" in its organisational structure. Those national institutes are designed to perform either educating and/or researching functions of the parent ministry and in certain ways can be considered a form of PSET. Examples of those Cambodian national institutes are the National Institute of Public Health (NIPH) of the Ministry of Health (MoH); National Institute of Education (NIE) of MoEYS; National Technical Training Institute (NTTI) of MLVT; National Institute of Statistics (NIS) of the Ministry of Planning (MoP); and Cambodian Agricultural Research and Development Institute (CARDI) of the Ministry of Agriculture, Forestry and Fishery (MAFF). These national institutes may also be evidence of influence of the state-regulated Continental model of governance (both by the French and the Soviet) on the Cambodian PSET system. So, between 1979 and 1993, the basis of the French-established and Soviet-influenced model of PSET system, institutions, and programs characterised Cambodian PSET and have lasted until the present time.

It is also in this period that the current idea of formal TVET emerged in Cambodia. According to Daroesman and Trewavas (1999, 203), the Cambodian TVET sector tended to officially begin in 1979, with the main aim to increase employment and reduce poverty after the end of the war. The Cambodian TVET and HE sub-sectors were initially under the same jurisdiction of MoEYS (Lonn and Khieng 2015, 91), but in 2005 the two sub-sectors were separated and governed by two different ministries: the academic pathway under MoEYS and the technical and vocational pathway under MLVT.

It is after 1993 when the country began to adopt a free market economy and democracy that the Anglo-Saxon European or Anglo-American HE model (i.e. the British, the Australian, and the American) has a presence in the country. More Anglo-Saxon evidence and substances of HE programs are increasingly seen in the Cambodian PSET system (Chhem 1997, 5) along with the works of international experts and aid.

Since 1993, Cambodian PSET system and institutions have been influenced by the agenda of international development partners – both multilateral or international organisations (e.g. UNESCO, World Bank, ADB, ASEAN) and bilateral partners (e.g. Japan, Australia) – after the decision to liberalise the economy of the country and to encourage foreign aid and investments (see Pit and Ford 2004, 342-345, for a more detailed discussion on international influences on Cambodian HE). The World Bank, for example, supports HE reform, while the ADB supports secondary education and TVET reform; others such as Japan International Cooperation Agency (JICA), Agence Francaise de Developpement (AFD), and Korea International Cooperation Agency (KOICA) directly support HEIs (Dy 2015, 49). In fact, among the three main sources of Cambodian PSET financial capital (i.e. from the government, from fee-paying students, and from international agencies), the financial support from international development partners (e.g. France, Japan, Sweden, the World Bank) still cover a certain percentage (Mak 2019).

Likewise, the private sector has also increasingly influenced the PSET environment. As of 2020, Cambodia has officially recorded 128 HEIs, among which 80 are private (MoEYS 2021, 100). Non-state post-secondary TVETIs have also been increased. Yok, Chrea and Pak (2019, 27, citing MLVT 2018) claimed that there are 73 of them. The justification for such an increase is to ensure access and equity for different types of PSET seekers. The voices, policies, and actions of private PSET institutions are no longer peripheral or irrelevant for the state-regulated system of Cambodian PSET.

To conclude, significant changes in Cambodian PSET policies and practices have been driven by the different political, cultural, and socio-economic influences through which the country has gone through over time. Those PSET changes have also been influenced, to a large extent, by foreign models at different times (Indian, French, Soviet, and Anglo-Saxon/Anglo-American) as well as the developing partners (with international agendas) and the private sector (abiding by practical and local realities) (see Chet 2006; Ford 2003; 2006). Over the past 20 years, privatisation of Cambodian PSET has been an important force of change. International development partners also play important roles in the translation, innovation, and localisation of foreign technologies and knowledge in the area of PSET in Cambodia. Despite influences from the outside, the courage and attempts of Cambodian scholars (especially, those in the 1960s and 1970s) to develop and characterise Cambodia's own identity of education in general and of HE in particular – for example, via what scholars call "Khmerisation" and "Cambodianisation" – took place in the past, though we have very few lessons about their success in doing so (see Ayres 2000).

The discussions above have posed critical questions on Cambodian PSET identities and approaches, the relationship between its HE and post-secondary TVET sub-sectors, their intellectual and vocational stances, and its future policy and institutional development directions. It should be remembered that historical traditions have important roles to play in all social institutions, especially universities (Altbach 2004, 19), and meaningful attempts to rethink the model of PSET may prove useful for the future of Cambodia (and other ASEAN countries) in the emerging global knowledge societies.

1.3. Current development of Cambodian PSET

1.3.1. HE development

1.3.1.1. HE development areas and phases

In the earlier years of the post-war HE reform, the *capacity development* activities of HE policy makers and officials (related to, for example, foreign language, information technology, and educational development skills) as well as the preliminary conducts of *research and investigation* on Cambodian HE by foreign experts were the key initial development works of Cambodian HE (Clayton and Yuok 1996). Between 2001 and 2005, an approximately USD3 million development grant from the World Bank allowed MoEYS to develop a new *legal framework* for Cambodian HE and supported policy makers to further define types of HE establishments (i.e. university and institute), establish a mechanism of national accreditation, allow public HEIs to become more autonomous, establish a credit transfer system, and rationalise the scholarship program (Ford, 2003, 12). The support also invited other policy focuses, such as the creation of minimum standards for foundation year programs and for HEIs. The fact that Cambodia waited until 2007 to have its Cambodian Education Law officially issued implies that the system had been operated for a certain period of time with an incomplete legal and regulatory framework.

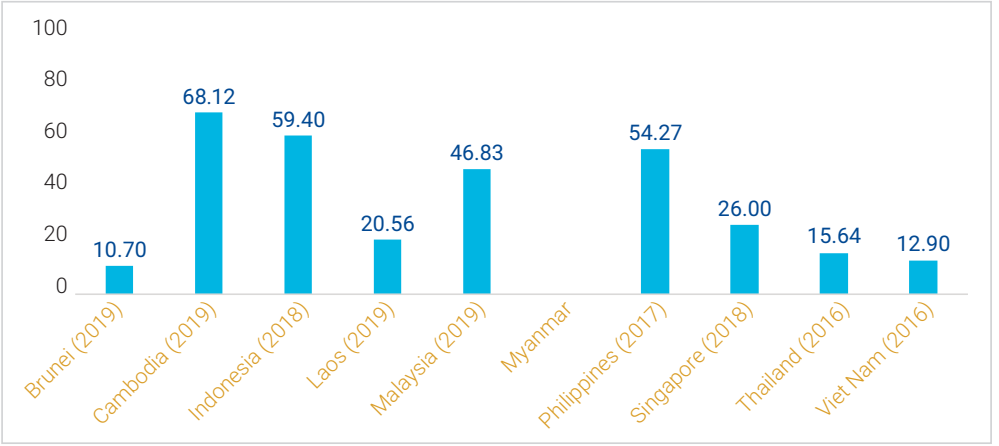
Even with the law and relevant decrees and policies, rule-based and meritocratic implementation remains stringent by the cultural tradition of patron-client hierarchical relationship and power (Ford 2003, 13). This condition points to the issue of *politicisation* in Cambodian HE milieu, evidenced in various aspects, from how power and authority are allocated at the governing and leading level of the system and institutions to how teaching and research freedom is viewed. This issue is generally a concern hinted (but never fully discussed) by scholars (see, Ford 2003; Chet 2006; Eng 2014; Un and Sok 2018; Ros, Eam, Heng and Ravy 2020).

In the 2000s, Cambodian HE introduced its first *privatisation* policy and the Public Administrative Institution (PAI) institutional model as a reform initiative (Un and Sok 2018, 3). Before then, the HE system had been highly state-regulated, state-controlled, and elite. The privatisation policy was intended to increase the number of HEIs and the access to HE in response to the increased local demand. Since then, the number of HEIs and enrolled students increased rapidly and significantly. Now, the private HE is an important part of the Cambodian HE system. According to the latest data from UNESCO as of 2019, the Cambodian HE system constitutes 68.12 percent of private HEIs. This is the highest percentage of private HEIs, compared to other countries in the region (See Figure 1.3). There are ten PAIs as of 2019 (Mak, Sok and Un 2019, 1).

In terms of *governance* at the system level, Cambodian HEIs are administrated under different governmental ministries. MoEYS (2021, 100) reported that there are 16 ministries governing 128 HEIs institutions as of 2020. The MoEYS oversees the

majority of these HEIs (mostly the universities and institutes). It should be noted that the TVETIs under the MLVT and other post-secondary educational and training institutions under other ministries – i.e. Ministry of National Defense (MND); Ministry of Cults and Religions (MCR); Ministry of Agriculture, Forestry and Fishery (MoAFF); Ministry of Health (MoH); Ministry of Culture and Fine Art (MCFA); Ministry of Interior (MoI); Ministry of Economy and Finance (MEF); Ministry of Public Works and Transport (MPWT); Ministry of Social Affairs, Veterans and Youth Rehabilitation (MoSVY); Ministry of Mines and Energy (MME); Ministry of Posts and Telecommunication (MPTC); Ministry of Land Management, Urban Planning and Construction (MLMUPC); National Bank of Cambodia (NBC); and Office of the Council of Ministers – are also included in this list of the 128 HEIs. So, despite the introduction of privatisation, the Cambodian HE system and institutions remain highly state-regulated, state-steered, and centralised. The fragmentation in the system-level governance remains a big challenge in terms of conceptualisation of PSET, coordination, financial operation, resource allocation, and monitoring and evaluation. Structural, rule-based interventions from the central policy bodies (particularly, the Directorate General of Higher Education (DGHE) of MoEYS) face multiple challenges.

Figure 1.3: Percentage of private HE providers of ASEAN countries



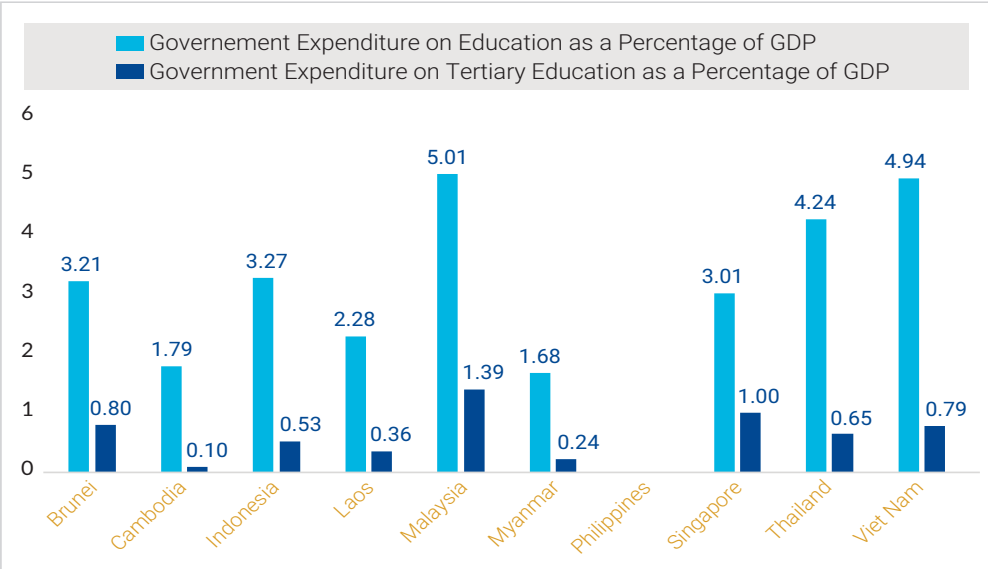
Source: UNESCO Institute of Statistics data, retrieved on 22 June 2021
Note: Number in brackets is the year the data is reported. Data for Myanmar is not available.

In terms of *financing*, the public blocked funding for HE via MoEYS was around 0.0005 percent of Gross Domestic Product (GDP) over the past decade, making Cambodia the lowest spender on HE among the ASEAN countries (Mak, Sok and Un 2019, 12). While the whole Cambodian public HE system receives less than 0.1 percent of the Cambodian GDP, MoYES spent only around 4 percent of its annual education budget on the HE sub-sector in 2013 and around 4 percent in 2016 (Un and Sok 2018, 5). In absolute terms, the expenditure on HE was USD15,069,541 in 2014, USD9,715,322 in 2015, and USD6,928,267 in 2016 (excluding wages) (Mak, Sok and Un 2019, 12). These

financial statistics suggest that each public HEI in Cambodia obtains a very limited amount of public funding, which, according to Un, Hem and Seng (2015), is mostly spent on administrative tasks and academic salaries.

Besides the annual public funding, the other two major sources of HE finance are from developing partners and private fee-paying students (Mak 2019). HEIs in Cambodia need to survive on fee-paying programs, meaning that the 128 institutions have to compete for a market share of around two hundred thousand students annually. Most public HEIs under MoEYS charge between USD400 and USD600 per year for bachelor's degree programs and around USD1,000 per year for master's degree programs (Mak, Sok and Un 2019, 14). However, the private HEIs need to spend on rent (land and/or building), utilities (water and electricity), other fixed and recurrent costs (such as teaching and learning materials and office equipment), and most importantly salaries of academic and administrative staff. Such a small market share of around two hundred thousand local students annually, the high competition (that further requires some institutions to lower the fees), and the high expenditure (especially, on rent and salaries for private HEIs) lead to a concern on whether the private HEIs have made an optimal investment to ensure the quality of education and learning outcomes for students, to promote non-teaching academic works (such as research and services) of academic staff, and to provide continuous academic and professional development to both academic and non-academic staff.

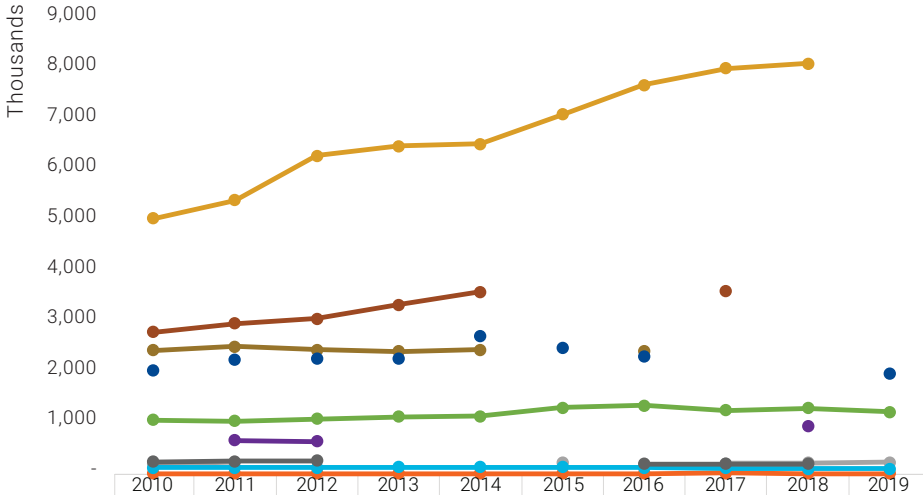
Figure 1.4: Percentage of government expenditure on education and tertiary education of ASEAN countries (averages between 2010 and 2019)



Source: UNESCO Institute of Statistics Data, retrieved on 22 June 2021
Note: Average is calculated between 2010-19, using only years with available data; No data is available for the Philippines.

Access and *equity* are also the key issues of Cambodian HE. Gross enrolment rate in Cambodian HE remains at 11.6 percent as of 2018 (MoEYS 2019b, 7, 40), so it is not yet a mass HE system, based on the Martin Trow's theoretical benchmark (15%). Annually, around two hundred thousand students enrolled in the system (see Figure 1.5 below for the exact number and for a comparative perspective with other ASEAN countries). The majority of the students choose such popular majors as business administration and management, English language, and information technology (Mak 2019). Simultaneously pursuing two degrees at different HEIs has remained a common practice among Cambodian undergraduate students (Un and Sok 2018) to increase their job prospects. Reportedly, 58,988 students graduated in the academic year 2015-16 (Un and Sok 2018, 2, citing MoEYS 2018). According to MoEYS (2021, 103-104), the number decreased in the academic year 2019-2020, with 8,184 associate degree graduates, 32,640 bachelor degree graduates, 3,296 master's degree graduates, and 31 doctoral degree graduates. It should be noted that, among the 128 HEIs, 45 offer master degree programs, and 21 offer doctoral degree programs (MoEYS 2021, 100), most of which are not full-time programs.

Figure 1.5: Number of student enrolments in tertiary education between 2010 and 2019 of ASEAN countries



	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Brunei	6	7	8	9	11	11	11	12	11	11
Cambodia	195	223				217		208	211	223
Indonesia	5,001	5,364	6,234	6,423	6,463	7,044	7,615	7,944	8,037	
Laos	118	125	126	137	132	130	122	111	105	101
Malaysia	1,061	1,036	1,077	1,117	1,128	1,302	1,337	1,249	1,285	1,218
Myanmar		659	634						932	
Philippines	2,774	2,951	3,044	3,317	3,563			3,589		
Singapore	237	244	255				195	195	198	
Thailand	2,427	2,497	2,430	2,405	2,433		2,411			
Vietnam	2,020	2,229	2,261	2,250	2,692	2,467	2,307			1,966

Source: UNESCO Institute of Statistics Data, retrieved on 22 June 2021

A key emerging issue of Cambodian HE development is that of *quality assurance*. The Accreditation Committee of Cambodia (ACC), formerly under the Office of Council of Ministers and currently under MoEYS, was established in 2003 as the sole, state-run quality assurance body. Even though an institution such as ACC is theoretically supposed to be independent, for Cambodia, it is a governmental agency (Un and Sok 2018, 2). To strengthen the accrediting and quality assuring capacities, the ACC released key official documents on the procedure for accreditation in 2016 and on the accreditation framework and rubrics in 2019. Likewise, two major HE associations – i.e. the Rector Council of Cambodia (RCC) and the Cambodian Higher Education Association (CHEA) – have also been established in Cambodia. The former constitutes 18 HEIs (Un and Sok 2018, 3) and the latter 56 private HEIs as of 2015 (Dy 2015, 51). How these two associations have functioned in response to quality assurance of Cambodian HE is not yet apparent.

1.3.1.2. Future direction of Cambodian HE development

With all of these background issues, HE performance and development in Cambodia have remained slow in many aspects in comparison to more economically advanced nations in the region and in other parts of the world. Even though various changes at the policy, institution, and program level have emerged, it is fair to say that the earlier-discussed major issues -- governance, finance, access and equity, and quality and relevance -- have remained a burden to the HE system and are the key agenda for Cambodian HE policy, practice, and research. Major policy documents continue to prioritise, invest, and intervene in these areas, with certain new strategic focuses, missions, and actions.

Starting from 2021, Cambodian HE policy planning and intervention have concentrated more deeply into such structural issues as the capacity of HE policy making and intervening body; HE governance and finance policies; STEM development (focusing on majors, infrastructure, quality and research promotion) through developing grants; improvement of HE curriculum, teaching, and learning; and scholarship provision to the disadvantaged groups of students. These different themes are laid out in various key documents such as the Higher Education Vision 2030, the 2017 Higher Education Roadmap, the Cambodia's Education 2030 Roadmap, and the new national Education Strategic Plan 2019-2023. Table 1.1 below offers a summary of Cambodian HE development directions from the four documents. The Higher Education Improvement Program (HEIP) has been the key programmatic development initiative of HE development, operated by the DGHE. Increased financial support of USD 92.50 million (with USD90 million loans from the World Bank and USD2.5 million contribution from the Cambodian government) will be used to implement the designed policies, strategies, and activities.

Table 1.1: Summary of different key policy and strategic plan documents of Cambodian HE

Higher Education Vision 2030	Higher Education Roadmap	Cambodia's Education 2030 Roadmap (for the HE Sub-Sector)	Education Strategic Plan 2019-2023 (for the HE Sub-Sector)
Objective 1: Create a comprehensive equity and access program that ensures all qualified students have the opportunity to study at HEIs and complete a quality program. **Objective 2**: Develop relevant curricula that provide students with excellent knowledge and skills that help them contribute fully to national development and labour market needs. **Objective 3**: Improve quality of learning, teaching and research systems to provide students with knowledge and skills needed in the labour market and contribute to national development. **Objective 4**: Develop a governance system, mechanisms and policies for higher education which enhance the quality of management and performance of higher education institutions and other relevant institutions.	**Goal 1**: Quality and relevance *Objective 1*: to improve teaching and learning *Objective 2*: to promote research and innovation *Objective 3*: to upgrade faculty and staff **Goal 2**: Access and equity *Objective 1*: to enable more students to enter HE *Objective 2*: to retain students in HE **Goal 3**: Internationalisation *Objective 1*: to promote academic mobility and collaboration *Objective 2*: to promote international and regional academic programs **Goal 4**: Governance and Finance *Objective 1*: to enforce and enact policies and legal frameworks *Objective 2*: to improve financial management and increase funding.	**Strategy 1**: Expand the provision of higher education through a number of interventions to increase enrolment in higher education by allowing both needy and competent students access to higher education irrespective of their social and economic background. **Strategy 2**: Improve the quality of higher education programs through professional/ academic upgrading programs for faculty members, curriculum improvement and aligning curricula with the globally changing needs and demands, improving academic and physical facilities. **Strategy 3**: Improve the governance and management of higher education sector by strengthening coordination, planning, financing, administration and monitoring functions. **Strategy 4**: Promote internationalisation of higher education in order to strengthen the overall quality, competitiveness, visibility and innovation, in particular with higher education institutions in the ASEAN region.	**Sub-sector objective 1**: Enhance equitable access and improve the quality of higher education programmes towards national and international accreditation *Strategy 1.1*: Increase results-based investment on prioritised higher education programmes *Strategy 1.2*: Improve capacity in teaching, learning and research through the development of higher education partnership programmes *Strategy 1.3*: Increase full-time academic staff with PhDs **Sub-sector objective 2**: Develop a governance and management system to support HEIs to become fully autonomous *Strategy 2.1*: Strengthen the financial and human resource management system at HEIs towards full autonomy *Strategy 2.2*: Strengthen the quality assurance system in higher education

Source: Authors' summary

1.3.2. Post-secondary TVET development

Scholarly literature generally categorises three TVET models: the state-regulated model (France), the liberal market model (Britain), and the dual corporate model (Germany), which are differentiated by various aspects including TVET regulators, TVET providers, TVET curriculum designing stakeholders, TVET financiers, and TVET qualifications and career paths (Wollschlager and Guggenheim 2004, 9). It is presumable that Cambodia designed its modern TVET model by following the French state-regulated model during the colonial period (1863-1953). However, scholars generally consider that Cambodian formal TVET sector commenced in 1979 and was aimed at increased employment and poverty reduction after the war ended (Daroesman and Trewavas 1999, 203). The development of the modern Cambodian post-secondary TVET sector had been in line with its HE counterpart until the separation of the HE and the post-secondary TVET governance between the MoEYS and MLVT, with the responsibilities for formal TVET programs transferred from MoEYS to MLVT in 2005 (MoEYS 2019a, 13).

1.3.2.1. Post-secondary TVET development areas and phases

Since the ADB loan project in 1996-1997 to support the development of Cambodian TVET sector, Daroesman and Trewavas (1999, 203-207) reported that this sector has been expected to:

- improve its coordination, administration, and management;
- increase relevance to industry needs;
- create demand-driven national accreditation standards;
- develop articulation system to link TVET to other education areas; and
- improve public mentality on values and choice of TVET.

With such broad expectations, some key system-level developmental missions of the TVET policy making bodies include management information system (MIS), staff development, training alliance facilitation, financial management, and education legislation (Daroesman and Trewavas 1999, 217). Some of these issues have remained a structural challenge until lately. At the institutional level, other issues have been raised and discussed. Outdated curriculums, poor facilities, and low salaries for staff are reported (Lonn and Khieng 2015) and are among the most concerned issues. Lonn and Khieng (2015) added that the Cambodian TVET system and institutions need to also consider the structural issues such as the low quality of graduates from upper secondary schools; the lack of majors and career guidance for TVET; the quality-oriented TVET design that remedies skills gaps and skill mismatch; the low Public-Private Partnership (PPP), and the gender equality issues in TVET education.

Currently, new and emerging TVET issues are further experienced by policy makers and relevant stakeholders in the context of the changing world of working, the decent job expectations, and the increasingly networked and digitalised economic activities.

Such trends require a vision of the post-secondary TVET that is more systemic and well-aligned across the educational sub-systems and the economic system, not only locally but also regionally and globally. Developing a positive image of the post-secondary TVETIs and the national skill strategies and systems (not just at schools but also at workplaces) becomes a highly urgent agenda of TVET development.

These broad TVET missions have been broken down into specific actions for policy planning, development, and intervention at different phases. The following table shows the actual, focused activities of the Cambodian TVET development at each phase (i.e. TVET system reform 1995-2004; TVET governance and management strengthening 2005-2008; Quality training improvement 2009-2014; and Quality and access enhancement 2015-2020). The table is reproduced from a presentation slide by Mr Tep Eoun, a deputy general of TVET, MLVT, on 02nd November 2011.

Table 1.2: Main phases of the development of Cambodian TVET

Phases	Focuses
1995-2004	• Beginning to build the National TVET competency-based system, • Building/upgrading TVET facilities in each province, • Setting up the National Training Board (NTB), • Linking to Priority Action Program (PAP), • Setting up National Training Fund (NTF), • Developing NTTI (National Technical Training Institute), • Developing basic Cambodian National Qualification Framework (CNQF).
2005-2008	• Strengthening NTB and NTF, plus new TVET financial model, • Strengthening capacity of Directorate General of Technical and Vocational Education and Training (DGTVET) to support TVET, • Accelerating decentralisation, • Strengthening Provincial Training Boards, • Targeting poverty reduction and out of school youth, • Provincial Training Centres (PTC) development in support of community-based skills, • Piloting commune training voucher program, • Developing revenue/life-long learning models for PTCs, • Improving quality and number of private TVET providers, • Developing NTTI as a model training institute for all TVETIs.
2009-2014	• Strengthening Technical Institute (TI)/Sector Council, • CNQF put in place, expanding competency standards/testing program, • Strengthening in-industry skills upgrading from employees, • Expanding PTC based training and voucher system to all provinces.
2015-2020	• Improving distance education, • Expanding the number of providers offering industry responsive training with international standards, • Promoting TIs in each province, • Developing NTTI regional centres.

Source: Reproduced from Tep Oeun's Slide Presentation (2011)

These development areas and specific activities have been supported mainly by the ADB, together with other agencies and the Cambodian government's contribution. Among these ADB-supported programmatic development initiatives at different phases are (1) the Special Rehabilitation Assistance Project (with the actual project cost of USD80.8 million upon completion, with USD67.7 million from ADB's Special Funds) in operation from 1993-1997; (2) the 1995-approved Cambodia Basic Skills Project for operation between 1995-2001 (with the actual budget of USD19.3 million upon completion, with USD16.2 million from ADB); (3) the Strengthening Technical and Vocational Education and Training Project (STVETP), approved on 2009, for operation between 2010-2015 (with the total budget of USD26.5 million upon completion, with USD24.2 million from ADB); (4) the Technical and Vocational Education and Training Sector Development Program (TVETSDP), approved in 2014, for operation between 2015-2020/21 (with an estimated loan of USD30 million from ADB, with an additional co-funding of USD15 million from Agence Francaise de Developpement); and (5) the S4C (Skills for Competitiveness Project) 2019-2024 (with an amount of USD88.23 million, USD60 million of which comes from ADB).

1.3.2.2. Some important background information of Cambodian post-secondary TVET

In terms of *system governance*, policies of the whole TVET sector are under the overarching governance, advise, guidance, and approval of the National Training Board (NTB), with the assistance of the DGTVET of MLVT (Lonn and Khieng 2015, 95). Likewise, the NTB also plays the role of accreditation of the TVET sector – as is the Accreditation Committee of Cambodia (ACC) for the HE sector (KWPF 2015), and both the NTB and the ACC are responsible for quality assurance and qualification design of their respective sectors. However, while the ACC plays the role as a registration body for HEIs, for the TVET sector, the registering bodies are separated by industrial sectors under different ministries (KWPF 2015, 4).

In fact, the governance of the whole Cambodian TVETIs is slightly complex. The TVETIs at the secondary school level are governed and supervised by MoEYS's Department of Vocational Orientation whilst the post-secondary TVETIs are controlled by MLVT (see UNESCO-UNIVOC 2014; Lonn and Khieng 2015). MLVT also supervises technical training programs that offer Certificate 1, 2, and 3, which are equivalent to grade 10, 11, and 12 of the academic upper secondary education program. There are only 39 formally registered TVETIs (Yok, Chrea and Pak 2019, 27), eight of which are based in Phnom Penh, 16 are given the title of "institute" and 23 are either "Provincial Training Centres (PTCs) or Vocational Training Centres (VTCs). And, again, there are 73 private TVETIs (Yok, Chrea and Pak 2019, 27, citing MLVT 2018). If we include non-formal TVET programs, there have been a total of 331 institutions throughout Cambodia (Lonn and Khieng 2015, 91). It should be noted that both MoEYS and MLVT have their own non-formal programs, sometimes indistinguishable. Such a situation surely creates, to a certain degree, overlapping roles among the two ministries.

In terms of e*nrolment*, based on the latest statistics from MLVT, in the 39 public TVETIs, there were 44,806 students in the academic year 2017-2018 (MLVT 2019, 1). Among these, 27,135 were enrolled in short course programs; 2,326 in Certificate 1 programs; 569 in Certificate 2 programs; 320 in Certificate 3 programs; 5,638 in Higher Diploma programs; 8,791 in Bachelor programs; and 27 in Master's programs. The share of enrolment into the Cambodian TVETIs is far lower than that into its HEIs, indicating low public values given to the TVET sector. In 2019, however, 62,347 students graduated from different TVET programs, an increase of 16.19 percent from 2018, according to the updated statistical information on the TVETMIS (TVET Management Information System) website.

The world of work, like the world of academia, is increasingly internationalised, regionalised, and globalised. The ASEAN economic integration and the mobility of workforce globally bring a lot of questions to countries in the region whose labour forces are low-educated and not equipped with the right skills and industrial experiences. Currently, the Cambodian government and its key TVET governing and administrative bodies (the NTB and the MLVT) have increased measures to engage development partners (especially, ADB, ILO, and Swiss Agency for Development and Cooperation (SDC)), the private sector, and relevant business or labour associations. *PPP* emerges as an important concept and outlook. The ministry hopes for more resources (financial and technical) to stay relevant and to bridge gaps between policies and practices in order to respond appropriately and timely to the development in market and industries.

Efforts to promote competency-based *curriculum* and *teaching and learning* approaches have been made by DGTVET and TVET providers, with support from development partners. Private and industrial partners have contributed to some extent in terms of building facilities and infrastructure at some TVETIs. However, these efforts have not guaranteed the values given to the TVET sub-sector as the level of employer satisfaction of the quality of TVET graduates remains a huge concern. This does not mean that TVET graduates face the problem of employment opportunities. Generally, the rate of graduates obtaining employment (during and after graduation) is very high.

1.3.2.3. Future direction of Cambodian post-secondary TVET development

From the policy perspective, the following areas and directions are in focus for the future development of Cambodian TVET system and institutions. Four key documents tend to direct and offer core information on these development strategies and missions: the National Policy on TVET 2017-2025, the National Employment Policy 2015-2025, the Cambodia's Education 2030 Roadmap, and the National Strategic Plan for TVET 2019-2023. Table 1.3 below offers a quick summary of key points in these documents.

Table 1.3: Summary of different policy and strategic plan documents of and related to Cambodian (post-secondary) TVET

Technical and Vocational Education and Training (TVET) National Policy 2017–2025	National Employment Policy 2015-2025	Cambodia's Education 2030 Roadmap (for the TVET Sub-Sector)	National Strategic Plan for Technical and Vocational Education (TVET) 2019-2023
• **Goal 1**: Improve TVET quality to meet national and international market demand • **Goal 2**: Increase equitable access to TVET • **Goal 3**: Promote PPPs and aggregate stakeholder resources to support sustainable development of TVET System • **Goal 4**: Improve governance of the TVET system	• **Goal 1**: Increase decent and productive employment opportunities • **Goal 2**: Enhance skills and human resource development • **Goal 3**: Enhance labour market governance	• **Strategy 1**: Expand the provision to increase access to TVET, paying special attention to the needs of women, marginalised groups, poor youth, dropouts, etc. • **Strategy 2**: Improve the quality and relevance of TVET programs to meet the needs of the labour market. • **Strategy 3**: Promote public-private partnerships and strengthen partnerships with different providers/ partners. • **Strategy 4**: Strengthen the management, coordination and governance of TVET.	• **Strategy 1**: Promote work conditions and harmonisation of occupations • **Strategy 2**: Modernise TVET system • **Strategy 3**: Preserve and increase occupations and jobs in and outside of the country • **Strategy 4**: Develop social security regime • **Strategy 5**: Enhance general supporting services

Source: Authors' summary

1.4. New discourses of Cambodian PSET in the dynamics of changes

When we look at the post-secondary TVET and the HE sub-sectors from a cross-sector perspective, it is presumable that Cambodian modern PSET system, sub-sectors, institutions, programs, and classroom-level courses have developed inconsistently, from its revival and reforms in the 1980s to the current state in the second decade of the 21st century. The central policy questions of Cambodian PSET until now still rest on its mixed and complex governance and organisational structure. These structural problems are shaped by mixed influences of the different foreign models and the multiple layers of the problems themselves, resulting in the lack of clarity and what Pit and Ford (2004) considered as the state of higher education with "mixed visions".

Cross-sector issues of HE and post-secondary TVET have continued to manifest in a complex dynamics of changes and further fuelled the difficulty in coordinating and consolidating the whole PSET system. Those changing trends have brought more questions to both sub-sectors and across them, in terms of governance and coordination; identities and functions; degrees and credit transfer mechanisms; curriculum focuses, frameworks, and designs; teaching and learning approaches; types of teaching or training workforce; social status and images of institutions; and research frameworks. These cross-sector issues underpin the whole PSET concept, system, and institutions in Cambodia, but academic literature and policy investigations have so far placed limited attention to these issues and reasons explaining them beyond Cambodian border.

Why there are such incessant changes in PSET globally have continued to be one of the central inquiries of comparative higher educational researchers, sociologists of higher education, and TVET researchers. In a broad sense, the dynamics of changes are shaped by historical and cultural traditions as well as social, economic, political, commercial, vocational, and generational conditions of a particular country and the impacting international and global trends in a particular era. In a more specific elaboration, some major causes of the blurred boundaries between HE and the post-secondary TVET and the shifting directions of PSET in the 20th and 21st century include (1) the global massification phenomenon of PSET after World War II, (2) the economy/market-oriented PSET policy designs of different countries, and (3) the changing nature of the world of work and employment.

- The massification of higher education leads to a shift in focus and changes in the role of the university sector in order to serve increases and diversities in higher education demands. The impact of globalisation on the massification of PSET is tremendous. International mobility of higher education seekers across borders has become increasingly common.
- Also, the government policies and agenda of many countries have pushed HEIs to be more performative and productive, not only in terms of accumulating academic capitals (such as published academic papers or obtained research grants) but also in terms of their roles in contributing to economic and industrial development (for example, by supporting industrial research or by means of technology transfer). In the face of more governmental controls and steering, the HE sector has no choice but to insert more professional, vocational, and practical substances into its academic and scholarly environment and to connect academic higher education to employment and the market. In this sense, institutional arrangement, educational programs, and teaching and learning approaches between HE and TVET become overlapping.
- The world of work has also changed, requiring employers to recruit more well-rounded employees with both hard and soft skills, fixed and transferable skills, as well as professionally specialised and socially and internationally adapting skills. Information and Communication Technology (ICT) and digital skills

become highly relevant and indispensable. More innovation and adaptability are needed by the HEIs, the TVETIs, and the companies in meeting the demands of the local, regional, and global labour market. PSET has to respond to such changes and stay relevant.

Another new factor that may tremendously incur changes in the whole PSET sector is the emergent discourse of the post-industrial knowledge economies and societies and the regard of the 21st century as the age of learning. In this age, the changes in the PSET space (e.g. changing academic profession, changing world of work, changing student generation, the changing focus on the 21st-century competence, the move towards holistic and integrative educational paradigms as in STEM/STEAM discourses, the increase of research-based resources for the learning science) are now of central importance in policy and scholarly decision making but are characterised by uncertainty and unpredictability. The implication of the new changes on the PSET system is that a nation's conceptual and operational foundation of PSET needs to be clear, firm, and resilient. Otherwise, the issues of fragmentation, confusion, and conflict of interests will continue to interrupt that nation's PSET journey towards quality, excellence, and global prestige. It should be noted that in the Global Knowledge Economy Index (GKI), indicators of both university education and TVET training (and others such as research and development and pre-university education) are included in the measurement framework (UNDP and MBRF 2021).The next chapter will explore this new societal discourse and its relevance to the PSET sector.

Based on the above discussions, Cambodian HE and its post-secondary TVET shall be discoursed together in the conceptual scope of PSET as both have developed together and faced inter-related challenges. As the world economy and human society have become more globalised, digitalised, and knowledge-driven, PSET needs to adapt to these dynamics of changes beyond its local concerns.

As the world stepped into the 21st century, there has been no sign that the sector of PSET globally will stop changing and facing further complications. And there is also no sign that the important and central roles of PSET in the knowledge-driven economies and societies will become irrelevant any time soon. With innovativeness and creativity (in terms of vision, missions, and approaches of PSET), providers and service seekers of PSET will continue to drive those changes and progress. Hence, policy makers of PSET need to articulate clearly how the system should be organised in a way that is functional for the local and global ecosystem of knowledge and work and determine which position the PSET of a nation should take in order to benefit from highly-connected knowledge economies and societies.

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Chapter 2

Cambodian Post-Secondary Education and Training in the Global Knowledge Societies: Issues for Consideration

Eam Phyrom

In the emergent global knowledge societies, the roles of Post-Secondary Education and Training (PSET) are not partial or peripheral, but central and foundational. To explain, PSET is one of the most important social engines that creates, innovates, translates, preserves, transmits, and diffuses knowledge. Almost no other social institutions have such a kind and level of capability and authority. In many countries, Higher Education Institutions (HEIs) provide a trustable base for intellectual development, research, and innovation activities as well as national policy consultation. Likewise, advanced technical training centres offer a space for vocational and workforce development and contribute to the design of national employment and skills systems that sustain economic growth.

The significant position of PSET in knowledge societies is stimulated by regional and global education outlooks and strategies. HEIs, for example, are increasingly playing active roles in forming regional alliances, promoting regional economic and cultural integration, and building regional innovation systems. Such a tendency can be observed in all major regions around the world, from the European Union (EU) to the Association of South-East Asian Nations (ASEAN). On a global scale, the educational agenda and strategies of international organisations – such as the United Nations Educational, Scientific and Cultural Organisation (UNESCO) and the World Bank – and business approaches of giant technology corporations (such as Microsoft, Alphabet, and Apple) have tremendous impacts on higher education (HE) practices, from access to quality.

In Cambodia, education policies have tried to adapt to this global move towards knowledge societies. In its Cambodia's Education 2030 Roadmap, MoEYS (2019a, 16) articulates attempts to align between the global agenda and the national education policies, focusing on four aspects: conceptual alignment, priority alignment, policy alignment and performance alignment. Cambodia's 2021 Secondary Education Blueprint more clearly positions the "knowledge-based society" as the visionary Cambodian society that shall direct the missions and approaches of Cambodian education (MoEYS 2021a, 1). As for its HE sub-sector, the 2017 Higher Education Roadmap and the Cambodia's Education 2030 Roadmap (for the HE section) similarly set strategic priorities to promote HE

"internationalisation" and to align HE programs and curricula with the "globally changing needs". In the same way, its post-secondary Technical and Vocational Education and Training (TVET) sub-sector has made efforts to reform and innovate its vocational training and occupational system in response to the more regionally integrated economic and cultural frameworks of the ASEAN. The TVET National Policy 2017–2025 sets one of the four goals to "improve TVET quality to meet national and international market demand".

In fact, the idea of a knowledge society, or "Sangkum Buddhi" in Khmer, is not completely new to Cambodia. The state religion of Cambodia is Buddhism. The Cambodian ancestors' decision to adopt Buddhism could indicate that the society is directed on the path of knowledge and wisdom. Likewise, the use of the Sanskrit-rooted word "Sassna" (directly translated as "religion" but also broadly meaning "education") as one of the three pillars of the national motto of Cambodia (i.e. Nation, Religion, King) further emphasises the great values placed on education and knowledge by the Cambodian society. In a recent book titled "Education Reform in Cambodia: Towards a Knowledge-based Society and Shared Prosperity", Hang (2018), the current Minister of Education, reminded us that the ability for the ancient Khmer civilisation to reach its golden age depends largely on human resources with knowledge. Throughout history, the privilege given to knowledge as a means to develop human societies is common for all great human civilisations. In ancient Greece, Plato, in his famous text "The Republic", went as far as arguing that an ideal leader is the "philosopher king" who rules by the love of wisdom and the principles of higher knowledge. In most Asian societies, knowledge is highly treasured and knowledgeable men well respected.

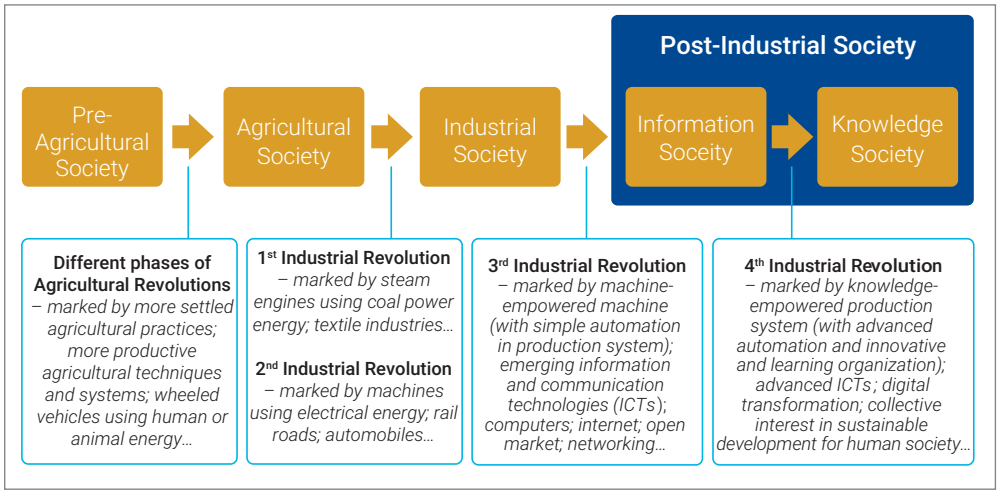
Despite the historical evidence of such ideological and social values given to knowledge, Cambodia needs to be well prepared in constructing and engineering its own knowledge society that fits right into the 21st century and to position itself properly in the larger landscape of the regional and global knowledge economies and societies. To achieve that ambition, the roles of PSET are important. So, we need to start with a clear understanding of knowledge economies and societies and their relation to PSET. Key questions are: What is a knowledge society? How does it relate to the PSET sector, both at the local and global level? And which aspects of Cambodian PSET need to be promoted to cope with what the global knowledge societies will bring? These questions are the core theses of this chapter.

2.1. The idea of the knowledge economies and societies

2.1.1. Concept and definitions

The most common understanding of the knowledge economies and societies is "epochal" (Sorlin and Vessuri 2007, 12; Forstorp and Mellstrom 2018, 25-26; Kabir 2019, 1-5). In this sense, the concept of a knowledge society is associated with the post-industrial epoch which was discussed first by Daniel Bell (1973). As seen in Figure 2.1 below, each epochal society is driven by some kinds of revolutions that lead to changes in the economic production system and other social characteristics.

Figure 2.1: Simplified diagram of major development epochs of human societies



Source: Author's synthesis

Despite the fact that knowledge economies and knowledge societies can be used together, the two concepts are different. Sorlin and Vessuri (2007), for instance, noticed that the concept of knowledge economies does not cover all important aspects (for example, the democratic principles) of the concept "knowledge societies". UNESCO (2005) even suggests the use of plural form of "societies", rather than a singular form, because different countries may have their own model and development phase of a knowledge society.

Furthermore, Kabir (2019, 3) explained what a knowledge economy is as follows:

> In knowledge economy, ideas, information and knowledge are the input resources; the research and development processes are highly knowledge-intensive; and the products, services, and commodities are new information, intellectual properties, and technological innovations.

Three main characteristics of the knowledge economies that differentiate it from the previous economies are (1) knowledge-intensive jobs dominate the labour market; (2) knowledge outweighs other production inputs; and (3) intangible capital demonstrates more weight than tangible (Kabir 2019, 5).

As for the definition of a knowledge society, among the previous discussants, Lytras and Sicilia (2005, 4) tended to offer the most technical conception:

> a new Strategic Position of our Society where the Social and the Economic Perspective is concentrated on the exploitation of emerging technologies, and well-defined knowledge and learning infrastructures are the main vehicles for the implementation of knowledge and learning strategies. The final milestone is a society with access to knowledge and learning for everyone.

Thus, a knowledge economy and/or society is that which treats (1) knowledge objects (i.e. information, data, ideas, and other intellectual resources) as a valuable

capital, commodity, or asset; (2) knowledge and learning functions (i.e. preservation, creation, innovation, translation, transmission, diffusion, application, management, and/or integration of knowledge) as the central process of work and life; and (3) knowledge infrastructures and learning systems (e.g. national innovation system, research and development institutions, knowledge-based production mechanism) as the key driving and navigating platforms for a nation to grow its economy and develop other social dimensions. In this sense, knowledge is not just the most important factor for the production system (compared to other factors such as land and building) but also a valuable end product in itself (Kabir 2019, 3). Knowledge workers (as coined in Forstorp and Mellstrom 2018, 25) – ranging from scholars, scientists, and professionals to information and data experts – as well as knowledge mediators and end-users will become key stakeholders in the knowledge economies and societies. Knowledge-intensive and knowledge-functional institutions, communities, and groups (such as educational institutions and workplaces that embed learning and innovation principles) (see, for example, Arimoto 2006; 2007; Lundvall and Johnson 2006; Guruz 2008; Wawak 2009) will become key players in the economic advancement and social growth.

Technologies (particularly, the Information and Communication Technologies (ICTs) and advanced digital technologies) and networking platforms (online and offline) are the tools and arenas to strategise, operate, and perform the knowledge functions. In the current context of globalisation, technologies allow free flow of and increased access to different types of knowledge (including scientific knowledge), information, and data in a greater scale and faster speed, further affirming the idea of the "global knowledge societies". Marginson (2010) noted that the "pluralistic scientific and cultural environment" is a central feature of global knowledge. The current open science advocacy and recommendations of the UNESCO are likely to pave a clearer path for the idea of global knowledge societies to prosper and become real. With all these said, the concept and framework of the global knowledge economies and societies have the potential to embrace all contemporary major development concepts – from data revolution to digital transformation, from green business to sustainable development, from data science to knowledge management, from global smart governance to Industry 4.0.

2.1.2. Underlying principles and assumptions

To further understand the idea and context of the global knowledge economies and societies, we need to explore (1) ongoing discussions about the type of knowledge in the global knowledge economies and societies and (2) key assumptions underlying the global knowledge economies and societies.

Seemingly, there have been two major views on the first point. One view is raised by earlier discussants that give light to the idea of knowledge societies (such as Robert E. Lane, Daniel Bell, and Nico Stehr) from their economic and developmental points

of view. These scholars apparently see scientific and technological knowledge as the basic form of knowledge in the knowledge economies and societies. Forstorp and Mellstrom (2018, 25), however, see this as a "downplay of the social distribution of knowledge and how it becomes embedded in the social, economic and political frameworks". In line with the Forstrop and Mellstrom's critique, the second view was occasioned by UNESCO, not as an opposite to the first but as an extension. While the first view tends to give more weight to the scientific and technological knowledge (more specifically the Western scientific and technological knowledge), UNESCO offers a more holistic and more pluralistic sense of knowledge. UNESCO includes indigenous knowledge system (IKS) and other forms of knowledge into its framework of knowledge societies, while still acknowledging the importance of scientific and technological knowledge.

UNESCO (2005, 17-20) suggested five principles and assumptions that should characterise the global knowledge societies:

- ***A knowledge society is a society that is nurtured by its diversity and its capacities**:* UNESCO has concerned the knowledge economies and societies with the momentum of globalisation and its agenda of global peace, equitable world, and sustainable development. In the knowledge societies, knowledge is given more power and privilege, not by any outside forces but by embracing social realities of a particular nation or a particular context. It is only by giving independent decisions and supportive capacities to functionalise knowledge in its real conditions that a society can defend its identities, secure its welfare, and rejuvenate itself. The different societal dimensions (political, economic, industrial, commercial, cultural, historical, social, and other dimensions) have freedom to negotiate the forms and modes of knowledge to be used.

- ***A knowledge society must foster knowledge-sharing**:* The key characteristics of a knowledge society are the importance and centrality of knowledge capitals, knowledge functions, knowledge infrastructures, and knowledge performances, but what is more central in this society is how to allow knowledge to efficiently mainstream into different dimensions of human life, work, and community. A knowledge society is not sustainable if knowledge is not widely disseminated and shared. Kabir (2019, 61) claimed that an implication of the knowledge society is "fluid access to knowledge as a public good by all individuals".

- ***The diffusion of information and communication technologies creates new opportunities for development**:* The constituencies of the knowledge economies and societies are *the post-industrial economies* driven by knowledge and technologies and the *information societies* with embedded innovations and inventions (Wawax 2009, 9; Forstorp & Mellstrom 2018,

24, citing Bell 1973). Kabir (2019, 92) enlisted a number of noticeable advanced technologies that are driving social development in a significant way: quantum computing, blockchain technology, 3D printing, internet of things (IoT), genetic engineering, nano technology, virtual reality and augmented reality, artificial intelligence, machine learning, robotics, bioscience, and 5G mobile technology. Many countries around the world have already considered developing their own national strategies for digital transformation, innovation systems, and tech-savvy lead-forces (used here to refer to consolidated groups of people who have a high level of mastery, professionalism, and entrepreneurship in technological fields and can serve as director, supporter, and guard for others to push the technological frontiers) in order to ensure adaptive capabilities of their nation in the global knowledge economies and societies.

- ***Knowledge societies are not limited to information societies***: The concept of the knowledge economies and societies is not completely synonymous with that of the preceding information economies and societies. To understand that we need to first understand the differences among knowledge, information, and data. "Data is the crude form and basic foundational building block of information; information is data with semantics (i.e. meaning); and knowledge embodies information with experience, insights, expertise that is used in the decision making process" (Kabir 2019, 141, citing Zins 2007). Kabir (2019, 60-61) argued that the idea of an information society relies basically on the use of ICTs to develop the human society, while the idea of a knowledge society relies on many other dimensions of knowledge (not just information and ICTs) – such as innovation built on advanced technologies, new knowledge creation and sharing by exploiting previous knowledge, and human development and learning – to impact various aspects of the society.

- ***Knowledge society is a new approach to relevant development for countries of the South***: This final point of the UNESCO's principles assumes that knowledge is important for the developing and least-developed countries to catch up and perhaps to contribute back to the global community. There is no doubt that key social dimensions (such as business, industry, politics, education, and community) of the least-developed countries have already drawn on benefits from the explosion of information, increasingly available data, diverse sources and modes of knowledge, and new forms of intelligence. Hence, the knowledge economies and societies present a vital alternative to many orthodox beliefs regarding the organisation of social, cultural, economic, and political life (Wawax 2009, 2) and are likely to promote inclusiveness and equity.

2.1.3. Current development and status

The development of the concept of global knowledge economies and societies happens along with the attempt to "engineer" it. Both the conceptual side and the engineering side are still being constructed and developed. To highlight some indicators on these constructions and developments, we can assess some existing initiatives.

As for the global knowledge economies, the World Bank once defined four pillars of its Knowledge Economy Framework: (1) educated and skilled labour force, (2) an effective innovation system, (3) a conducive economic and institutional regime, and (4) a modern and adequate information infrastructure (Chen and Dahlman 2006, 4-8). However, the World Bank's project on Knowledge Economy was discontinued in 2012 (EBRD 2019, 32).

In 2014, the European Bank for Reconstruction and Development (EBRD) (2019, 4) developed its Knowledge Economy Framework (built on the existing framework of the World Bank), with four similar pillars: (1) skills for innovation, (2) innovation system, (3) institution for innovation, and (4) ICT infrastructure.

Then in 2017, the United Nations Development Program (UNDP), in collaboration with the Mohamed Bin Rashid Al Maktoum Knowledge Foundation (MBRF), developed the Global Knowledge Index (GKI), constituting seven areas: (1) pre-university education, (2) technical and vocational education and training, (3) higher education, (4) research, development and innovation, (5) information and communication technology, (6) economy, and (7) the general enabling environment (UNDP and MBRF 2021, 2).

In terms of measurement, there are 12 knowledge indicators included in the measure of the Knowledge Economy Index (KEI) of the World Bank (Chen and Dahlman 2006, 11). For the EBRD, there are 38 indicators (EBRD 2019, 5). Perhaps because these previous indicators are not comprehensive, equitable, and/or representative enough to cover the idea of knowledge economy on a global scale, the new measurement approach of the GKI has been established. For this latest framework of the GKI by the UNDP and MBRF, there are 155 variables (UNDP and MBRF 2021, 22) in its seven areas.

It should be highlighted that the most recent GKI report (see UNDP and MBRF 2021) ranks Cambodia 112th of 154 countries, which makes it the eighth among the ten ASEAN nations (see Table 2.1). The GKI scores of four ASEAN countries (i.e. Indonesia, Cambodia, Laos, and Myanmar) have remained below the world GKI average of 48.4. Among the seven areas, Cambodia still need to work hard to improve its higher education sector and its research, development, and innovation sector (as well as other areas whose score is still below the middle value of 50).

Table 2.1: ASEAN countries' Global Knowledge Index

Global Rank	ASEAN Rank	Country	Global Knowledge Index	Pre-University Education	Technical and Vocational Education and Training	Higher Education	Research, Development and Innovation	Information and Communications Technology	Economy	Enabling Environment
6th	1st	Singapore	69.3	77.8	66.3	60.7	49.6	72.2	82.1	80.1
51st	2nd	Malaysia	53.6	60.9	58.3	41.9	35.5	55.5	65	60.2
59th	3rd	Brunei	51.3	69.5	53.8	49.7	20.6	50.2	55	64.5
64th	4th	Philippines	49.6	70.5	61.6	49.6	25.7	40.7	51.1	47.6
66th	5th	Vietnam	49.6	74.4	54.5	35.8	28.2	40.9	60.1	55.2
68th	6th	Thailand	49.5	67	43.4	37	32	48.6	64.1	57
87th	7th	Indonesia	46.3	57.6	49.5	45.3	23.3	40.5	57.9	52.1
112th	8th	Cambodia	40.1	43.3	43.3	32.5	23.7	39.7	52.5	48.8
121st	9th	Laos	38	50.1	42.1	42	19.9	23.1	45.1	46.7
136th	10th	Myanmar	34	44.3	41	26	19.6	26.6	42.4	40.4

Source: Reproduced from UNDP and MRKF 2021, 5-6

While the development of these indicators for the global knowledge economies has become more concrete, the conceptual development and engineering process of the global knowledge societies have seemingly been at an early stage. There have been a series of world summits, organised by UNESCO, that provide some indication to establish the holistic framework of (global) knowledge societies. For example, the themes explored by researchers and stakeholders, as presented in the 2009 World Summit on the Knowledge Society (WSKS) (see Lytras 2009, V), include eleven general pillars:

- ***Pillar 1***: Information Technologies – Knowledge Management Systems – E-business and Business and Organisational and Inter-organisational Information Systems for the Knowledge Society;
- ***Pillar 2***: Knowledge, Learning, Education, Learning Technologies, and E-learning for the Knowledge Society;
- ***Pillar 3***: Social and Humanistic Computing for the Knowledge Society – Emerging Technologies for Society and Humanity;
- ***Pillar 4***: Culture and Cultural Heritage – Technology for Culture Management – Management of Tourism and Entertainment – Tourism Networks in the Knowledge Society;
- ***Pillar 5***: E-government and E-democracy in the Knowledge Society;
- ***Pillar 6***: Innovation, Sustainable Development, and Strategic Management for the Knowledge Society;
- ***Pillar 7***: Service Science, Management, Engineering, and Technology;
- ***Pillar 8***: Intellectual and Human Capital Development in the Knowledge Society;
- ***Pillar 9***: Advanced Applications for Environmental Protection and Green Economy Management;
- ***Pillar 10***: Future Prospects for the Knowledge Society: From Foresight Studies to Projects and Public Policies; and
- ***Pillar 11***: Technologies and Business Models for the Creative Industries.

All or some of these pillars are likely to be considered as elements of the future framework of the global knowledge societies.

2.2. The emergent global knowledge societies and the PSET

The concept of global knowledge societies has become a multidisciplinary research area. In the educational discourses, the areas of international and comparative education and sociology of education are ones that pay critical considerations on this concept (Forstorp & Mellstrom 2018, 6-7). PSET has increasingly become an important educational sector that is closely intertwined with the progression of the global knowledge societies, the global agenda of lifelong learning, and the open science movement. A number of factors should be highlighted to explain this strong connection.

- First, research and innovation which are the core functions of PSET have generated many positive impacts on economies and societies, and such impacts have become increasingly evident in the 21st century. Fedoroff (2012) noted that knowledge societies rest on a foundation of educational and research excellence. Neubauer (2012) similarly explained that the rapid and exponential growth of information and knowledge and the HE capacity to accommodate the explosion of information and knowledge characterise the core attributes of the global knowledge societies. Education and research are the key elements in the formation of the global environment, being foundational to knowledge, to the take-up of technologies, to cross-border association, and to sustaining complex communities (Marginson 2010, 6964).
- Second, the increasing relevance of science, technology, engineering, and mathematics (STEM) is another explanation of the strong connection between PSET and the global knowledge economies and societies. To develop STEM workforce and knowledge workers who are literate in STEM to serve the knowledge economies, PSET system and institutions have an important role to play. The digital technologies and ICTs needed in the process of knowledge creation or dissemination are also an important component in the structure of STEM education and STEM pipeline.
- Thirdly, collaboration and partnership in the PSET ecosystem are another obvious explanation because through such collaboration and partnership knowledge can be shared and diffused into the larger society. These collaborative practices emerge in the form of Triple-Helix mechanism, university-industry linkage, Public-Private Partnership (PPP), or third missions of PSET institutions. In many instances, PSET institutions play the central role in such collaboration. Such collaboration within the PSET ecosystem promotes and speeds up the process of translation, application, and innovation of knowledge and technology from universities to industries and vice-versa.

In fact, international and regional organisations have devised new strategies to link PSET to the global knowledge societies since the 20th century. These strategies can be observed both in the Higher Education (HE) sub-sector and the post-secondary TVET sub-sector of PSET.

- For the HE sub-sector, the UNESCO and the Organisation for Economic Cooperation and Development (OECD) have been working as the key players in transforming the connection between the global and regional knowledge societies and the PSET. Regionally, the European Bologna Process and Lisbon Strategy have been viewed by scholars as an exemplary mechanism that paves the way for European countries to make their education become a medium for the most dynamic and competitive global knowledge-based economy (Wawax 2009, 4). The European countries do so in order to respond to the rising knowledge, science, and technology power of the United States (US) and

some rising Asian countries as they [the European countries] have learnt the economic benefits those countries reap from their strong knowledge bases. Regionalisation of HE in other regions of the world (e.g. Latin America, Africa, and ASEAN) follows suit. Countries around the world have started to conceptualise and develop their own National Innovation System (NIS) (see, for example, Lundvall and Johnson 2006) as well as research and development systems and knowledge policies. Furthermore, international HE researchers have worked to track records of how the academic profession and the global HE have changed in the emergent knowledge societies. The third international survey of academic profession, starting in 2017, is labelled Academic Profession in the Knowledge Society (APIKS), which is an extension from the previous two CAP surveys in 1992 and 2007 respectively.

- Likewise, the link between the global knowledge economies and the post-secondary TVET sub-sector has become apparent. The changes in the world of work, the more automated and digitalised work mechanisms, the preparation of national skills system, the global trend toward decent employment, the link of TVET to life-long learning and education for all, and the promotion of learning organisation or learning at workplace are all emerging trends within the intertwined sectors of post-secondary TVET and labour economy. The International Labour Organisation (ILO), the Asian Development Bank (ADB), and the UNESCO's UNEVOC (International Centre for Technical and Vocational Education and Training), together with regional organisations such as the European Centre for the Development of Vocational Training (Cedefop), are among the key players that occasion these changing discourses. The ASEAN countries have also shown increasing interests in promoting and harmonising the TVET sub-sector among the member countries to support the region's human development and economic growth.

Despite all these positive connotations, the connection between the emergent global knowledge societies and the PSET sector has been fuelled by "competition" – an issue that concerns many low-performing countries whose PSET systems and institutions remain at the periphery. Waldavsky (2010) coined the expression, "the great brain race", to connote this active competition in the global HE environment, as evidenced in the rise of university ranking, brain-drain-brain-gain talent strategies, international and regional collaboration of HEIs, and formation of national leagues of HEIs. In this sense, there will be an intricate interplay between collaboration and competition in the nexus between PSET and the global knowledge economies and societies. This is not to mention other negative aspects in terms of "coping with complex challenges such as climate, migration, food security, international terrorism… and financial crisis" (Forstorp and Mellstrom 2018, 33).

Thus, the journey and roles of PSET to transform a country, like Cambodia, into a knowledge society will not be highly comfortable. Cambodian leaders, economists,

cultural experts, and educational thinkers need to take the country's PSET sector more strategically as the nation is integrating itself into the region and further into the more collaborative but competitive world of education and work at the global level. Without appropriate planning and designs, the already low-performing HE and post-secondary TVET institutions of the country may lose their competitive edges and so stay as an outlier to the global core system.

2.3. Emerging areas and issues of Cambodian PSET in the global knowledge societies

An OECD's publication by Santiago, Tremblay, Basri and Arnal (2008, 18-22) recommended policy makers of tertiary education across the globe to rethink and redesign their systems and institutions in the knowledge society framework as follows:

- establish a grand vision for tertiary education,
- ensure that the capabilities of tertiary education contribute to countries' economic and social objectives,
- devise sound instruments for steering tertiary education,
- develop a funding strategy that facilitates the contribution of the tertiary education system and the economy,
- emphasise quality and relevance,
- raise the profile of equity within national tertiary policy agendas,
- position national systems in the international arena, and
- implement the issued policies successfully.

Asian PSET institutions have no choice but to join this international and global intellectual and economic race. However, they have to shoulder multiple responsibilities. Altbach (2004, 13-27) noticed that the 21st century Asian higher education systems are operated in the following contexts: higher education traditions modernised by Western models but ignored their own pre-Western intellectual cultures; increasing links between universities and economies; expansion and massification of higher education; privatisation of higher education; and necessity of open, distance higher education. He thus suggested eight areas and issues of challenges for consideration: massification, access, differentiation, accreditation and quality control, research, academic profession, globalisation and internationalisation, and transnationalisation (Altbach 2004, 27-31).

Based on these international and Asian frameworks, Cambodia needs to re-examine and align its PSET with the megatrends of global knowledge economies and societies while at the same time maintaining the local relevance and needs. As we integrate insights from previous local literature and official documents on PSET (for example,

Clayton and Yuok 1996; Chhem 1997; Sloper 1999; Pit and Ford 2004; Chet 2006, 2009; Khieng, Srinivasa and Chhem 2015; Srinivasa and Chhem 2015; Dy, 2015; Lonn and Khieng 2015; Un, Hem and Seng 2017; Un and Sok 2018; MoEYS 2014; MoEYS 2017; MoEYS 2019a; MoEYS 2019b; RGC 2017), nine key PSET areas emerge to be relevant and significant to prepare Cambodian PSET for the coming global knowledge economies and societies.

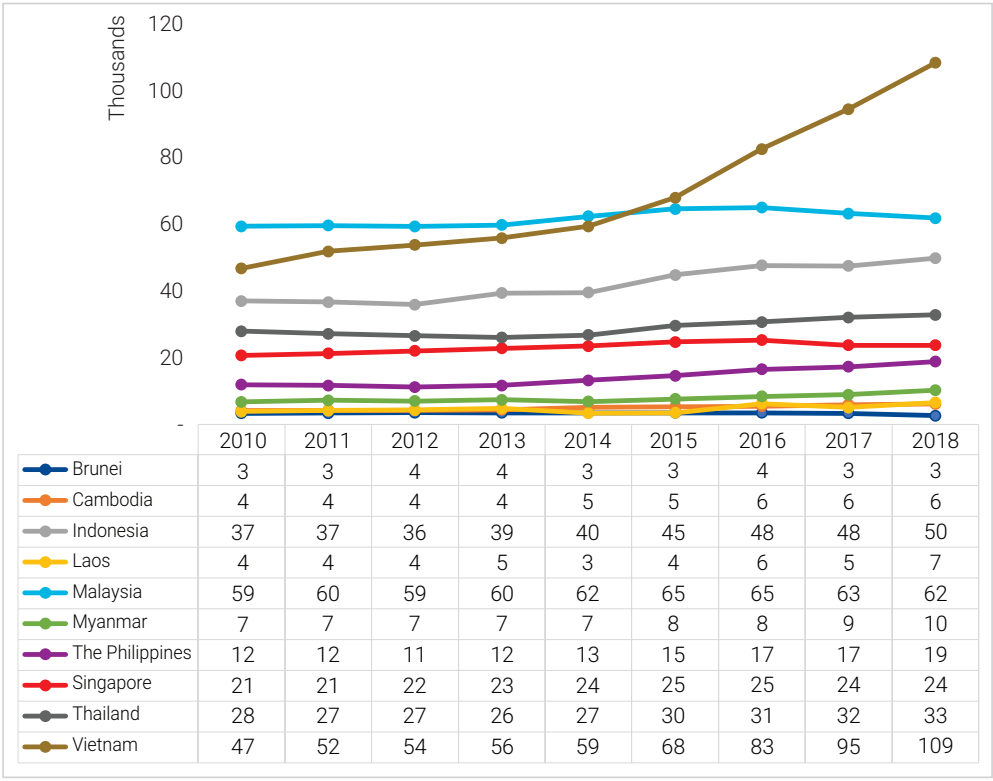
2.3.1. HE internationalisation

Internationalisation of HEIs has become an inevitable mission for HEIs in the 21st century. Almost all aspects of HE (e.g. curriculum, textbooks, faculty members, and students) can be part of the internationalisation dynamics. The cross-border mobilities of students, faculties, investors, and workers to find new educational or economic opportunities have become more common. Impacts of HE internationalisation can further shape political, economic, and cultural aspects of a nation and/or its region. So, the whole endeavour to develop HE policies in the context of the global knowledge economies and societies should not discount the necessity and clarity of internationalisation policy framework, goals, strategies, as well as approaches on the ground.

Recently, East Asian countries and some South-East Asian countries have been highly active in promoting internationalisation of their HEIs, following the initiative in Europe through the Bologna Process and the Lisbon Strategies (that result in the European Higher Education Area (EHEA) and the European Research Area (ERA) frameworks). Since the beginning of the 21st century, Japan, China, and South Korea have put serious efforts and investments on attracting foreign students and talents, improving their local students' global mindsets by sending them abroad and exposing them to the international environment at home, and raising their HEI ranks in terms of scientific contribution and numbers of top-ranked global universities. Hong Kong, Singapore, and Taiwan all have their own approaches to attract foreign professors to serve some of their globally prestigious HEIs. Malaysia has been acknowledged as a regional hub for HE and recognised for its vibrant HE transnational policies. Certain national universities in Thailand and (recently) Vietnam have been enlisted in the global university ranking result.

In Cambodia, internationalisation and regionalisation are perhaps still a new concept for the current Cambodian HE system and institutions (Leng 2016; Tek and Leng 2017). The ASEAN economic and cultural integration and the rise of internationalisation discourse of universities in East Asian and some South-East Asian countries are an impetus that makes the concept of "internationalisation" highly relevant for Cambodia HEIs. The number of Cambodian students sent to pursue HE at foreign universities has increased slightly annually, and, compared to other ASEAN nations, the number is noticeable (see Figure 2.2). In the past five years, in the ASEAN region, only Vietnam tended to sharply increase the number of students sent abroad.

Figure 2.2: Total number of outbound tertiary students studying abroad of ASEAN countries



	2010	2011	2012	2013	2014	2015	2016	2017	2018
Brunei	3	3	4	4	3	3	4	3	3
Cambodia	4	4	4	4	5	5	6	6	6
Indonesia	37	37	36	39	40	45	48	48	50
Laos	4	4	4	5	3	4	6	5	7
Malaysia	59	60	59	60	62	65	65	63	62
Myanmar	7	7	7	7	7	8	8	9	10
The Philippines	12	12	11	12	13	15	17	17	19
Singapore	21	21	22	23	24	25	25	24	24
Thailand	28	27	27	26	27	30	31	32	33
Vietnam	47	52	54	56	59	68	83	95	109

Source: UNESCO Institute of Statistics Data, retrieved on 22 June 2021

Despite much changes in recent years in overall, Cambodian HE has remained nascent in internationalising its system and institutions in various critical aspects, from institutional infrastructure to large-scale programmatic initiatives to promote internationalisation. Strategic policies and action plans to promote internationalisation and regionalisation from the Cambodian side remain limited. Most Cambodian HEIs are still the participants, not yet the initiator, leader, or game changer of HE internationalisation. Ford (2003, 12) noted: "Cambodian higher education is on the periphery of the international scene – barely able to access it, let alone participate or contribute to it". The country is more active in sending rather than hosting. As for scholarship programs, in the academic year 2019-2020 in particular, Cambodia sent 437 students (143 females) to pursue both the TVET and higher education degrees (MoEYS 2021b, 107). However, MoEYS (2021b, 107) reported that Cambodia received only 155 foreign students (71 females) in the academic year 2019-2020, most of whom are from neighbouring Laos, Vietnam, and China.

Internationalising HEIs is not an easy and inexpensive mission, but, in the 21st century, Cambodia has no choice but to strategically and concretely embrace and conceptualise

the missions of internationalisation and regionalisation of its HEIs. The strategies have been outlined already in the 2017 Cambodian Higher Education Roadmap. But concrete actions and the outcomes and impacts of those actions remain to be observed. How Cambodian HEIs can move from being a mere participant to a more active contributor in HE internationalisation, not only responding to the local market needs but also achieving international academic excellence and prestige, is among the critical questions to be addressed.

2.3.2. Changing academic profession

The academic profession is key to the functioning of all HEIs and HE systems (Altbach 2004). The academic profession is a broad concept that covers or is related to academic career, academic works, academic identities, academic rank, academic rewards, and academic communities. Currently, as noted earlier, the international and global discourse of the academic profession has moved into a new phase that connects the academic profession to the knowledge societies (i.e. Academic Profession in the Knowledge Society (APIKS)).

To give a brief statistical information, Cambodian HEIs under MoEYS employ around 16,167 HE staff as of 2019, among whom the number of lecturers is 12,539 (MoEYS 2019b, 40), which is about 78 percent. By qualification, 15.5 percent of the lecturers held a bachelor degree (or 1,947 people), 69.8 percent a master's degree (or 8,751 people), and 8.7 percent a doctoral degree (or 1,090 people) (MoEYS 2019b, 40).

For these Cambodian academics and their profession in the face of the global knowledge societies, there are many questions and challenges. How the academics are recruited, how their works are evaluated, how they are rewarded, whether their work environment is satisfactory, and whether they have adequate freedom for their higher intellectual pursuit need further improvement and investigation, so as to allow the Cambodian academics to perform their best.

While Cambodian HE needs a strong academic career structure and culture (Un, Hem and Seng 2017), a particular issue of academic identities is generally ignored and unrefined in the discussion about Cambodian HE and academic profession. What the idea of an academic person constitutes and how s/he should be differentiated from other teaching or education-related professions are neither well explored nor shared among the local HE teaching personnel. More to the point, values given to the Cambodian academics are also somehow declining, as perceived by academics themselves (Ros, Eam, Heng and Ravy 2020). Only by understanding the academic identities and professionalism in a substantial way (especially, by comparing one's identities with the identities of academics from other nations) can policy makers and academics themselves reclaim their values, a sense of dignity, and the motivation for professional excellence. It should be noted further that academic identities can be shaped by local HE tradition and indigenous knowledge. Cambodian ancient

higher learning and indigenous knowledge may influence Cambodian academic identities in certain ways across times, but, unfortunately, considerations of the academic identities from such an indigenous perspective have been limited as well. On the same line of thoughts, academic development activities to support faculty members and students at Cambodian HEIs (for example, to understand their identities, to promote their leadership, or to advance their professionalism in teaching, learning, and research) seem to be constrained in many ways and so need further considerations, both at the system and institutional level.

2.3.3. Research

Research is the engine of the global knowledge economies and societies as it plays important roles in knowledge creation, diffusion, and exploitation. Building national research cultures, institutional research capacities, and individual research competence and confidence becomes an unavoidable mission for different sectors in Cambodia. The quantity and quality of Cambodian researchers, scholars, scientists, and professionals (to be serving in domains related to intellect, idea, knowledge, information, and data) need to be promoted to an optimal level.

For the HE sector in particular, academic research has to be defined as a core function because the essence of academic works is knowledge, and the way to create knowledge, especially scholarly and scientific knowledge, is via scholarly and scientific research. Academic and scientific research will continue to play important roles for the advancement of knowledge universally. Likewise, applied and developmental research at different kinds of research institutions in Cambodia will have a lot to contribute in the era of global knowledge economies.

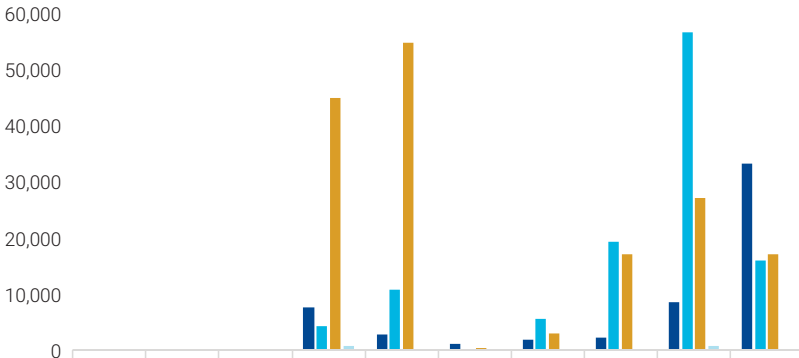
Cambodian HEIs and their graduate/advanced degree programs have begun to promote research infrastructure, culture, capacity, resource, activity, and impact at both the national system and institutional level. However, it has been common so far for the existing literature to label Cambodian HEIs as teaching-oriented and its graduate programs more as research-unproductive. Except for certain leading universities and certain areas of research, research activities (especially, academic research that aims for the advancement of theoretical knowledge) in Cambodia remain very limited in both absolute and relative terms.

According to the first national survey on Cambodian R&D conducted in 2015/16, 135 institutions in Cambodia can be classified as institutions with research activities – 29 (out of 81) government research institutions, 32 (out of 109) institutes of higher learning, 29 (out of 510[1] small business enterprises and 264 large business

1 The 510 small business enterprises cover 93 percent of the total number of enterprises in Cambodia (MoP 2018, 119).

enterprises), and 45 (out of 418[2]) non-governmental organisations (NGOs) (MoP 2018, 18, 119). Based on the UNESCO data in 2015, Cambodia has roughly 233 researchers in the government institutions, 178 in the HEIs, 40 in the private non-profit institutions, and only 20 in the business enterprises per million inhabitants. Compared to the average number of researchers per million inhabitants of other ASEAN countries, Cambodia is among the lowest, both in overall and by sector (see Figure 2.3).

Figure 2.3: Number of researchers per million inhabitants, by sectors, of ASEAN countries



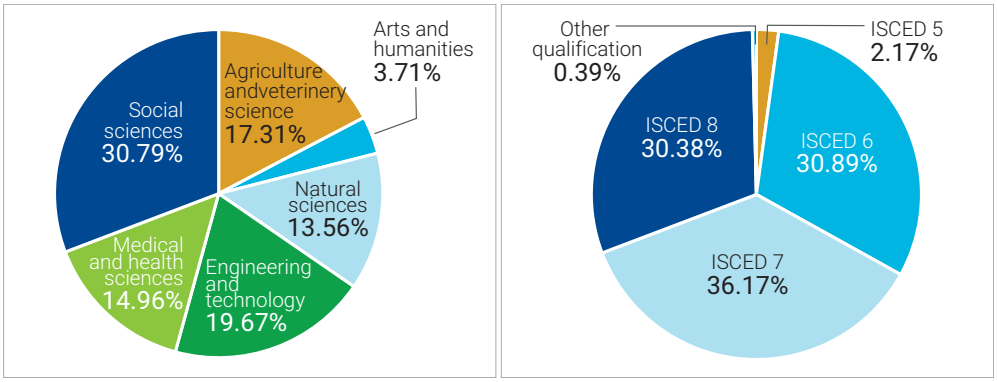
	Brunei	Laos	Cambodia (2015)	Indonesia (2018)	Malaysia (2018)	Myanmar (2017)	Philippines (2015)	Singapore (2017)	Thailand (2017)	Vietnam (2017)
Government institutions			233	7,580	2,853	1,064	1,850	2,317	8,678	33,294
Business enterprises			20	4,344	10,904		5,592	19,372	56,782	16,110
Higher education institutions			178	45,088	55,051	488	3,085	17,140	27,294	17,257
Private non-profit institutions			40	803	72		264		703	292

Source: UNESCO Institute of Statistics Data, retrieved on 22 June 2021
Note: The data reported is that from the most recent year available from each country. Cambodian data is for 2015. There is no available data from Brunei Darussalam and Laos.

In 2015, the small pool of Cambodian researchers constituted 30.79 percent of researchers in social science, 19.67 percent of researchers in engineering and technology, 17.31 percent of researchers in agriculture and veterinary science, 14.96 percent of researchers in medical and health science, 13.56 percent of researcher in natural sciences, and 3.71 percent of researchers in arts and humanities (see Figure 2.4). In the same year, around 170 researchers (or 36.17 percent) obtained an ISCED 7 qualification (i.e. master's degree or equivalent level); 146 (or 30.89 percent) with an ISCED 6 qualification (i.e. bachelor's degree or equivalent level); 143 researchers (or 30.38 percent) having an ISCED 8 qualification (or doctoral degree or equivalent level); 10 researchers (or about 2.17 percent) with ISCED 5 (short-cycle tertiary education); and 2 researchers (or .39 percent) having other qualifications (see Figure 2.4).

2 The 418 non-governmental organisations cover 90 percent of the total non-governmental organisations in Cambodia (MoP 2018, 119).

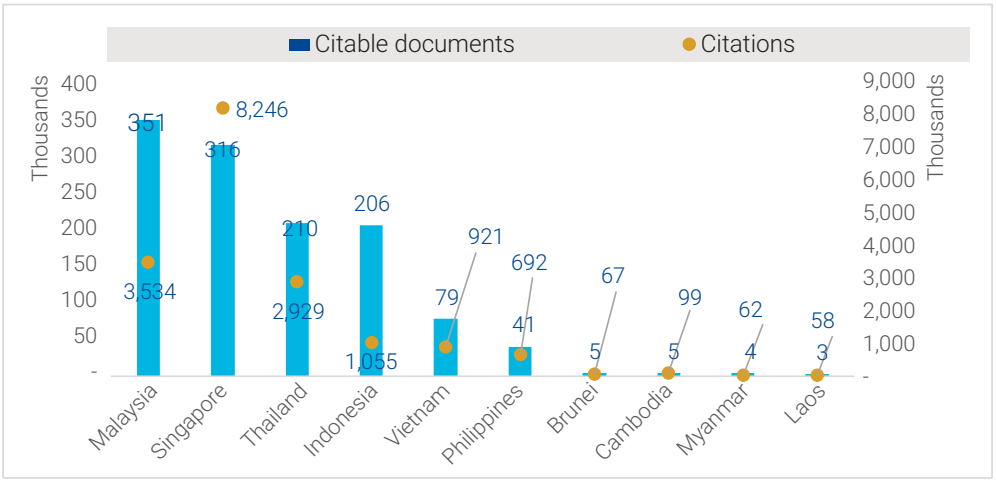
Figure 2.4: Percentage of Cambodian researchers, by fields and by qualifications (for 2015)



Source: UNESCO Institute of Statistics Data, retrieved on 22 June 2021.
Note: ISCED = International Standard Classification of Education

The total number of published and citable research outputs in all fields by Cambodian researchers between 1996 and 2020 (as recorded in the Scimago Journal and Country Rank database) is 4,631 documents (see Figure 2.5). The number is slightly higher than Myanmar (4,434 publications) and Laos (3,103 publications) but far lower than that of other more economically advanced ASEAN countries and the Asiatic region average.

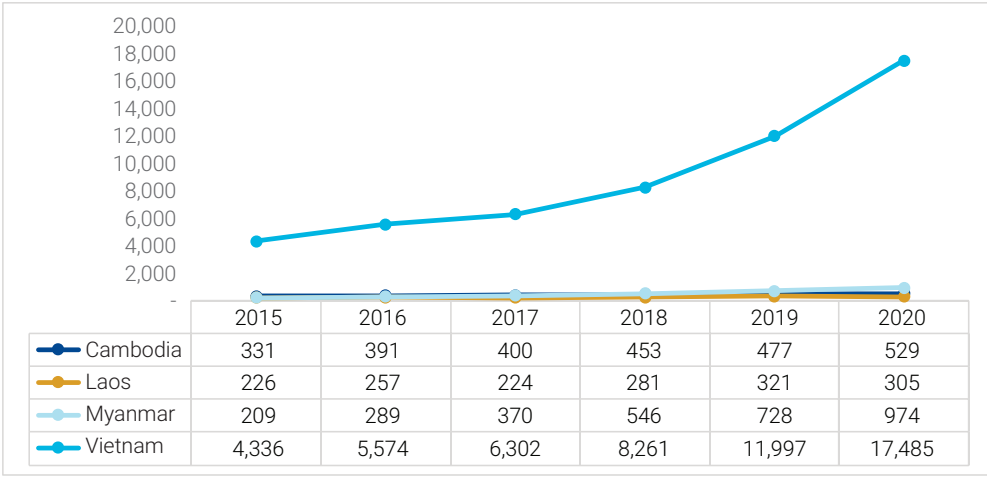
Figure 2.5: Total number of research publications and citations in all fields of ASEAN countries between 1996 and 2020



Source: Scimago Journal and Country Rank (**https://www.scimagojr.com/countryrank.php**), retrieved 4 November 2021

Between 2015-2020, among the CLMV countries of ASEAN, the rate of increase in research outputs of Vietnam is noticeably higher than that of Cambodia, Laos, and Myanmar, although the three countries' outputs have also increased year by year (see Figure 2.6).

Figure 2.6: Trend of number of research publications (citable documents) in all fields of CLMV between 2015 and 2020

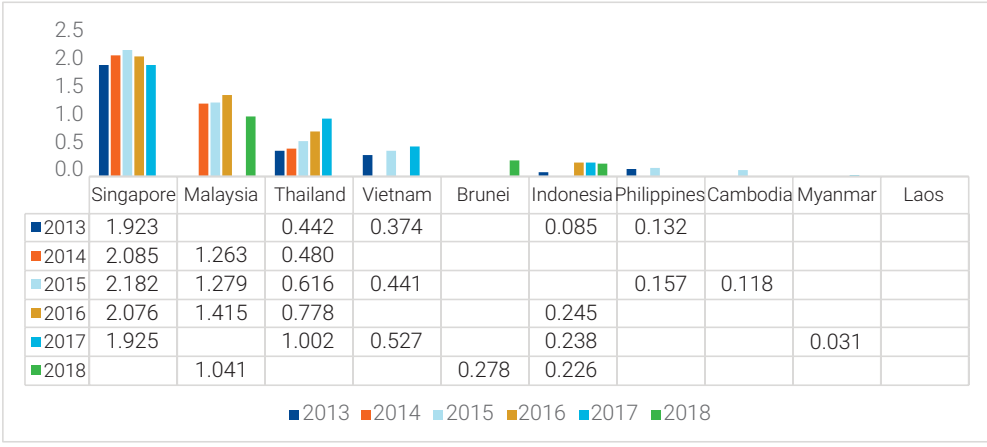


	2015	2016	2017	2018	2019	2020
Cambodia	331	391	400	453	477	529
Laos	226	257	224	281	321	305
Myanmar	209	289	370	546	728	974
Vietnam	4,336	5,574	6,302	8,261	11,997	17,485

Source: Scimago Journal and Country Rank (https://www.scimagojr.com/countryrank.php), retrieved 4 November 2021

The status of Cambodian Government Expenditure on Research and Development (GERD) as a percentage of GDP is around 0.12 percent (in 2015) (see also MoP 2018, 18), making the country one of the lowest investors in R&D in the region (see Figure 2.7). According to this figure, Singapore and Malaysia have invested heavily in R&D, and Thailand and Vietnam have gradually increased their GERD every year since 2013.

Figure 2.7: GERD as a percentage of GDP of ASEAN countries between 2013 and 2018



	Singapore	Malaysia	Thailand	Vietnam	Brunei	Indonesia	Philippines	Cambodia	Myanmar	Laos
2013	1.923		0.442	0.374		0.085	0.132			
2014	2.085	1.263	0.480							
2015	2.182	1.279	0.616	0.441			0.157	0.118		
2016	2.076	1.415	0.778			0.245				
2017	1.925		1.002	0.527		0.238			0.031	
2018		1.041			0.278	0.226				

Source: UNESCO Institute of Statistics Data, retrieved on 22 June 2021
Note: There is no available data from Laos.

Issues challenging the promotion of research at Cambodian HEIs can be observed at different levels: the system level, the institutional level, the academic community level, the program level, or the individual level. At these different levels, multiple

factors have been identified as the inhibiting factors of research engagement or performance of Cambodian HEIs or academics – including the missing generation of Cambodian academics (killed during the Khmer Rouge regime); system-level complexities surrounding PSET governance, institutional classification, and research system design; lack of academic cultures and research traditions at universities; limited financial resources and rewards; lack of authentic institutional research direction and leadership; lack of system of institutional research management and research support and development services; individual researcher factors (personal attributes, competences, mindsets); and technical difficulties in conducting research (from difficulties in data collection to a weak system of intellectual property rights) (see Kwok et al. 2010; Eng 2014; Eam 2015; 2017; 2018; Heng, Hamid and Khan 2020).

To cope with these challenges, a number of emerging policies and interventions in Cambodian HE and advanced degree programs have been put in place. Since 2010 MoEYS has formulated research policies, master plan, and action plan; developed graduate education guidelines; provided funding opportunities to HEIs and faculty members; formulated a professorship status; prepared research management manuals; developed researcher databases; etc. MoEYS claimed to have promoted research engagement, performance, and culture basically through funding and capacity development – with 45 research projects for 24 HEIs through the World Bank financial support (MoEYS 2019b, 7). In the 2019-2023 Education Strategic Plan, the government aims to produce three centres of excellence by 2023 (MoEYS 2019b, 41). At HEIs, individual initiatives to seek funds and undertake research activities by faculty members have become more active at some universities in recent years as more local research funding opportunities have been availed.

The policy makers and HE leaders understand clearly that in order to improve research performance and so knowledge creation in Cambodia, the country cannot depend solely on research and publications conducted by foreign scholars or Cambodian scholars who are pursuing their graduate degrees abroad or those who are working at foreign universities. Local talent to produce quality research needs to be developed. Graduate degree programs need to be promoted (Eam 2017). Research-based and research-oriented educational programs at HEIs need to be established and/or innovated (Eam 2018).

Thus far, however, inquiries on the areas of research education, training, and development (REDT) at Cambodian HEIs remains scarce. Most research studies on Cambodian research have focused on the issue of research engagement or performance from a sociological, psychological, institutional, and policy perspective. Little has been explored from an educational and pedagogical perspective on REDT. How graduate/advanced degree programs in Cambodia operate and how to find the right model to educate, train, and develop researchers (academic or applied) remain scarcely discussed. In the emergence of the global knowledge economies and societies, these issues have to be addressed.

2.3.4. HE accountability

In the neoliberal context of HE globally, whereby the market mechanism and the government's managerialism become more influential on academic works and institutions, the question of accountability becomes a highly relevant and critical topic for Cambodian HE system, institutions, and personnel (Eam, Ros, Heng and Ravy 2020). It should be highlighted that Cambodian academics are now working in a context of HE that is more market-oriented, regionalised, internationalised, and globalised.

HE accountability is closely connected with and essential for achieving quality, evaluation, management, administration, and/or governance of HEIs. In countries where a performance-based financial approach is practiced in their HE sector, accountability indicators are useful for the government in determining how to finance and support HEIs as well as for HEIs to evaluate or reward their academics. So far Cambodia has not yet adopted the performance-based funding for HEIs. Likewise, the current implementation of accreditation scheme as a means of external quality assurance may require that Cambodian HEIs embrace appropriate accountability measures. While the governance of Cambodian HE at the system level is still searching for an appropriate model to circumvent fragmentation and the increased number of HEIs has continued to raise concerns on quality, low-resourced Cambodian HEIs (both the public and the private ones) may find it hard to be fully accountable, especially when those institutions and their personnel do not find the accountability concepts and mechanisms captivated.

Furthermore, the extended concepts and approaches of HE accountability, which have been developing and possibly changing across times and places, are not yet well discussed by stakeholders at the policy, institutional, and individual level in Cambodia. There is a need for a model of accountability that helps Cambodian HEIs and personnel to adapt into the new kind of economies and societies. They thus need to expand their sense of accountability beyond the traditional, informal, or local meaning (Eam, Ros, Heng and Ravy 2020). Emerging accounting agencies that have influences on HE (such as government authorities, industries, students and their parents, social communities, and even international and supra-national stakeholders) all need some information and justification from Cambodian HEIs on how they perform their roles. Without questions, Cambodian academics and its teaching personnel need to prepare themselves to adapt to accountability measures imposed by different stakeholders although that means they have to face more challenges with their academic career.

2.3.5. Public-Private Partnership in TVET

In the first two decades of the 21st century, Cambodia has focused intensely on its economic development, entrepreneurial culture, and digital transformation. Multiple pieces of evidence attest to this: the Cambodian economic goals 2030 and 2050; the

Industrial Development Policy (IDP); the emerging Industry 4.0 discourses; and the current national policy framework on Cambodian Digital Economy and Society 2021-2035. These trends give importance to the post-secondary TVET sub-sector, which is one of the most important sectors that connects education and training, employment, workforce, and economy all together.

Institutions of the post-secondary TVET need to get ready in responding to a changing world of work which has become more digitalised, automated, knowledge-driven, and networked. In the more connected world of work, the theme of Public-Private Partnership (PPP) in TVET has emerged or been promoted in major reports, plans, and policy documents of Cambodian MLVT and major international development organisations (such as the ADB and the World Bank). PPP as a development mechanism is necessary for exchanges of resources between the resources-limited public institutions and the more affluent private sector. Despite continuous practices of collaboration in the Cambodian TVET sub-sector, how such collaboration should be formulated in a values-added, more cost-efficient, and more meaningful way is still a question pursued by Cambodian stakeholders (i.e. policy makers, TVET providers, private sector, and others).

2.3.6. Talent and vocational development

In the changing world of work, talent development and management have also become an important discourse as companies face skill shortages, skill gaps, or skill mismatches. To meet such challenges, companies or employers find new strategies for reskilling and up-skilling their employees or workers. Generally, companies with enough resources have internal strategies to build and control their own talent pools. They can also approach external and global talents in case the internal and local talents are not available. A professional framework for talent development competency has already been established by the Association for Talent Development (ATD) (ATD 2021).

Thus, in the global knowledge economies and societies, talent is what private companies and national policy makers alike seek to develop in order to ensure and sustain business competitiveness as well as national competitiveness. But little is still understood about the concept and mechanism of talent and talent development as well as the related framework of vocational and workforce development in general and in the Cambodian employment context.

Likewise, how the new conception of talent and talent development can be embedded into or adopted by the current model of Cambodian TVET is an invaluable inquiry to pursue. Little exploration has been conducted on this particular research problem.

2.3.7. Workplace training and learning

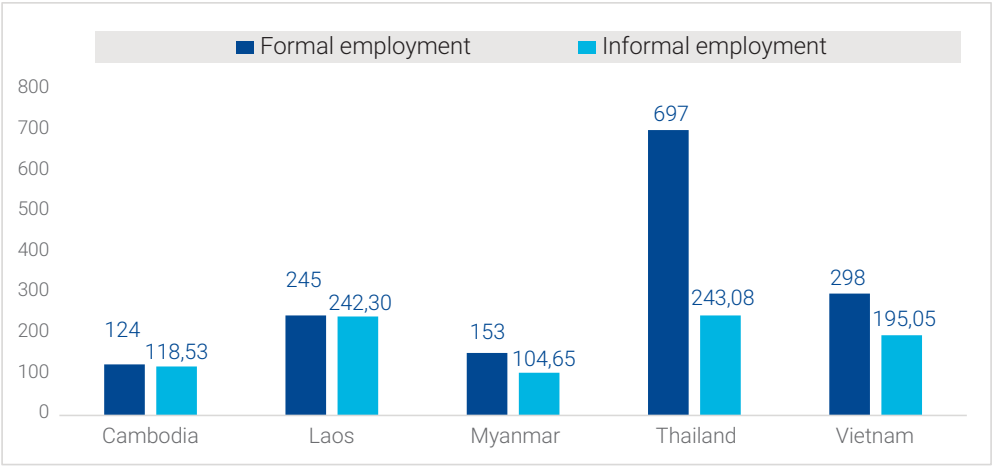
Workplace or workplace-based training has been an important mechanism for private companies to obtain needed skills for their business operation and for them to contribute back to the societies. Workplace training can also be considered an important school-to-work transition strategy for the national employment and skill sector to consider.

Currently, internship is among the most common forms of workplace training programs in Cambodia, which provides work opportunities for Cambodian students in between their training and career. Eam, Heng, Ravy, Tim and Song (2020) noted that Cambodian firms establish internship programs based on the principle of mutual benefits among different stakeholders (i.e. the firms, the interns, and the educational institutions). The study (2020, 32) further added that the problem with internship in Cambodia is not that firms do not see its benefits, but that "they do not have measurable evidence to prove that the benefits exceed the costs and that this workplace-based training can really contribute to the firm's productivity and build its professional culture in the long run, as stated in theories".

While internship has become very popular, Cambodian apprenticeship has not received an equal level of attention despite its potential benefits detected elsewhere, especially in countries adopting the German and Swiss dual system of TVET. Cambodian apprenticeship is reportedly more common in the informal sector of the economy (UNESCO 2013). Given the fact that Cambodian informal economy plays a very important role in the country's economic performance (with 45.8 percent of informal employment in 2019, not considering employment in the agricultural sector) and that both the formal and informal average earning of the country's workforce remains lower compared with its neighbouring countries (see Figure 2.8), the development of quality apprenticeship system and programs in Cambodia can be an appropriate option to ensure high-quality workforce in the country. This opinion, however, needs to be well explored before any concrete actions. What constitutes the idea of quality apprenticeship and how quality apprenticeship can be implemented successfully in Cambodian context are important questions.

Furthermore, in the global knowledge economies, occupants in any employment area need to engage in continuous learning at their workplace. Companies of the 21st century also need to build an appropriate learning infrastructure and culture at the workplace. When staff lack learning capabilities and habits or if companies cannot enable such a learning-friendly work environment, both sides are likely to fail to catch up with important trends in their industries and so lose opportunities to grow. Embedding the learning culture (somehow rooted in educational setting) into the work or business setting of companies can be challenging. One way to do that is perhaps to relate learning to the training and/or development function of the companies. The question is how.

Figure 2.8: Average earnings by formal/informal employment, excluding agriculture (in USD) of CLMV and Thailand



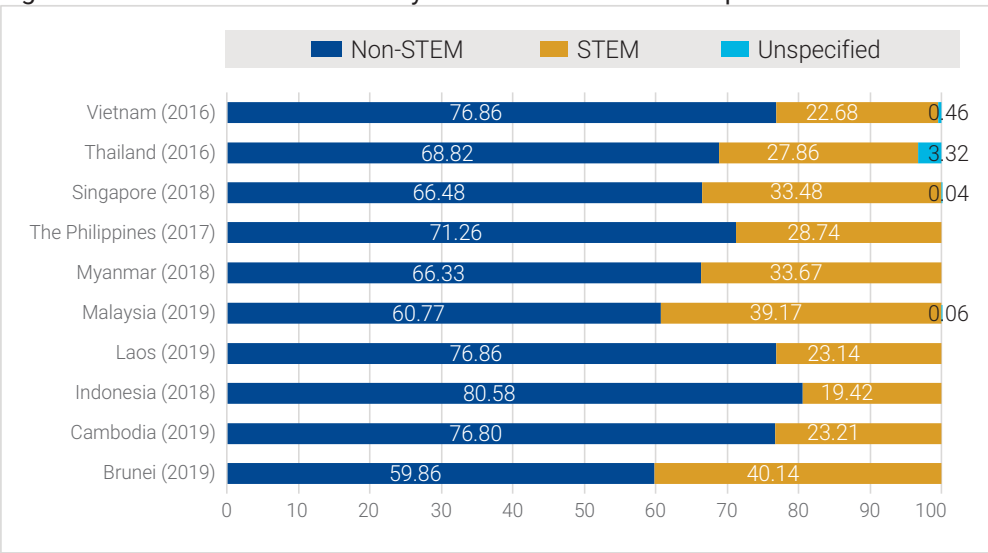
Source: ASEANStatsDataportal (https://data.aseanstats.org/), Retrieved October 2021
Note: Original data was in local currency and so converted into USD by the author, based on the rate in Google Currency Converter on 3 November 2021

2.3.8. STEM

STEM is a new perspective that somehow represents the holistic and integrative paradigm shift in the field of education. Rather than treating disciplines as disconnected fields, this new paradigm tries to find nexuses and integrative substances of knowledge among the science, technology, engineering, and mathematics disciplines. Yamada (2015, 118) offers an interesting explanation about how the globalisation of HE makes all nations concentrate on STEM majors, claiming that many countries start to anticipate fierce economic competition in the approaching global knowledge-based society and acknowledge that STEM majors will support their countries in that future competition. The promising impacts of the applied and integrative approach of STEM inspire the government of many countries, including Cambodia, to try to promote STEM education and to design what is generally referred to as a STEM pipeline. The notion of STEM pipeline covers STEM stream during secondary education (or lower) level, STEM major at post-secondary education level, and STEM career after graduation from post-secondary education.

However, MoEYS (2021b, 107) re-concluded that Cambodia is still challenged by the lack of STEM majored graduates, especially at the master's degree level. The government aims to increase the number of enrolments in STEM majors from 27.1 percent to 32 percent in 2023 (MoEYS 2019b, 40) to catch up with the skills needed in the ASEAN region. In fact, this low enrolment in STEM majors is not just a trend particular to Cambodia. ASEAN countries in general produced more non-STEM graduates than STEM graduates (see Figure 2.9). Likewise, almost all ASEAN countries have shown policy interest in increasing STEM-professional human resources.

Figure 2.9: Pattern of enrolments by STEM vs non-STEM disciplines

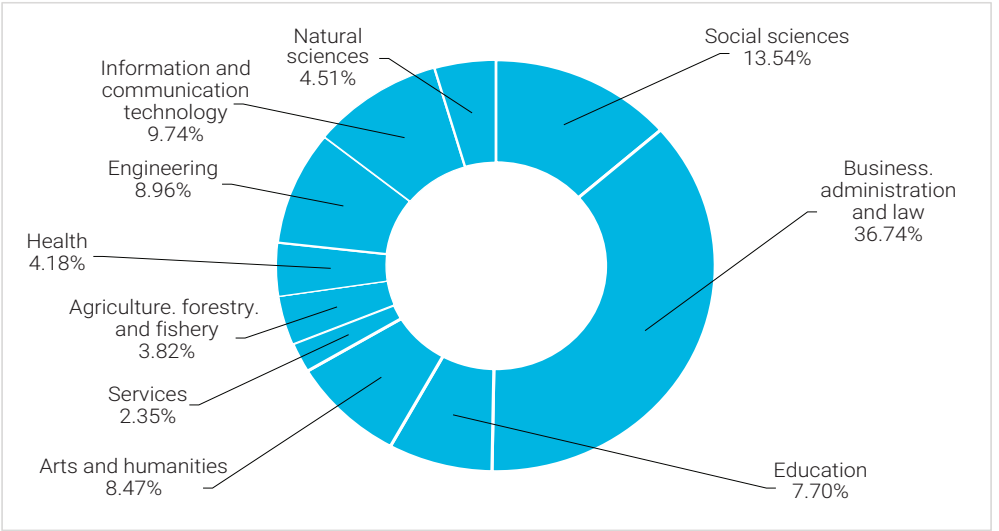


Source: UNESCO Institute of Statistics Data, retrieved on 22 June 2021
Note: The number in the bracket is year is most recent available data.

STEM is a huge discourse and has undergone dynamic development at all levels of Cambodian education. At the policy level, it has been widely discussed, even beyond MoEYS and MLVT. For instance, the Ministry of Industry, Science, Technology and Innovation (MISTI), the Ministry of Post and Telecommunication (MPTC), and the Ministry of Economy and Finance (MEF) have recently established various programs to promote STEM skills and talent to ensure Cambodian readiness for Industry 4.0 and digital economies. Sometimes, the discourses are extended with the inclusion of arts into STEM, generating the term "STEAM".

Still, when STEM is observed from an educational perspective, a lot of issues have remained for Cambodia, from understanding of the principles of STEM as opposed to discrete science disciplines to how to ensure an adequate number of capable STEM students and professionals who can contribute to innovating the national economy. It should be noted that in 2019, according to UNESCO data, Cambodian STEM-majored graduates are mostly in the field of ICT (9.74 percent) and engineering (8.96 percent) (see Figure 2.10). Natural sciences (4.51 percent) are the STEM-related fields with the lowest enrolment. The latest 2021 report from MoEYS, which analyses students currently in Bachelor programs of the academic year 2019/20, shows a similar trend: business-related majors (42 percent), foreign languages (10 percent), information technology (9 percent), social science and arts (9 percent), engineering (8 percent), law (7 percent), basic science (5 percent), health (5 percent), agriculture (3 percent), and tourism (2 percent) (MoEYS 2021b, 104).

Figure 2.10: Percentage of Cambodian graduates from tertiary education by fields (2019)



Source: UNESCO Institute of Statistics Data, retrieved on 22 June 2021

2.3.9. Learning

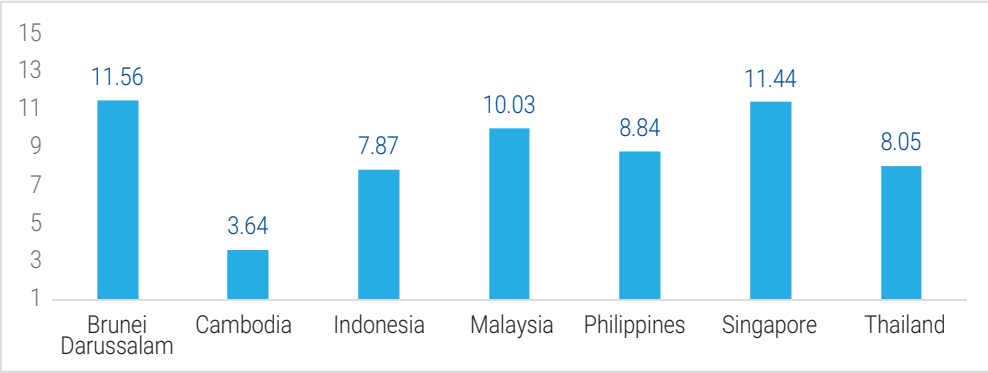
In the 21st century, resources for learning are abundant and ubiquitous. The digital and internet platforms offer not only static but also interactable resources and mediums for learning. For the Cambodian education sector, therefore, an urgent and important problem to address is whether Cambodian PSET students have already acquired necessary learning skills or been an independent learner who can exploit the multiplicity of learning resources.

There are concerns about Cambodian students in general and those at the level of PSET for not being exposed to such independent learning attitudes (see Sam, Ros, Keo and Sophal 2012). It should be noted that Cambodia has the lowest mean years of schooling (only 3.64 years) of its 25-year-old-plus population, compared to other ASEAN countries' populations (see Figure 2.11). Although schooling is not equated with learning, this trend should not be taken for granted by Cambodian education policy makers and researchers. In this line of discussion, specific issues of concerns may include the amount of time Cambodian students actually spend on learning, how they actually learn, how much interest they have in learning, or where they prefer their learning to take place (i.e. in the formal school setting or in a less formal setting).

Moreover, learning strategies and styles may vary by subjects. How students learn science and mathematics can be completely different from how they consume materials in social science and art subjects. As more research-based knowledge on learning science and theories (such as self-regulated learning, adult learning, or learning how to learn) have increasingly offered educators and students in developed

countries a great deal of insights and benefits, we are not sure how Cambodian teachers and students, especially those at the PSET level, have reaped such benefits. And how to support them to be able to gain such benefits is also an interesting and impactful research question to explore.

Figure 2.11: Mean years of schooling of the ASEAN population (25 plus years of age)



Source: UNESCO Institute of Statistics, retrieved on 22 June 2021
Note: Only countries with available data are included.

2.4. Final words

The themes and issues discussed above are highly relevant for researchers and policy makers as they [i.e. the themes and issues] reflect the implications of the global knowledge economies and societies on the PSET sector. For Cambodian PSET, these issues and themes are somehow foundational to its development approaches and its future standing on the global intellectual and vocational arena. Exploring them will generate insights into the direction, position, and/or missions of Cambodian PSET system and institutions which can function well in the new human societies at both the local and the global level.

Acknowledgements

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Section I

Cambodian Higher Education and Academia through the Lens of Changing Academic Profession and Global Higher Education

Chapter 3

Internationalisation of Cambodian Higher Education: Trends and Challenges

Leng Phirom

Abstract

This chapter examines the changing context of higher education internationalisation in Cambodia over the past 25 years, after the country began to transition from a centrally planned economic and political system to a free market economy.Three analytical frameworks are adopted: a typology of higher education development, world systems analysis, and path dependence. The study follows a qualitative research study design, with document analysis and interviews as the primary data sources. International activities in Cambodian higher education have moved from mere dependence on aid to establishing collaborative partnerships with a diverse range of partners across the globe. However, in the absence of strategic planning and adequate resources, internationalisation has been somewhat ad hoc and reactive, with most higher education institutions limiting their programs to serving local needs. Large-scale internationalisation projects have been shaped by the geopolitical interests of foreign donors. Also, the historical legacy of foreign education models has set and, in many ways, restricted the internationalisation trajectories of many higher education institutions. The study concludes with several recommendations to make sure that current international expansion activities will contribute to Cambodia's realisation of its Higher Education Vision 2030 in producing human resources with both utilitarian knowledge and socio-cultural values.

Keywords: Cambodia, internationalisation, world systems theory, path dependency, comparative education, international education

3.1. Introduction

Since the early 1990s, internationalisation has increasingly become a popular discourse in higher education, moving towards the core mission of universities worldwide. From a global perspective, its importance, complexity, and intensification are manifest in various activities, the most noticeable being the steady increase in internationally mobile students. As reported by the UNESCO Institute for Statistics (2019), the number of students going abroad for higher education reached over 4.1 million in 2013, up from 2 million in 2000, representing 1.8 percent of total global higher education enrolments. The British Council and IDP Education Australia have estimated that the number of internationally mobile students will reach 8 million by 2025 (Hayward 2016). In 2018, the top five destination countries for international students were the United States (22 percent), the United Kingdom (10 percent), China (10 percent), Australia (7 percent), Canada (7 percent), and France (7 percent) (IIE 2018), while China was projected to overtake the UK as the world's second-largest destination for international students in 2020.

232 international branch campuses were operational worldwide by 2016, with a further 25 expected to be coming into operation in the future (Cross-Border Education Research Team 2016). The recent establishment of higher education hubs in Qatar, the United Arab Emirates, Hong Kong, Malaysia, Singapore, and Botswana has taken higher education internationalisation to the next level. From a historical point of view, Knight (2014) identified three consecutive generations of cross-border education, namely student/people mobility, program and provider mobility, and higher education hubs.

The last decade has brought more attention to "internationalisation at home", defined by Beelen and Jones (2015, 69) as "the purposeful integration of international and intercultural dimensions into the formal and informal curriculum for all students within domestic learning environments". Underlying this trend is the social equity proposition that internationalisation should be for all, particularly for the vast majority of non-mobile students, rather than being confined to a small group of internationally mobile students and scholars (de Wit 2015). As Soria and Troisi (2013) reported, efforts to promote internationalisation at home, particularly through interactions with international students and participation in curricular activities with global and international content, have been very valuable in boosting students' global, international, and intercultural competencies. Thus, internationalisation at home can be viewed as a means for promoting global citizenship education – a recent global trend in education that UNESCO (2014, 9) defines as "a framing paradigm which encapsulates how education can develop the knowledge, skills, values and attitudes learners need for securing a world which is more just, peaceful, tolerant, inclusive and sustainable". As reported by the European University Association in *Trends 2015*, 64 percent of European higher education institutions (HEIs) had implemented internationalisation at home by 2015 (Sursock 2015). Overall, the internationalisation landscape has become increasingly dynamic and more complex than ever before.

Although the global picture of internationalisation appears almost ideal, a closer look at internationalisation across regions and countries suggests rather complex developments in policies, motivations, approaches, and strategies, which have been shaped by different political, economic, social, and cultural conditions (Altbach 2006; Knight 2008). In the words of de Wit et al. (2015, 27), in higher education internationalisation, "There is no one model that fits all". Even within a single country, internationalisation activities vary widely from institution to institution. This is particularly the case for Cambodia, where recent higher education internationalisation activities have been shaped by rapidly changing geopolitical developments over the past 25 years.

The 1990s marked the beginning of Cambodia's rehabilitation, after two decades of civil conflict and international isolation, which annihilated virtually all social, cultural, political, and economic institutions in the country. It began to adopt a free market economy with multiple-party politics, moving away from a centrally planned economic and political system. This change ushered in various forms of foreign aid from the Western world, through both bilateral and multilateral mechanisms, to help rebuild Cambodia. Like other sectors, higher education, which then comprised only eight HEIs, was heavily dependent on foreign technical and financial assistance for its rehabilitation and operation throughout the 1990s. Hence internationalisation during this early period was mainly aimed at rebuilding higher education.

Although not unique to Cambodia, existing literature concluded that within the context of dependence on foreign assistance, internationalisation in Cambodian higher education during the 1990s was characterised by considerable foreign domination or even neo-colonialism (Pit and Ford 2004; Clayton 2006). This was manifested in various forms, including the adoption of foreign languages, curricula, and programs as well as the direct effect of foreign influences on the administrative patterns and processes at some HEIs.

The Cambodian higher education landscape has significantly changed over the past two decades, partly as a result of the privatisation reforms introduced in the mid-1990s, allowing public HEIs to charge tuition fees and private HEIs to operate alongside public HEIs. The system expanded from eight public HEIs in 1997 to 118 (46 public and 72 private) HEIs as of 2016. Even though the major HEIs remain concentrated in Phnom Penh, 17 out of 25 provinces have HEIs. From just 1 percent of college-aged students enrolled in higher education in the early 1990s, the number of higher education students in 2015–16 stood at 227,385 (12 percent of the college-age group), with 24,970 enrolled in associate degree programs, 182,987 in undergraduate programs and 19,428 in postgraduate programs (MoEYS 2016a).

This growth and expansion have taken place within the context of the country's deepening engagement in ASEAN and in many ways have been shaped by that, as well as by its involvement with other countries across the globe. As such, internationalisation

activities have grown significantly. It is the purpose of this study to examine the internationalisation of Cambodian higher education over the changing context of the past 25 years, when the majority of HEIs became increasingly dependent on student tuition fees rather than aid for their main sources of income. Internationalisation in Cambodian higher education has long existed; however, due to time and space constraints, the study concentrates on the limited time frame of the last 25 years.

Various approaches have been adopted to study higher education internationalisation. Drawing on previous literature, Cheng, Cheung and Ng (2015, 5–6) identified three main types of research strategies: (1) a focus on one key domain of internationalisation, for example, rationales for internationalisation or the trends of international student mobility; (2) a focus on the relationship between key domains of internationalisation, such as the contribution of international activities to the enhanced international mobility of students, teachers, and programs; and (3) a holistic approach focusing on the key factors of most domains as a whole. The last approach fits particularly well with this study, the purpose of which is to map higher education internationalisation activities in Cambodia.

The rest of the chapter begins by describing three analytical tools that guide the discussion: a typology of higher education development, world systems theory, and the concept of path dependence. Then it explains the method used, before moving on to provide an overview of the changing context of higher education internationalisation over the past 25 years. The discussion concludes with some thoughts on how to move Cambodian higher education forward in the right direction.

3.2. Theoretical frameworks

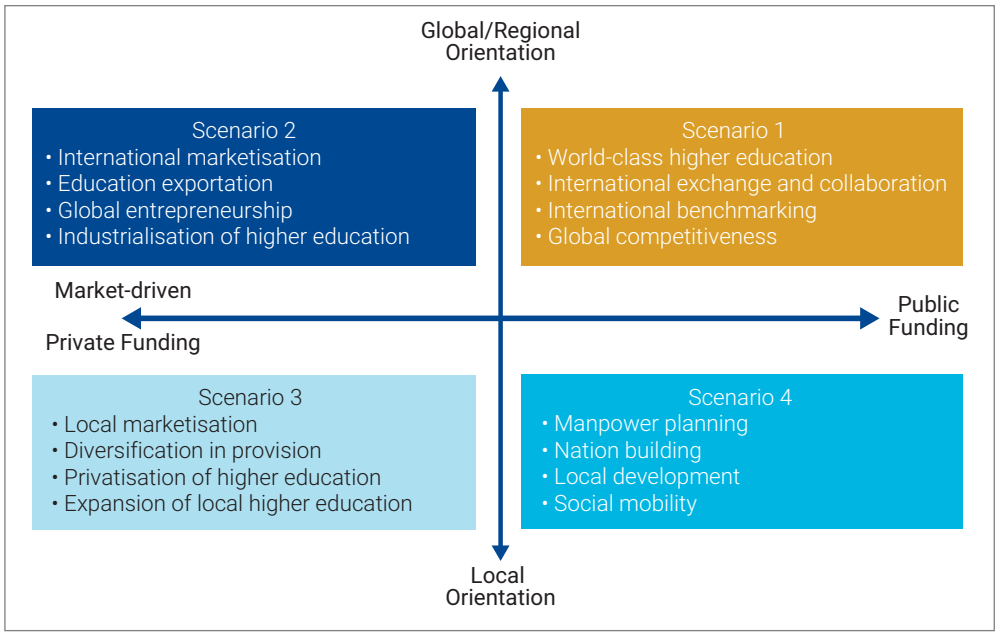
This study's first analytical lens for exploring the internationalisation of higher education is the typology proposed by Cheng, Cheung and Ng (2015). Arguing that the development of higher education in a particular country is influenced by the tensions between public funding and private funding/market-driven approaches and between global/regional and local orientation, Cheng, Cheung and Ng (2015) proposed four scenarios for higher education development, as shown in Figure 3.1. The first scenario explains publicly funded higher education systems that are globally/regionally oriented, with emphasis on the development of world-class higher education, international benchmarking, global branding, international exchange, and global competitiveness. Systems within the second scenario are characterised by market demand/private funding and a global/regional orientation with emphasis on international marketisation and export, global entrepreneurship, and industrialisation. Higher education systems in scenario 3 are driven by market demand/private funding and local orientation, with emphasis on local marketisation, privatisation, expansion, and diversification of provision to meet growing diverse demands in local communities. The fourth scenario, which is a traditional model of higher education development, is characterised by public funding

and local orientation. This study uses this framework to examine the counterclockwise flow of Cambodian progression to higher education internationalisation within the broader context of Cambodia's higher education development.

The second theoretical framework is world systems analysis, particularly the concept of South-South, North-South-South, and North-South cooperation (Arnove 1980; Wallerstein 1974). Challenging the core assumption of modernisation theory that all countries can adopt a single path of development (commonly known as the Washington consensus), Wallerstein (1974) – one of the pioneering scholars to develop the world systems theory in the social sciences – argues that the world economy is characterised by unequal relationships in which powerful and wealthy "core" nations, with advanced technology, dominate and exploit weak and poor "periphery" societies. In between these two categories are the "semi-periphery" societies that play multiple roles in maintaining and reinforcing the structural inequalities among countries. For instance, developing countries such as Turkey, China, India, and Brazil, to name a few, have been both recipients and donors of foreign aid for many years. Overall, Wallerstein's conceptualisation of the world system centred on structural inequality among nations, with Northern countries dominating and exploiting all others, thereby benefiting the most from the global order. In the sense of this tradition, the internationalisation of higher education would for the most part serve the interests of the core countries, at the expense of poorer nations.

However, since the 1990s, the world order has gradually shifted away from a bipolar to a multipolar system, with the economic and political rise of such countries as Brazil, Russia, China, India, and South Africa (the BRICS nations). This has huge ramifications for higher education internationalisation. For instance, along with its recent economic rise, China has significantly increased its educational assistance to developing countries in a wide range of disciplines and forms, including skills training, academic exchange, collaborative research, school construction, and educational support through joint efforts with such international organisations as UNESCO. While it is undeniable that these programs have been shaped by China's geopolitical and economic interests, other developing nations have also gained from their engagement with China. King (2014) and Yang and Ma (2015) have argued that China's international educational development model is unlike traditional Western approaches. It has become increasingly known as the "Beijing Consensus" (Ramo 2004) and has taken the form of mutual collaboration, trying to respond to the practical needs of developing countries, while at the same time promoting Chinese national interests at the global level. As indicated in its first and second white papers on foreign aid, released respectively in 2011 and 2014, China has identified itself as a developing country, always referring to its engagement with other developing countries as South-South collaboration.

Figure 3.1: A typology of higher education development: four scenarios



Source: Cheng, Cheung and Ng 2015, 7

With the rise of East Asian societies and Singapore, scholars have astutely noted the emergence of the Confucian Model of higher education (Li 2012; Marginson 2011). This not only suggests the complexity of the world but also the different development paradigms which go beyond Wallerstein's traditional explanation of exploitation shaped by the Washington Consensus. Larsen (2016, 178) argues that "the flows of knowledge and people associated with IoHE [internationalisation of higher education] are not simply from one nation-state to another but operate in more complex, multiple, and heterogeneous ways". For this reason, this study adopts world systems analysis in a more flexible and inclusive manner so as to examine various forms of North-South, South-South, and North-South-South partnerships with the proposition that those partnerships can simultaneously offer benefits and pose challenges for Cambodian higher education.

The third theoretical lens is the path dependence concept, which highlights how current and future trajectories bear the imprint of past decisions or history. Schreyögg and Sydow (2009, 4) say that the concept "implies at the very least a sequence of events narrowing the scope of action eventually resulting in a state of persistence or inertia". Pierson (2003, 195) describes path dependence as a self-reinforcing process, in which:

> [a] fairly modest change induces a feedback loop, which reinforces the initial direction of change. Collective action, for instance, may lead to shifts in expectations and resources that facilitate more collective action; similarly, institutionalisation may ease problems of coordination, fostering more than institutionalisation.

Perellon (2005) applied the concept of path dependence to explore how three countries, namely Spain, Switzerland, and the Netherlands, responded to cross-national policy harmonisation in the area of quality assurance. He concluded that while policy convergence did take place to some extent, variations among countries remained and that these had been shaped by "national institutional, political and, naturally, historical contexts" (Perellon 2005, 294). Numerous comparative studies have suggested that existing institutional patterns and historical legacies have limited the global convergence of educational policies and practices (Busemeyer and Vossiek 2016; Crossley 2010; Steiner-Khamsi 2012). Using path dependence as an analytical framework can explain how much the legacy of a succession of different models of higher education, including French, Soviet, and, more recently, North American models, has influenced internationalisation in Cambodian higher education.

3.3 Methodology

This study is part of a larger qualitative project which aims to explore the internationalisation landscape of Cambodian higher education. This chapter relies on document analysis as the primary data collection method, supplemented by in-depth interviews and my personal experience as an insider researcher. Documents included policy papers, reports from several HEIs, and other relevant literature on Cambodian higher education as well as in the field of comparative and international higher education. Collected documents were triangulated with information collected from interviews with 18 participants at seven universities, three of which are large universities located in Phnom Penh. Those participants included senior administrators, faculty members, and students who had pursued their graduate studies abroad. The study adopted a purposeful sampling approach by selecting only people and institutions that were at the forefront of higher education internationalisation in order to fit the purpose of the study. Some of the data for this study was drawn from the author's doctoral thesis (Leng 2015), which focuses on international partnerships in contemporary Cambodian higher education.

All interviews were conducted from 1st August to 4th September 2016, with the purpose of gaining wider and deeper insights into what was happening on the ground. The qualitative data was analysed for emerging themes concerning internationalisation in Cambodian higher education. For the purpose of anonymity, pseudonyms are used for the institutions and individuals who were interviewed.

It is important to acknowledge that this study has been shaped by my role as an insider researcher, my familiarity with my own local norms and culture, and my knowledge of Cambodian higher education internationalisation. I was an undergraduate student and later a lecturer at one of the participating universities, before going abroad to pursue postgraduate studies. My role as a research fellow at the Cambodia Development Resource Institute (CDRI) has also enabled me to establish new networks with

scholars, researchers, and policymakers in the field of education. However, personal and professional connections were not in any way part of my decision to select the universities or participants for my study. Rather, the selection process was made based on each individual's experience and involvement in higher education internationalisation activities.

3.4. Brief history of Cambodian higher learning

Cambodia's modern higher education system has its roots in Western traditions and came into existence only after Cambodia obtained independence from France in 1953. However, Cambodian forms of higher learning had long existed, before the arrival of the Spanish, Portuguese, and French. According to Chhem (2007), in the 10th century, small similar forms of university colleges, called *Yashodharasramas*, were built at Angkor Thom, and later fully-fledged monastic universities were founded by King Jayavarman 7. Among them were Ta Prohm (1186 CE) and Prah Khan (1191 CE) which were located at the heart of the capital of the Angkor Empire. Their infrastructure, governance system, and curricula were inspired by the ancient Indian universities of Nalanda and Vikramasila. Thousands of students and their professors resided on large campuses (60 hectares) abiding by the Buddhist discipline as prescribed in the Vinaya Pitaka (Book of Discipline). Based on epigraphic sources, Chhem (2007) noted that the curriculum included Sanskrit, grammar, mathematics, engineering and technology, medicine, religious philosophy and literature. The rise of Cambodia during the Angkorian era (802–1431) as a highly developed society was partly attributed to the advancement of its technology and knowledge system (Chandler 2008). Although the political and social order was then influenced by Hinduism, Indian knowledge and culture were localised to suit the needs and then the overall context of Cambodia. For example, the Indian caste system never took root in Cambodia. And traditional Cambodian arts and architecture were unique (Ayres 2000).

The glory of the Khmer Empire ended in 1431 when Siam attacked and burned Angkor city – the event that forced Khmer King Ponhea Yat to move to Srei Santhor and then to Phnom Penh, the present capital of Cambodia. This ushered in a four-century period of what is known as the Dark Ages of Cambodia. The country became constantly subject to invasion by its rising neighbour Thailand (then Siam), and later, by Vietnam, which expanded in size and power from the 17th century onwards. Internal political strife in the 17th century, especially among royal family members, also contributed to the weakening of the Khmer Kingdom (Chandler 2008).

The arrival of Theravada Buddhism in Cambodia in the 13th century, as well as the decline of the Khmer empire in the late 14th century, led to the emergence and spread of a new form of education called pagoda education, in which Buddhist monks (*Luak Sang*) taught Cambodian boys carpentry, reading and writing, particularly in relation to Buddhist teachings (Tully 2002). This form of education lasted until the early 20th century when France established its protectorate over Cambodia from 1863 to 1953,

and began to modernise pagoda education by bringing in new subjects, such as arithmetic and geography, and setting up secular state schools in Phnom Penh and provincial towns (Fergusson and Le Masson 1997; Tully 2002). However, with France's relatively limited attention to the overall development of Cambodian education, post-secondary education did not exist in the country until the establishment of the National Institute of Juridical, Political and Economic Sciences in 1949 (Ayres 2000). During this colonial period, a relatively limited number of Cambodian elites pursued their post-secondary education in Vietnam or France.

The first modern Western-oriented higher education institutions came into existence during the post-independence era when Prince Norodom Sihanouk began modernising Cambodia by placing strong emphasis on education, investing 20 percent of annual national expenditure in the sector. Several universities were established in the early 1960s to meet the needs of society. They included the Khmer Royal University (1960) and six others in 1965, namely the Royal Technical University, the Royal University of Fine Arts, the Royal University of Kampong Cham, the Royal University of Takeo-Kampot, the Royal University of Agronomy Science, and the People's University (Chhum 1973).

Civil war and international isolation from 1970 to 1989 greatly hindered the development of higher education in Cambodia. The Khmer Rouge (1975–79) annihilated all social infrastructure, including all higher education institutions. As Chandler (2008, 7) described:

> Many of Cambodia's institutions were destroyed or overturned, and the urban population, forcibly exiled from towns and cities, was put to work alongside everybody else (except for soldiers and CPK cadres) as agricultural labourers. The new regime abolished money, markets, formal schooling, Buddhist practices, and private property. In a headlong rush toward a socialist utopia, nearly two million Cambodians, or one in four, died of overwork, malnutrition and misdiagnosed diseases or were killed.

It was estimated that more than 80 percent of teachers, including university professors, were killed during the regime (Clayton 1998). Little progress was made throughout the 1980s, due to Cambodia's isolation from the international community, except for its relations with Eastern bloc countries. Only after the signing of the Paris Peace Accords in 1991 did progress begin in all areas, including higher education. This overview suggests that the current development of Cambodian higher education bears the cultural historical imprints of those times.

3.5. Overview of internationalisation in Cambodian higher education

As indicated earlier, the internationalisation of Cambodian higher education in the 1990s took the form of aid and technical assistance, mainly from bilateral donors. France was then the major developed nation providing Cambodia with large-scale higher education

assistance in a wide range of knowledge areas in the social and natural sciences. The public HEIs that benefited from early French assistance programs included the Royal University of Phnom Penh (RUPP) (mainly the Department of French), the Institute of Technology of Cambodia (ITC), the Royal University of Law and Economics (RULE) (then the Faculty of Law and Economics), the University of Health Sciences (UHS), the Royal University of Fine Arts (RUFA), and the Royal University of Agriculture (RUA) (Cuenin 1999). For instance, ITC (then named the Khmer-Soviet Friendship Higher Technical Institute) received its first funding package of almost USD18 million from the French government in 1994 (Duggan 1997). At ITC and UHS, French assistance supported the development and renovation of buildings, laboratories, and other teaching and learning facilities, while at other universities, French assistance was primarily concentrated in human resources development, with limited support for school facilities or equipment (Clayton 2006).

At that time, educational assistance from other countries, including the United States, the United Kingdom, Australia, and Japan, was relatively marginal compared to that from France, and focused on certain fields or disciplines. Moreover, much assistance from multilateral agencies went to basic education, primarily based on the premise that return on investment in basic education was higher than that on higher education (Duggan 1997). In this regard, bilateral assistance, in any form, was indispensable for the development of Cambodian HEIs at the time. Overall, the main purpose of the internationalisation of Cambodian higher education during this early period was to rebuild and strengthen the human and institutional capacity of Cambodian HEIs.

Over the past 20 years, particularly since the privatisation reforms were introduced in 1995, Cambodian higher education has grown and expanded significantly, with the private sector constituting two-thirds of total HEIs by 2016. The UNESCO Institute for Statistics (2019) reports that the number of Cambodian students studying abroad increased from 1,418 in 1999 to 5,928 in 2018, with an outbound mobility ratio of 2.9 percent (Table 1 lists the top 10 destination countries for Cambodian students in 2018). Comprehensive data on inbound student mobility is limited; still, it is known that most foreign students in Cambodia were Khmer-language learners or were on short-term exchange programs. The number of foreign faculty members reached 588 or 4.8 percent of the total 12,256 faculty members by 2015 (MoEYS 2016a).

New forms of higher education providers have also come onto the scene, including foreign branch campuses such as the Malaysia's Limkokwing University of Creative Technology and Raffles International College. Nagoya University Satellite Campus was established in Cambodia in 2014, which offers transnational doctoral programs in four fields – law, medicine, agriculture and international development. Located on the second floor of the Cambodia-Japan Cooperation Center, the satellite campus main office has played a coordinating role in connecting Nagoya University with its three Cambodian counterparts, namely RUPP, RUA, and RULE. At the time of this study, eight students were enrolled in the program, with three admitted in 2014 and five in 2015.

Table 3.1: Top 10 destination countries for Cambodian students, 2018

Countries	Number of Cambodian students
Australia	1,054
Thailand	1,031
France	641
United States	547
Japan	458
Vietnam	432
Saudi Arabia	369
South Korea	314
Malaysia	241
New Zealand	177

Source: UNESCO Institute for Statistics (2019)
Note: The list is exclusive of the number of Cambodian students going to study in China, which has reportedly increased over the years.

3.5.1 International activities through bilateral relations

Recent developments of internationalisation in Cambodian higher education exhibit noticeable changes. First, there has been a shift away from the Francophone system toward more collaboration with a greater variety of HEIs worldwide. Even at ITC, where Francophone networks were dominant throughout the 1990s, French activities have gradually declined with recent endeavours mainly limited to technical assistance, joint research projects, student and faculty exchange programs, and scholarships for graduate studies in France, all of which are taking place on a smaller scale than before.

By comparison, other countries have become increasingly engaged with ITC. Japan – currently one of ITC's major partners – has established a large-scale regional program called the ASEAN University Network/Southeast Asia Engineering Education Development Network (AUN/SEED-Net) program, supported and coordinated by the Japan International Cooperation Agency. The program was initiated by the former Japanese Prime Ministers Hashimoto and Obuchi at the Japan-ASEAN Summit in 1997 and the ASEAN+3 Summit in 1999, respectively. With the aim of developing well-qualified engineers for ASEAN, the AUN/SEED-Net has built strong networks among leading engineering HEIs in the region and in Japan. Three phases (Phase I 2003–08, Phase II 2008–13, and Phase III (2013–18) were completed. At present, the network consists of 26 HEIs selected by each of the 10 ASEAN member states, and 14 leading Japanese supporting universities selected by the Japanese government.

To date, activities under this network have included postgraduate scholarships for Cambodian students, joint research projects/seminars and exchange programs, and support to establish laboratories. By 2013, the total number of faculty (with either a master's or doctorate) at ITC who had graduated from English-speaking institutions, most of whom were supported by the AUN/SEED-Net program, equalled that of those educated at French-speaking institutions (53 vs. 52). Other new partners, including

South Korea, have also become increasingly engaged in international activities with ITC and many other Cambodian universities. For instance, through the Ministry of Education, Youth and Sport (MoEYS), the Korea International Cooperation Agency (KOICA) funded ITC to the tune of USD1 million (2013) as part of its project to build the ASEAN Cyber University among CLMV (Cambodia, Laos, Myanmar, and Vietnam) countries.

Cambodia's increased internationalisation activities with China also deserve mention, due to China's emergence as one of the major donors and foreign direct investors in Cambodia as well as its importance at the global level. Chinese educational support for Cambodia, mainly in the form of scholarships, has been relatively marginal and widely dispersed compared to Chinese aid to Africa. For instance, 30,000 scholarships were offered to African students by the Chinese government to study in China in 2015 (Bothwell 2016). In contrast, Chinese aid to Cambodia, which has amounted to around USD400 million annually since 2011, has been focused on building economic and physical infrastructure rather than developing education or health (Cambodian Rehabilitation and Development Board of the Council for the Development of Cambodia 2016).

However, China has recently begun supporting Cambodian science and technology at the higher education level through the International Centre for Higher Education Innovation (ICHEI) – a UNESCO Category 2 Institute established in 2016 on the campus of the Southern University of Science and Technology of China (SUSTech) in Shenzhen, China. In its early phase, 15 faculty members from RUPP were selected for short-term training in China. ICHEI also worked closely with Cambodia's MoEYS to recruit seven Cambodian students to pursue undergraduate studies in engineering at SUSTech. ICHEI will scale up its assistance for its Cambodian counterparts in other areas, including strengthening their ICT facilities. This is in addition to institution-to-institution educational initiatives between Cambodian and Chinese universities that have accumulated over the years. The University of Kratie has received roughly up to USD10 million from the Chinese government, mainly for the construction of buildings. All this will have huge ramifications for the internationalisation of Cambodian higher education in the near future.

With a few exceptions, international activities through bilateral assistance from developed countries have remained sporadic and marginal. For instance, Australian educational support for Cambodia has been focused on scholarships, sponsoring more than 600 Cambodians to study in Australia between 1994 and 2016 (DFAT n.d.). In December 2015, Australia's Department of Foreign Affairs (DFAT) awarded a grant of USD500,000 to the Cambodia Development Resource Institute to conduct policy research on various higher education-related topics, including internationalisation of higher education, policy research, STEM education, governance and financing, and typology of higher education institutions. The aim was to produce high-quality accessible user-friendly policy research products to "fill knowledge gaps and provide evidence for sound policy making on higher education reforms" in Cambodia (CDRI 2015, 2).

Within the region, Cambodia's internationalisation collaborations with ASEAN countries, including training, scholar and student exchange programs, and joint conferences and seminars have been very active. As indicated in Table 3.1, Thailand, Vietnam, and Malaysia are among the top 10 destination countries for Cambodian students. During the interviews, several participants suggested that Cambodia should not look too far beyond its ASEAN neighbours (i.e. towards Western countries), stressing that there are a lot of things that can be done together and at a lower cost. This, along with geographical proximity, has enabled universities in provinces, particularly in the north-western part of the country, to organise numerous student exchange activities with their Thai counterparts.

The establishment of the ASEAN Economic Community in December 2015, and with it the freer movement of goods, services, investments, and skills, has further pushed the region's HEIs to work more closely together. It is within this context of growing interconnectedness that ASEAN countries, including Cambodia, are now working towards implementing the ASEAN Qualifications Reference Framework, which was endorsed by all ASEAN member states in mid-2015 to ensure the comparability of qualifications across the region. Other important initiatives that have thus far promoted academic mobility and collaboration among ASEAN countries and beyond include the ASEAN University Network, the Southeast Asian Ministers of Education Organisation, and University Mobility in Asia and the Pacific. This is not to mention other student mobility programs set up by the European Union and others that have recently engaged with Cambodian HEIs.

3.5.2. International activities through multilateral relations

In 2010 the World Bank began its substantial higher education assistance program for Cambodia through the Higher Education Quality and Capacity Improvement Project (HEQCIP) – a USD23 million project (50 percent grant and 50 percent loan) which was planned for five years, but was subsequently expanded to continue until September 2017. The project's objective was to "improve: a) the quality of teaching, management, and research in project-supported entities and b) pilot the targeting of disadvantaged students for enhanced access and retention" (MoEYS n.d.). Through this project, 64 Cambodian students were sent to Australia for their master's and doctoral studies, with 58 successfully completing and returning to Cambodia as of May 2016 (MoEYS 2016b). A group of 28 students from the MoEYS and HEIs was also sent to Canberra University to study for a Graduate Certificate in TESOL from August to December 20.

In early 2016, the Directorate General of Higher Education (DGHE), with support from UNESCO and the World Bank, formulated the Cambodian Higher Education Roadmap 2030. Approved in 2017, the policy provides guidelines for the development of Cambodian higher education over the next 10 years and beyond.

While it is a challenging exercise to map out all the detailed international activities across the higher education system, the overall trend is moving away from total dependence on foreign education assistance to building collaborations with numerous partners through various initiatives at institutional, national, regional, and international levels. Large-scale international partnerships, mainly supported by foreign governments or their aid agencies, as in the case of France, Belgium, Japan, South Korea, and recently China, have taken shape within the public sector. Such a priority has been influenced by bilateral relations at the national level, which emphasise supporting public HEIs. International activities involving only local and foreign institutions have taken place on a smaller scale, albeit large in number and widely dispersed. Plus, the trend of adopting English as a foreign language, instead of French, has become pervasive in both public and private HEIs.

3.6. Discussion

Within the typology of Cheng, Cheung and Ng (2015), internationalisation in Cambodian higher education has taken place within the third scenario in which student tuition fees have increasingly become the main sources of funding for the vast majority of HEIs. Programs and curricula are designed mainly for the local market, as reflected in the lack of degree-seeking foreign students. As most interviewees explained, Cambodian higher education is still of limited quality by international standards. This can be attributed to several factors. First, the majority of HEIs still use Khmer as the medium of instruction. Second, rote learning is still the dominant practice throughout the system, and most scholars and institutions focus mainly on teaching, with limited research activities. As one interviewee pointed out,

> In our curriculum, we usually cut and paste materials from other countries' curricula, without analysing and studying them. We do not have enough resources to do research to produce our own curriculum … Sometimes, universities have good curricula, but do not have qualified faculty members to implement them. (KP3)

In theoretical terms, the above view exemplifies the common issue of the disconnection of ontology (content), epistemology (pedagogy), and axiology (purpose) in Cambodian higher education.

No clear internationalisation policy exists, neither at the national nor institutional level, with most international activities occurring on an ad hoc or reactive basis. Even at such institutions as ITC and Paññāsāstra University of Cambodia (PUC), which have been active in internationalisation by definition, international activities have been mainly supported by foreign partners – a common phenomenon throughout the education system. Cambodian institutions have, for the most part, made in-kind contributions in financial terms.

Analysis of collected policy documents and online review of the missions and visions of various HEIs suggest that only a few of them have a strong internationalisation orientation. PUC, for instance, has not only extended its outreach to foreign partners, focusing on student and program mobility, but has also introduced internationalisation at home. According to participant KP3:

> All universities in Cambodia have to adopt internationalisation within this context of globalisation. If we do not engage in the international community or if we do not think outside the box, we will be outdated. We have to send our students abroad. At the same time, we acknowledge that we cannot afford to send all students abroad, so we have various initiatives to bring in foreign faculty and students to PUC. For instance, with the United States, every year a lot of American students from California State University Dominguez Hills, Long Beach and Fullerton come to PUC. This home-stay program allows Cambodian and American students to share and understand each other's cultures better.

Senior administrators at other HEIs were also aware of the importance of international activities, despite the lack of policy and strategies at their respective institutions. As participant KP2 indicated, ITC is very international, as reflected in the diverse educational backgrounds of its teaching and administrative staff, the members of the governing board and consortium from different countries, and its growing collaboration with various countries worldwide. He emphasised that ITC has been international since its inception. It was established in 1964 with support from the Soviet Union, but then used French as the medium of instruction due to the country's prior academic and colonial links with France.

However, while acknowledging its benefits, participant KP1 from RUPP talked about internationalisation as a response to outside pressure:

> … due to regional economic, political and educational trends, we cannot avoid or ignore internationalisation, whether we want to be engaged in it or not. RUPP used to limit its focus to local orientation only, due to its budget and capacity constraints. However, the regionalisation process, including ASEAN Economic Community 2015, as well as increasing global engagements with other countries, have pushed RUPP to join international activities …

Overall, due to limited resources, most Cambodian HEIs have adopted a laissez-faire approach toward internationalisation, with a somewhat restrictive local orientation and a lack of strategic planning. Cambodian internationalisation has taken the traditional form, with many participants citing the academic rationale of enhancing the quality of teaching, learning, and research and the acquisition of new knowledge and skills as the only primary motivation. Other motivations, including cultural, political, and socio-cultural aspects, were not high on the agenda for many HEIs.

Within the global knowledge system, Cambodian international activities have remained marginal, as Ford (2006) pointed out a decade ago. Through the lens of world systems analysis, internationalisation in Cambodian higher education has been influenced and

shaped by the geopolitical relations and interests of foreign partners. For instance, French assistance to Cambodia, which amounted to EUR270 million (around USD364 million) from 1993 to 2013 (Agence Française de Développement 2013), has gradually declined because Cambodia is no longer a main priority of French assistance due to its steady annual economic growth of around 7–8 percent over the last two decades. One of the major reasons behind French assistance was to promote the French language and culture in Cambodia.

In recent years, as part of their economic expansion in Cambodia as well in the region, Japan and South Korea have stepped up their international activities with Cambodian universities. Likewise, China's economic activities in Cambodia have become dominant, though its support for education has been relatively limited. This is not unusual, however, given that prioritising the development and strengthening of the economic and physical infrastructure upon which social infrastructure can be built later is characteristic of the Chinese development model (Samith 2016). True to form, China provided Cambodia USD600 million in aid for three years from 2016 to 2018 to support four areas – the electoral process, education, health and clean water. China's support for education in Cambodia can be clearly linked to its economic and political expansion in the region and the world. The establishment of ICHEI is a good example of how China aims to "pursue a leadership role at the global level through its increased financial contribution to UNESCO" in order to support the development of higher education in the developing world (ICHEI n.d.).

As elsewhere, English – the scientific and academic language of the Western world – has become a popular language in international activities for the vast majority of Cambodian HEIs. English-speaking countries, noticeably the United States, the United Kingdom, and Australia, were the priority destination countries for the vast majority of Cambodian students, followed by Singapore, Japan, South Korea, and China. These Western countries are believed to have advanced education systems and their credentials are highly regarded in the developing world, Cambodia included – a common global trend as indicated by Altbach (2006). In this regard, a few participants who went to China for their graduate studies did so because of their limited opportunities to go to other more developed countries.

Interestingly, many senior administrators and faculty members interviewed in this study asserted that the general public in Cambodia still hold the conventional view that China is a relatively closed developing country. Fascinated by its recent development and innovation, however, they went on to claim that some top Chinese universities are equivalent to their Western world-class counterparts and have therefore strongly encouraged their students to pursue their studies in China should the opportunity arise. Their views were reflective of the emergence of Chinese higher education at the global level. By 2018–19, China had 14, 23 and 58 universities among the top 500 in The Times Higher Education (THE) World University Rankings, QS World University Rankings, and Shanghai Jiao Tong University Ranking, respectively, excluding those in Hong Kong and

Macau. Regardless of their methodologies, these rankings suggest the rise of Chinese higher education in the world academic order. THE and QS rankings have recently paid attention to the stronger recent performance of higher education in BRICS countries.

Adding to the complexity of Cambodian higher education internationalisation is the establishment of Malaysia's Limkokwing University of Creative Technology in Cambodia, as well as Malaysia's emergence as one of the destination study countries for Cambodian students and students from other countries. Malaysia, like many other emerging economies, has become both an importer and exporter of higher education. According to the Cross-Border Education Research Team (2016), by 2016, Malaysia had 14 foreign branch campuses with another campus operating outside the country. Malaysia's quality education, the geopolitical benefits, and the historical connections of ASEAN give the country a comparative advantage in attracting students and scholars in the region. Larsen (2016, 178) argues that the space and networks have played a significant role in driving higher education internationalisation across the globe, and within ASEAN: "higher education regional integration began long before European initiatives with the establishment of the Association of Southeast Asian Institutions of Higher Learning in Thailand in 1959". Lee (2015) indicated that Malaysia has established higher education hubs in order to project its "soft power" in the region and beyond – a concept coined by Nye (2004) to refer to the ability of a country to influence others without force or coercion, but rather through its culture, political values, and foreign policies.

Another interesting case is the establishment of many collaborative programs, for instance, between Cambodian and Japanese universities at ITC, which stemmed from extensive Japanese assistance to the ASEAN region (the AUN/SEED-Net program) and therefore cannot be explained in isolation from the national and regional agencies concerned. Simply put, the involvement of the Japanese government in the AUN/SEED-Net program suggests that numerous international academic activities arose out of the intertwining of bilateral relations within the context of the multilateral network. Within this network, more advanced HEIs in such countries as Thailand, Malaysia, the Philippines, Indonesia, and Singapore have played an important role in bridging the quality gap between Japanese universities and those of CLMV countries. All this not only provides insight into the emerging modality of North-South-South higher education networks, as exemplified by Japan-ASEAN collaborations, but also contributes to the ongoing discourse on the role of regional bodies, like ASEAN, in international higher education. While world systems analysis has explained the internationalisation of Cambodian higher education in a Western dominated manner, with South-to-North flows of students and scholars, mainly driven by the regional and international asymmetrical political and economic nature of the world, there are several interesting points to note. In some partnership programs, many Cambodian students at PUC went to teach English at its partner university in South Korea. PUC prides itself on being the largest provider of English language training, offering more than 700 general English classes per day – the largest in absolute number in the region. This suggests the growing complexity of the world academic order.

Participant KP8 claimed that her decision to pursue her master's degree in China was largely because her family is of Chinese descent. This finding is in line with Jiani's (2016) study on the various motives behind international students choosing mainland China as their study destination. As she pointed out, "[A] growing number of descendants of Chinese immigrants are choosing to return to the country of their origin in search of their cultural identity" (Jiani 2016, 14). The implication of this quest for cultural identity is that cultural factors should be viewed as equally important as the economic and political factors in higher education internationalisation.

Plus, relations with foreign participants were not always zero-sum, as suggested in the neo-Marxist approach of world systems analysis. Japanese support for ITC has been appreciated by the university's leaders and faculty members, due to their emphasis on the needs and ownership of the Cambodian side. Likewise, China's growing support for Cambodia in STEM education has been much needed, as this area is still underdeveloped. The senior administrator at the MoEYS asserted that the World Bank-supported HEQCIP project, whose purpose was to train Cambodians how to conduct and manage research, was a great success as a starting point to promote and institutionalise a research culture in Cambodia.

Through the third theoretical lens of path dependence, the trajectories of internationalisation in Cambodian HEIs have been shaped by their historical development. Two examples can be provided here, one of which is ITC, where the French language and other academic and administrative patterns remain important even though the university is leaning towards more engagement with Japan, South Korea, and other ASEAN member states. As indicated earlier, ITC was rooted in the French and Russian models when it was built and later in the 1980s and 1990s when it was re-built. These academic and administrative legacies have limited the university's connections with institutions in such countries as the United States, the United Kingdom, and Australia. Participant KP2 even indicated that the university is open to re-establishing its partnerships with Russian institutions in the future.

The opposite is the case for PUC, which has had strong connections with universities in the United States from the very beginning. Adopting the liberal arts model as well as English as the medium of instruction has enabled the university to partner with HEIs worldwide, particularly those emulating the Anglo-American models. Compared to ITC, PUC had only two memorandums of understanding with French universities, neither of which was active at the time of study. One administrator argued that the lack of active partnerships with French universities was due to their unequal attitude as a former colonial power. Another administrator argued that the adoption of the American model, including English language, made it very difficult for the university to establish partnerships with French universities, which always insist on using French in collaboration.

While the path dependency concept and the world systems analysis provide more agency to institutions and structural inequalities between richer and poorer countries,

the study recognises the role played by human actors in bringing about change. For instance, ITC's leaning towards more engagement with Japan and institutions in other countries has been propelled by the rector who holds a doctoral degree from Japan. In fact, throughout the system, existing professional and personal connections between Cambodian and foreign contacts at various national, institutional, and departmental levels were not only the starting point for but also the key factor contributing to the success and sustainability of many internationalisation activities, including international university partnerships.

3.7. Final thoughts

There is no doubt that internationalisation has had a positive impact on the development of Cambodian higher education over the past 25 years, starting from the rebuilding of human and institutional capacity to the recent utilitarian and humanist emphasis on producing a skilled and capable labour force to support the socioeconomic development of Cambodia. However, in the absence of strategic policies and resources, international activities have been shaped and driven by foreign partners who have approached Cambodian HEIs with their own agenda. Uncritical adoption of foreign ideologies and values, often without the integration of local knowledge, can be counterproductive, rendering local HEIs vulnerable to issues of quality and relevance. For the most part, Cambodian higher education internationalisation has been confined to student mobility.

To move Cambodia forward, the government, HEIs, and other stakeholders should take a more proactive, rather than a reactive or ad hoc, approach. This means Cambodia needs to set out a long-term strategic plan to promote outbound mobility and increase the international experience of its students, faculty, and staff. At the same time, internationalisation at home should be strengthened to enable Cambodian HEIs to nurture a critical mass of educators and learners with local, international, and global competencies, avoiding parochialism or nationalism – an issue that has caused prolonged episodes of social chaos in Cambodia in its post-World War II history (Ayres 2000), as well as the wider world. In the words of HE Dr Hang Chuon Naron – the Minister of Education, Cambodia – education is a means to promoting peace and harmony not just for Cambodia but for the world as a whole, and "Cambodia is in the process of integrating global citizenship [education] into the curriculum" (Hang 2016). Internationalisation at home will be a means for Cambodia to achieve such a goal, moving beyond the often too restrictive local orientation of its education system. Several Cambodian universities have already moved in that direction. However, the practice needs to be institutionalised and embedded within the national and institutional visions and missions.

The internationalisation of educational content must be done with care and caution so that it is consistent with Cambodia's Higher Education Vision 2030, which

highlights the social, cultural, economic, and political values of education. Plus, internationalisation should take place in various programs, aiming for diversity and creativity that goes beyond the reach of market-driven or income-generated approaches. Higher education internationalisation has to be a platform for knowledge exchange, intercultural understanding, and mutual benefit between Cambodians and their foreign counterparts, rather than a matter of one-way dominance and imposition by more economically advanced countries. In other words, internationalisation should be a means, not an end. The past success story of Cambodia's combining and nurturing Indian knowledge and technology with indigenous wisdom during the Angkorian era is a reminder that foreign knowledge has to be localised to ensure that education remains relevant to the needs of Cambodian society. This localisation process will offset global/local tensions, setting proper trajectories for Cambodian higher education development. As the study has revealed, many higher education models, once adopted, have huge long-term ramifications for the future and any adjustment can only be made at great cost.

This study contributes to comparative and international education research, highlighting the dialectical intersection of different theoretical approaches to understanding the complexity of higher education internationalisation. This significant role of human agency as well as the social, cultural and political context of the developing world, complementary to the limited analyses by economic/political theories, suggests the existence and in many ways the re-emergence of multiple educational development models and perspectives among different societies – a case which has been increasingly acknowledged in the field since the early 1990s.

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Chapter 4

Conceptualising the Development of Academic Professional Identities

Eam Phyrom

Abstract

This study seeks to understand the concept of academic professional identities by examining how it has developed across times and places. The study employs literature review as a method. Based on the review, the identities of academic professionals are extrinsically formed and reformed by macro-level conditions such as academic revolutions, academic cultures, and academic career structures. Furthermore, the academic professional identities are intrinsically developed in an integrative way in relation to (1) the knowledge-centric nature of the academia, (2) the substance of scholarship, (3) the idea of professionalism, and (4) the higher intellectual ability. This study therefore reconstructs a comprehensive framework of aspects that shape and develop the academic professional identities and then draws on the framework to discuss current issues facing the Cambodian academic profession.

Keywords: Academic identity, academic profession, academic professional, academic career, academic culture

4.1. Background

An academic career has been increasingly viewed as a profession and academics as professionals. This claim is evident in the increasing uses of such terms as "academic profession", "academic professionals", "professor", or "professoriate" in the higher education (HE) research literature as well as the HE policy discourses (see Light 1974; Boyer 1990; Copurl 1990; Altbach 2003; Teichler, Arimoto and Cummings 2013; RIHE 2019). The field of research on the academic profession has received increasing interest, especially among the sociologists of HE alongside the sociologists of profession (Gumport 2007, 19), and among the international and comparative HE researchers (see, for example, Altbach 2003; 2011; Teichler, Arimoto and Cummings 2013).

In order to trace changes and to evaluate and compare performances and work environment of the academic profession around the world, those international communities of researchers have jointly conducted three international surveys on the academic profession so far:

- the first survey in 1992/3 labelled "The Carnegie Survey of the Academic Profession" and participated by 15 countries with 19,161 respondents (Teichler, Arimoto and Cummings 2013, 3);
- the second in 2007/8 called "The Changing Academic Profession (CAP)" and participated by 19 countries (Teichler, Arimoto and Cummings 2013, 19); and
- the latest one in 2017/8 titled "The Academic Profession in the Knowledge-Based Society (APIKS)" participated by over 30 countries (see https://apiks.hse.ru/).

The academic profession is key to the survival, functioning, development, and excellence of HE, the same way that the teaching profession is foundational for primary and secondary education. However, the whole image of the modern academic professionals is no longer the same as that of the academics in the 18th or 19th century Europe or the United States, where the academic revolutions took place (Jencks and Reisman 2002; Kerr 2002; Altbach, Reisberg and Rumbley 2010). Their cultures, institutions, career structures, roles, works, and, especially, the traditional basis of freedom have changed.

The current transition towards global knowledge economies and societies has further introduced new challenges for the academic professionals of the 21st century. With that said, the academic professionals have been expected (if not pressured) to take new roles and responsibilities, such as adapting to new technologies, engaging with global academic communities, and participating in a new kind of network that is not academic in nature.

Consequently, academic works now become very complicated and go in all directions: conducting and publishing high-quality research, presenting the latest research results at academic conferences, instructing academic courses, developing quality

syllabuses and instructional materials, supervising students to do research, engaging and supporting students in their learning, holding leadership and administrative roles to serve the employing institution, serving as a member of independent academic or professional communities, engaging in personal and professional career development, engaging more entrepreneurially and innovatively in generating resources, connecting with industrial and commercial sectors, becoming a knowledge communicator to the public, serving as a member of committees to advise government policies, and/or performing other ad hoc roles according to the real needs of the employing institution.

What justifies these numerous roles and responsibilities? Who are these academic professionals? Why are they tasked with or expected to perform so many roles and responsibilities? These questions more or less pertain to the concept of academic identities and what shapes the academic profession and identities across times and places.

The notion of "academic professional identities" is very important. It is central to how academics define their roles and responsibilities, how much autonomy they need for their work, what level of work qualities and ethical standards they need to reach, how satisfied or stressful they are with their work, how they should be promoted and rewarded, or how the society values them (see, for example, Boyer 1990; Copurl 1990; Barnett and Napoli 2008; Lee, Jung and Shin 2020; Ros, Eam, Heng and Ravy 2020). Academic identities are "of central symbolic and instrumental significance in the lives of individual academics and in the workings of the academic world" (Henkel and Vabo 2006, 130).

However, the meaning of identities of the modern academic professionals are complicated, and understanding what shape those identities in a comprehensive way is not an intuitive endeavour, neither for non-academics nor for academics themselves. Thus, calls for a reconsideration of academic professionalism have been increasing everywhere (Nixon, Marks, Rowland and Walker 2001; Altbach 2003).

4.2. Rationales for discussing academic professional identities in Cambodia

At the policy level of Cambodian HE since 1995, the meaning and promotion of academic professional identities have not been actively discussed. However, a number of the current HE policy documents and research discourses implicate the necessity to re-examine the Cambodian academic professional identities.

First of all, a declaration of Ministry of Education, Youth and Sport (MoEYS), issued on 28 August 2020 (see MoEYS 2020), aims to select and provide professorship status in the education sector. That will officially lead to a new form of academic performance evaluation and academic ranking system for lecturers and instructors at Cambodian higher education institutions (HEIs). Sooner or later, an internationally aligned academic title system and a performance-based evaluation approach to offer the professoriate title will be implemented at all Cambodian HEIs.

Second, the enhancement of the quality assurance and accreditation schemes of Cambodian HE (both the internal and external schemes) (see ACC 2016; ACC 2019) and some new research-based policy reports (see, for example, Mak, Sok and Un 2019a; 2019b) tend to favour increased participation from academic representatives in the institutional governance, leadership, management, and decision-making. To engage efficiently, those academic representatives need to have a clear understanding about the justification for their engagement, the scope of their capacities, and the level of their authorities.

Third, less related to HE but applied to the Cambodian education sector in general, the MoEYS's Teacher Professional Standards, issued in 2010, sets forth four dimensions of Cambodian professional standards for teachers: (1) knowledge of the profession, (2) practices of the profession, (3) professional learning (or development), and (4) professional ethics (MoEYS 2009). This brief document offers some basic ideas about what it means to be a Cambodian teaching professional from a legal and policy point of view. However, it does not focus specifically and in detail on the academic professionals in the HE sub-sector, whose identities are in many ways different from those of the school teachers. Freidson (1986, 15) claimed:

> In contrast to school teachers in "lower" educational institutions, university professors are granted enough time free from teaching to make it possible for them to do scientific, scholarly, and intellectual research and writing that does not generally have sufficient market value to provide a living by itself.

Pasternack (2019, 25) furthered:

> Unlike schools, institutions of higher learning depend on internal tensions that are what makes them institutions of higher learning in the first place. These tensions range between theory and practice, research and teaching, academic freedom and social responsibility, subjectivity and objectivity, natural sciences and liberal arts, basic and applied research, a specialist and generalist orientation, development and education, tradition and innovation, disciplinarity and interdisciplinarity, certainty and uncertainty.

The above distinctions may need to be made clear in the Cambodian context, so that the roles and responsibilities of Cambodian academics can be clearly framed.

In the same line, from a research perspective, calls for more active promotion and enrichment of the academic culture, academic career structure, academic scholarships, and research activities in the Cambodian HE sector (see Kwok, Chan, Heng, Kim, Neth and Thon 2010; Un, Hem and Seng 2017; Eam 2018; Ros, Eam, Heng and Ravy 2020) have been increasing since the start of the 21st century. In Cambodia, the understanding of identities of the academic professionals is especially important for (1) early-career academics, most of whom are currently teaching at universities, especially those who hold bachelor's degree(s) (around 15.5 percent of them) (MoEYS 2019, 40); (2) those academics not receiving advanced academic research training and lacking actual research experiences; and (3) graduate students (i.e. master's or

doctoral degree students). For these groups of academics and academics-in-the-making, the sole focus on teaching may distort their comprehensive image of being an academic professional, lower their professional performances, and in the long run affect their academic career path. As implied in Ros, Eam, Heng and Ravy (2020), the choice to enter and stay in the academic career in Cambodia is highly contested.

After all, the current global context of HE and changing academic professions necessitates the quest for a deeper understanding of the identities of the academic professionals. Such an understanding shall guide how the nation's academic workforce should dialogue to collectively raise their values, design a quality work environment, and protect their career integrity and dignity. For Cambodia, the understanding will also contribute largely to enhancing the image and position of her academic scholars and scientists on the international, regional, and global arena in the long run.

4.3. The current study

4.3.1. Purpose

This chapter discusses the concept "academic professional identities" or the identities of the academic professionals. In other words, the chapter conceptualises different dimensions that shape, form, and/or characterise the academic identities of the modern academic professionals.

4.3.2. Priori conceptual consideration

To rationalise the feasibility of such a research objective, we need to acknowledge certain prior assumptions. Firstly, the concept of academics in this study is treated as a general (or a universal) concept. The "general concept" here means it can be universally related to by the academics in different countries, regardless of the different (and unique) terms, histories, and meanings applied to the idea of academics in different places. Secondly, the discussion of academic identities in this study is done in the modern context of HE whereby the academic job is considered as a profession. Only by accepting that the modern academic job is a profession can we look at the academic men as the academic professionals (see Gumport 2007) and so apply the term "academic professional identities" in its proper discourse.

4.3.3. Methodological consideration

The current study uses literature review as a method (see Snyder 2019) to analyse, synthesise, and integrate knowledge surrounding the academic professional identities. The use of literature review as a method to synthesise a body of knowledge of a specific research area or to answer a specific research question has been increasingly practised by researchers as well as policy makers due to the proliferation of published research literature and policy documents in different fields. The philosophical tradition guiding and rationalising the use of literature review in social science research is

the hermeneutic tradition (Harverkam and Young 2007), which is popular among historians, archival researchers, as well as social researchers.

For this study, the whole reviewing procedure includes selecting the main texts, reviewing and analysing the selected texts, synthesizing and integrating the texts into key writing themes, and reflecting on the syntheses and integration. This reviewing procedure was not linear. It was done along with the writing of this chapter, which was iteratively revised multiple times. So, the review approach is more comprehensive and integrative than systematic and analytical.

The collection of the main texts for review was rather selective, not systematic, due to the time limitation and the capacity to access the literature. Only the well-established research texts in the most relevant research areas were considered for inclusion (see Table 4.1). That said, the author included in the review more of the well-referred texts on "the idea of university" and "the idea of higher learning" as well as the well-cited literature on "academic identities", "academic profession", and "scholarship".

Table 4.1: Research areas and exemplary thinkers and/or researchers whose texts are reviewed

Research areas and key terms for searching	Exemplary thinkers and/or researchers
Studies related to the idea of university, the idea of higher learning, the idea of HE, HE system and structure, HE institution, philosophy of HE, sociology of HE, and comparative and international HE	John Henry Newman, Karl Jasper, Michael Oakeshott, Wilhelm von Humboldt, Ronald Barnett, Joseph Ben-David, Burton R. Clark, Ulrich Teichler, Patricia J. Gumport …
Studies related to academic identities, academic profession (especially CAP), academic man, academic professionals, academic culture, academic career, academic revolution, scholarship, and sociology of profession	Logan Wilson, Mary Henkel, Pierre Bourdieu, Elliot Freidson, Donald Light Jr., Maurice Kogan, Tony Becher, Phillip Albatch, William Cummings, Akira Arimoto, Jung Cheol Shin, Ernest L. Boyer, Rice Eugen, Steven Anthony Quigley …

Source: Author's synthesis

4.4. Academic profession shaped extrinsically

The academic profession and academic professional identities have changed and been shaped across times and places through different episodes of academic revolutions. The profession and identities are also influenced by different dimensions of academic cultures and academic career structures in different contexts. We therefore can think of the academic profession and the identities of the academic professionals as both an oscillation and a blend, shaped by different macro-level and extrinsic sources.

4.4.1. Academic revolutions and the academic profession

The societal and internal functions of the academic institutions and the roles of the academic professionals have been fluctuating and varying across times and places. As described by Ben-David and Zloczower (1962, 81):

> Universities only a hundred years ago were exclusive academies of scholars pursuing privately their learned interests and instructing a small number of highly selected students who prepared to enter the civil service or one of the traditional professions, and in exceptional cases became scholars themselves. Today universities educate – in some countries – as much as a fourth to a third of all the young people in the appropriate age groups, and conduct research of vital importance for the survival or destruction of human society.

The professionalisation of the academia at universities or HEIs has taken place along with gradual academic revolutions first in Europe, then in the United States, and now globally. Altbach (2016) noted that the academic revolution started in Europe, expanded elsewhere, and redefined its shape. Researchers generally agree that there was an academic revolution in Germany (or Prussia to be exact) in the early 19th century when Wilhelm von Humboldt, a Prussian educational philosopher, defined the principles of "unity of research and teaching", "solitude and freedom", and "community of teachers and students" to be the foundational characteristics of a university (Yusuf 2007, 2; Schneijderberg and Teichler 2018, 15). Yusuf (2007, 2) further specified that the Humboldtian model was implemented at the University of Berlin in 1810 and approved that the teaching and research combination became a model for other universities in Europe and the United States. He also emphasised that this combination revolutionised and broke the 600-year status quo of universities as professional training grounds.

In the late 19th century and throughout the 20th century, there was a gradual rise of the American university (Jencks and Reisman 2002, 12-20), influenced by both the Humboldtian model of Germany (of the Continental tradition) and the English and Scottish model (of the Anglo-Saxon tradition) (Kerr 2002, 1-5). It is through these waves of transformation that various institutional models such as the "American research university" and the "graduate school model" have emerged subsequently and begun to have impacts beyond the United States and even back to Europe from where the United States adopted the university models.

These episodes of academic revolutions in Europe and the United States had tremendous effects on the development of HE systems and institutions as well as the professionalisation of the academia around the world, leading to what Altbach, Reisberg and Rumbley (2010) termed the "global academic revolution". This global academic revolution (especially, the one starting in the United States) and the whole changing environment of HE and academia (in terms of the increased government regulation, HE massification, marketisation of HE, internationalisation of HE, technologisation in HE, and the movement towards universal HE) together and further pose significant effects on the modern academic profession and the identities of the academic professionals of the 21st century.

4.4.2. Academic cultures and the academic profession

The formation of academic professions across times take place within a broad landscape of so-called academic cultures. To give a sense of what academic culture(s) is/are, Ringer (1990, 279) stated:

> Defined in a narrower sense, academic culture is an intellectual field or subfield, a network of interrelated and explicit beliefs about the academic practices of teaching, learning, and research, and about the social significance of these practices. Defined in a wider sense, an academic culture encompasses practices, institutions, social relations, along with beliefs.

Although the concept of academic cultures can be vague and hard to define in exact terms, from an organisational and comparative perspective, Clark (1980) chose to classify this wide-ranging concept into four categories: the culture of discipline, the culture of profession, the culture of enterprise, and the culture of system, based on this sociological and organisational view of HE. Whether an academic professional serving in a modern HEI is consciously aware of these cultural dimensions of the academia or not, s/he is more or less shaped and warped by these elementary cultures. Table 4.2 below offers a brief explanation for each dimension.

Table 4.2: Burton R. Clark's four dimensions of academic cultures

Academic cultures	Conceptual elaboration
Discipline	• The culture of discipline is central to the knowledge and knowledge functions of the academia. More specifically, this dimension is centred around (1) the existing body of disciplinary knowledge and (2) the intellectual, inquiry, or learning paradigms employed to acquire, critique, create, or communicate those knowledge objects. • Generally, the beliefs, values, norms, and/or artefacts of knowledge of a particular scholarly or scientific discipline are rooted in and shaped by the cultural traditions of that discipline and the collective consensus of its members. It is this culture of discipline that generates, preserves, and advances the academic content knowledge, concepts, theories, hypotheses, facts, and/or inquiry approaches in a discipline or sub-disciplines. • Only within or through this cultural dimension of discipline of the academia can such notions as "academic freedom", the "sense of belonging to academic communities" (or collegiality), "theoretical research", or "knowledge for knowledge" be experienced by the academics. • When people use or try to conceive the term "academic cultures", what they generally refer to is this culture of discipline. The influence of this dimension on academic identities remains highly vibrant in such academic disciplines as natural sciences or philosophy.

Academic cultures	Conceptual elaboration
Profession	• The culture of profession is more related to the work and the professional practice aspects in the academia. This dimension is an interplay between (1) the professional practices that manifest academic roles and responsibilities or ethical standards as well as (2) the actual practices of a particular specialisation or profession or, in other words, the application of the disciplinary knowledge into the vocational or working domains. • This dimension gives way to the modern ideas of "academic profession" and "academic professionals" by defining the academic roles and responsibilities; their required qualifications; their professional standards in terms of approaches, methods, and techniques; and their professional attitudes or ethical standards, etc. • This culture of profession remains highly vibrant in traditional professional fields, such as medicine, law, and engineering. • It should be noted that academics were once not considered as professional workers because of their collective defence of the need for absolute intellectual freedom which may or may not yield any usable (social) outcomes as other professions can offer. That is why the academic communities are sometimes called "the learnt communities", not the "professional communities".
Enterprise	• The culture of enterprise focuses on the organisational, institutional, and/or entrepreneurial aspects of the academia. Basically, the culture of enterprise can be viewed as a landscape surrounding the controlled, managerial, or corporatised principles and practices of the institutional managers, administrators, or academic entrepreneurs, as opposed to the freedom-oriented cultures of the academic professionals. • Academic enterprising generally revolves around congregation of resources, organisational arrangement, and organisational development, which leads to the achievement of certain institutional goals. Different academic institutions may incorporate different organisational cultures, norms, values, traditions, and sources of knowledge and so have unique institutional visions, missions, goals, strategies, and activities. • The academic institution (in the form of university, academy, or centre for learning) is generally loosely organised. Namely, it is organised into different faculties, departments, divisions, schools, centres, offices, councils, commissions, or groups, based on the disciplinary orientation (specialised or inter-disciplinary) of the academic members and/or the administrative function (fixed or ad-hoc) of the non-academic members. Within the loosely organised academic institution, there is always a possibility of establishment of new forms of working groups that may not be known to other groups.

Academic cultures	Conceptual elaboration
System	• The culture of system generally covers different dimensions of the macro-level national and societal environment that shapes the HE or academic institutions and their personnel. • This macro-level system generally governs and steers the institutions from above or from without through policies, strategies, direct demands, or reactions. The culture of system may have political, legal, market, civic, and even religious implications on the academic institutions and the academics. The culture of system is a key determinant of why the academic institutions and the academics extend their functions and roles outsides of their disciplinary, professional, and institutional boundaries. • Although the idea of system here is generally discussed at the national level, it can also incorporate the larger academic system at the international, regional, and global levels. Such incorporation is highly practical in the context of HE of the 21st century.

Source: Author's interpretation

The interaction among these different cultural dimensions is intricate. Among the four academic cultures, the two most primary ones to the academic professional identities are the knowledge-centric culture of the discipline and the practice-centric culture of the profession. The two share at least two core principles: the principle of academic freedom (or professional autonomy) and the sense of communities (i.e. the sense of belonging to the academic communities or the communities of practices). Despite this similarity, the culture of discipline is more oriented towards higher disciplinary learning and intellectual inquiries (i.e. academics as knowledge learners or explorers), whereas the culture of profession is more oriented towards vocational performances and reflective practices in the academia (i.e. academics as knowledge workers or practitioners).

The relationship between the organisational culture of enterprise and the governing culture of the system (especially the national system) is also strong. Both cultures share the "controlling" and the "managerialism" substances. Likewise, the culture of enterprise of the institution can be heavily influenced by the national and societal system it is based. Generally, the academic institutions are governed, regulated, and funded by the national system of HE through an important social institution – i.e. the government. So, the academic institutions are theoretically accountable to the government that controls the HE system and administrates the nation. As we can observe, academic institutions organised in a democratic society have different institutional structures, values, and practices from those in the socialist or communist society.

In fact, the cultures of enterprise and of system are generally in conflict with the cultures of discipline and of profession. That is, again, because the former two stand on the principle of control and managerialism, while the latter on the principle of independence and freedom. Globally, the HE and academic governance has been increasingly influenced by neo-liberalism. In this context of governance, the academic

practices are heavily influenced (if not determined) by the culture of enterprise and of system. In this view – whether it is through the socio-economic perspective of Henry Etzkowitz (2008) on the triple helix or the socio-organisational framework of Burton R. Clark (1983) on accountability triangle – there are three important social stakeholders of HE: the state/government, the market/industry, and academia/profession. The state or government authority, under the political framework, seeks accountability and conformity. The market and industrial sector, under the economic framework, seek profit and production. The academic and professional communities, under the intellectual and professional framework, seek scholarly knowledge and wisdom and intellectual freedom or professional autonomy. When these different agencies pose their influences, the academic institutions and the academic professionals have to embrace these multidimensional effects while trying to protect their academic authorities. In the words of Bleiklie and Kogan (2006, 11–12):

> Governmental regulation takes place through central policy-making bodies and bureaucracies, the allocative bodies and the quality assurance bodies. These provide the frame for the policies for the universities, which they seek to find their particular identities and niches within them. At the same time, a different set of policies is formed through invisible colleges of academics. They decide the award of the more prestigious academic posts and honours, reputational statuses and, interlocking with the allocative systems, the awards and differential allocation of funds.

These mixed but conflicting cultural impacts make the whole academic profession exceptional and stand apart from other professions which are more unified and less wide-ranging in their scope of works. Likewise, this situation leads to the formation of the academic professional identities that is more complicated than the formation of identities of other professionals.

We can also notice that all the different dimensions of academic cultures, built through different phases of academic revolutions across times and places, are now increasingly international, regional, and global.

- From the culture of discipline perspective, the disciplinary knowledge and approaches are in principle not bounded by institutions or nations. Such principles as logical truth or theoretical generalizability of the scholarly and scientific knowledge are believed to be universal. Though they may be varying by geographical differences, the different types of and approaches to knowledge can still be discoursed together on the same universal platform.
- From the culture of profession perspective, it is increasingly acknowledged that teaching, research, and services (or third missions) become the key functions of HEIs internationally – despite the varying degrees of orientation of and approaches used by the academics from different countries in performing these functions. More international standards to define and evaluate different academic aspects have been developed, discussed, and borrowed across nations to serve more general needs.

- From the culture of enterprise perspective, the governance mechanism, institutionalisation process, and career structure of the modern HEIs are influenced more or less by the Western models, and HEIs around the world are increasingly on the same path of trying to collaborate and compete for regional and global ranking. To make such a global comparison possible, certain institutional structures and indicators need to be formalised across nations.
- Finally, through the culture of system perspective, the current movements of internationalisation, regionalisation, globalisation, and transnationalisation of HE and the influences from international (or supranational) organisations (such as UNESCO, OECD, the World Bank) on HE development around the world suggest that the cultures of the national HE systems need to adapt to the larger international and global ecosystem.

4.4.3. Academic career structure and the academic profession

Academic career structure refers to the various principles that guide the organisation of the academic career in a certain national context (Frolich et al. 2018). Unlike the traditional idea of academia seen in relation to the image of less organised "ivory tower", the modern academic careers are embedded into the general labour market and the broader legal framework of a country (Frolich et al. 2018, 8). To organise the academic career structure, we need to consider the following aspects: academic career preparation, academic recruitment, work contract, work conditions, academic position, academic ranking, academic performance evaluation, academic promotion, academic rewards, academics' professional development, and academic career pathway. In many countries, these different aspects of the academic career structure highly shape the development of the whole academic profession, academic performance, and, especially, academic professional identities.

To explain, the requirement for a doctoral degree (or post-doctoral experiences) as the basic qualification to enter the academe in many countries has a serious implication for the academic professional identities, especially in terms of researcher involvement (Eam 2015). To move up the academic ladder after being recruited, academic professionals need to produce research publications, obtain grants, or even engage in research-based development or application activities. Furthermore, because information and knowledge have accumulated rapidly and are easily accessible, obtaining a PhD and having a few publications do not complete the learning and developing cycle of the academic professionals. They have to engage in continuous professional development activities locally and internationally, which are partly designed to promote the academic identities and professionalism (Debowski 2017). In this way, they can grow and achieve professional excellence.

The academic professional identities (along with the academic performances) of individual academics change according to different stages of their academic career

(i.e. early stage, middle stage, and late stage). Well-informed and well-performed academics are generally able to move successfully from one stage to another and achieve a better rank, status, and rewards. The life-time tenure track system employed in many countries in the past has shifted to be more contract-based, which means that being given a professor title no longer implies a guaranteed life-time work status. Working contracts and conditions of the academic professionals have now become more flexible as, in many countries, workloads may increase due to different institutional, governmental, and societal requirements. The teaching and research roles have remained foundational, but there have been changes in the orientation towards either the research track or the teaching track (see Teichler, Arimoto and Cumming 2013; Lee, Jung and Shin 2020).

Because of the increased activities in the third mission of the HEIs (Mok 2013), academics are also assigned with different new kinds of work tasks (such as networking with the industrial sector or engaging more with the wider communities). There has seen an increase in numbers of PhD holders, who are traditionally supposed to serve the academia, working for the non-academic sectors (industrial, commercial, governmental, or non-governmental sector).

Another explanation is related the macro-level governance model. Even though each country has its unique academic career structure due to the different HE governance models the country has adopted, HEIs around the world are increasingly influenced by the massification, privatisation, market mechanism, and the increasing managerialism. Baruch and Hall (2004, 257) asserted that the increasing managerialism in the governance of academic institutions has shifted the academic career to be more like the career of the business professionals and gives more power to the administrators and the academic entrepreneurs who can attract resources and less to the academics.

Through the above discussion, the development of academic professional identities depends largely on how the academic career structure is organised and operated.

4.5. Academic professional identities developed intrinsically

The academic professional identities cannot be just viewed from the macro-level and extrinsic perspectives. The literature suggests that the identities of the academic professionals are developed, formed, and characterised intrinsically and somehow subjectively.

In the existing literature, the concept of individual academic identity (or identities) is generally viewed in two ways: as a fixed unchanging essence of self or "the essential self" on the one hand, and as dynamic, shared, and changing/conforming different selves, on the other. Henkel and Vabo (2006) referred to the first as the "idealist" concept of identity and the second as the "communitarian" concept of identity.

These two conceptions have long been debated, in fact not just in relation to academic identity but also to the notion of identity in general. The idealist conception sees identity as "being". In the literature of academic identity, there are still critical attempts to find common underlying principles or what Quigley (2011) called "commonalities" in the quest to define an academic professional. In this sense, the academic being or self can be considered a single human agency. In his work titled *Human Agency in Social Cognitive Theory*, Bandura (1989) rejected the dichotomous conception of self (as an object and as an agent). He (1989, 1181) expounded: "The same self performing multiple functions does not require creating multiple selves endowed with different roles".

The scholars in support of the communitarian conception of academic identities rejected this idea of the single identity, however. According to Drennan, Clarke, Hyde, and Politis (2017, 1), "academic identity is today defined as lying at the crossroads of individual life course experiences and higher education specific contexts, and thus as an increasingly plural identity". Henkel and Vabo (2006) also acknowledged that the idealist view of academic identity was less valued by the late 20th century and that the communitarian "multiple selves" view became more relevant and realistic. The dominance by the communitarian view shifts the focus from the question of "being an academic" to the question of "becoming an academic" (Henkel and Vabo 2006).

To extend the literature discussion, the author adopts a more integrative view on the existing debate, assuming that the idealist and the communitarian views can be pragmatically conceived together. This integrative view can be explained by four themes, somehow discussed separately in the existing body of the academic profession literature: (1) the knowledge centrality of the academia, (2) the substances of scholarship, (3) the idea of professionalism, and (4) the higher intellectual ability.

4.5.1. The academic professional identities and the knowledge-centric nature of the academia

The first essence of being an academics is based on the centrality of knowledge in the academia. Clark (1983) made it very clear in his seminal work "The Higher Education System: Academic Organisation in Cross-National Perspective" that the core of academic substance everywhere is knowledge, and Freidson (1986) contended that it is their special kinds of higher knowledge that give power to the professionals in general and the academic professionals in particular. Wilson (1942, 3) furthered that the conservation, dissemination, and innovation of knowledge are the functions of academicians everywhere. The different extrinsic aspects of the academia discussed above (i.e. academic revolutions, academic cultures and institutions, and academic career structures) are more or less knowledge-centric, knowledge-functional, or at least knowledge-related.

But what is academic knowledge? There are different views on what academic knowledge is. The epistemologists generally classify knowledge into three forms: acquaintance knowledge (i.e. knowledge of things or people one is familiar with), knowledge-how (i.e. knowledge of skills or ability to do something), and propositional knowledge (i.e. knowledge of facts at the structural or logical level of meaning) (McCain 2016, 18). The academic knowledge is generally associated with the third form, the propositional knowledge, which is sometimes related to or defined as the "Mode 1 of knowledge". According to Savin-Baden (2008, 96), the Mode 1 of knowledge is the "propositional knowledge that is produced within the academy separate from its use …".

While most studies on knowledge productions discussed the Mode 1 and Mode 2 of knowledge (following Gibbons, Limogese, Nowotny, Schwartzman, Scott and Trow (1994)), Savin-Baden (2008) further extended the classification of knowledge forms or modes, based on previous discussions by Ronald Barnett, Cynthia Cockburn, and other researchers. His classification provides a clearer image of what the propositional (academic) knowledge is in relation to other modes. Table 4.3 offers a brief explanation of each of the five modes of knowledge, discussed by Savin-Baden.

Table 4.3: Modes of knowledge

Modes	Characteristics
Mode 1	Propositional knowledge that is produced within the academy separate from its uses and the academy is considered the traditional environment for the generation of this form of knowledge. *[i.e. knowledge related to such ideas as "knowledge as an end in itself" or "knowledge for knowledge" or "knowledge for its own sake". It is more about knowing intellectually, theoretically, or conceptually.]*
Mode 2	Knowledge that transcends disciplines and is produced in, and validated through, the world of work. *[i.e. knowledge related to such ideas as "knowledge-how", "know-how", "knowledge for uses", or "knowledge for practices". It is related to skills and the application of knowledge into real works.]*
Mode 3	Knowing in and with uncertainty, a sense of recognising epistemological gaps that increase uncertainty. *[i.e. recognising that the knowledge that one knows, creates, or imagines is incomplete or uncertain, especially when one tries to accurately define or explain it.]*
Mode 4	Disregarded knowledge, spaces in which uncertainty and gaps are recognised along with the realisation of the relative importance of gaps between different knowledge and different knowledge hierarchies. *[i.e. knowledge related to emotional intelligence; for example, knowing when to keep the mouth shut or when to promote oneself. This kind of knowledge is "disregarded" because it has not been much valued in the traditional academia.]*
Mode 5	Holding diverse knowledge with uncertainties. *[i.e. the state of knowing or knowledge that covers all the four modes of knowledge (or a number of them) together without a clear sense of directions or certainties]*

Source: Reproduced from Savin-Baden (2008, 97), with additional interpretation in italics

Besides the epistemologists, the sociologists of profession, knowledge, and/or science also offer some ideas on what academic knowledge is. From a sociological

point of view, the academic or scientific knowledge is formal. Freidson (1986) differentiated the idea of "formal knowledge" which is carried out by scientists, professionals, or technocrats from the common, popular, and unspecialised kind of knowledge possessed by the laypeople. The author believed that this form of knowledge has languages of its own and is shared and understood only among the elite or special groups who study or practice the field. In this sense, formal knowledge covers both the Mode 1 and Mode 2 knowledge. Freidson (1986, 2-9) further characterised formal knowledge by such principles as rationalisation, normalisation, and technicality.

The formal knowledge is perhaps closely related to what Wells (2004) and Smits (2012) referred to as the "theoretical" knowledge of different scholarly or scientific disciplines (i.e. formal science, empirical science, and humanistic studies). Smits (2012) implied through his discussions that the different scholarly or scientific disciplines somehow need various requirements in the creation of the theoretical knowledge: systematisation of knowledge, methods-based knowledge attainment, universal knowledge, and sometimes the requirement for knowledge replicability. He explained:

> … the various branches of scholarship are usually distinguished on the basis of their characteristics and methods. Thus, the formal (or a priori) sciences are usually contrasted with the empirical sciences. Formal science (such as mathematics, logic and computer science) study abstract objects starting from certain existing axioms and rules of inference. The validity of a theory is then completely dependent on these axioms: the reality they create is a wholly artificial one. This is fundamentally different in empirical sciences (such as psychics and biology): here, the validity of a theory can be tested by way of physical experiment. The third type of discipline is formed by the humanities, dealing with the diverse products of human mind (p. 36).

Smits (2012) mentioned that the scholarly and scientific knowledge involves tertiary-level representation such as creating taxonomies, theories, or models and is highly systematised and specialised. Wells (2004, 64) furthered:

> Indeed, it appears that one of the most salient characteristics of theoretical knowing, as it has developed Western culture, is the tendency towards ever-increasing specialisation of fields of study, each distinguished as much by its dominant constructs and research procedures as by the specific aspect of the physical world with which it is concerned.

Through these discussions from the epistemologists' and the sociologists' points of view, the academic knowledge can be closely related to the propositional, formalised, theoretical, systematic, and/or specialised form of scholarly and/or scientific disciplines. It should be noticed that the pure natural scientific approaches to knowledge creation (i.e. the approaches based on the positivist and empiricist traditions) have become increasingly dominant in the academic world. These approaches are strictly

built on the logical traditions, scientific methods, and objective analyses, generally supported by the so-called empirical evidence. According to Stockemer (2019, 6-7), to be empirical, four principles must be conformed to: falsifiability, transferability, cumulative nature of knowledge, and generalisability. Similarly, Schwartzman (1984, 201) claimed that the scientific knowledge is: (1) based on empirical observation, in contrast with classical knowledge based on hermeneutics and rational speculation; (2) systematised and geared toward explanation, in contrast with practical, applied knowledge; and (3) produced by a community of freethinking scholars, in opposition to all forms of authoritative systems of thought and belief.

After all, the academic, scholarly, and/or scientific knowledge in all disciplines has gradually been preserved, refined, created, innovated, acquired, used, communicated, and/or diffused. This whole list of activities to do with knowledge is what Arimoto (2006, 2007) refers to as the "knowledge functions". The knowledge function is constituted in almost all activities happening in the sphere of the academe, from teachers teaching to researchers creating new knowledge and to students studying the existing knowledge. It is these knowledge functions that firm up the centrality of knowledge in the academia, and that knowledge centrality is a key attribute of academic identities.

4.5.2. The academic professional identities and the substances of "scholarship"

To further understand the identities of the academic professionals, we need to turn to another important concept – the concept of "scholarship". The substances of scholarship underly and constitute most functional roles and responsibilities of the academic professionals. This argument was made clear after the publication of a text titled "Scholarship Reconsider: Priorities of the Professoriate" by Ernest L. Boyer in 1990. This well-cited publication defines four types of scholarship: the scholarship of discovery, the scholarship of application, the scholarship of integration, and the scholarship of teaching (See Table 4.4).

The different dimensions or types of scholarships are more or less integrative or interrelated (Boyer 1990; Rice 1991). The essence of integration or interrelatedness is reflected in such concepts as the "teaching-research-study nexus" (Clark 1993, 1995; Arimoto 2006) or "the intertwinement of academic works" (Fumasoli, Goastellec and Kehm 2015, 3). To quote Badgett (2015, 201):

> In my own career, the connections between engagement, research and teaching have been so closely intertwined that it's hard for me to think about them as creating trade-offs. Each part of that professional triangle presents opportunities for us to learn and create valuable knowledge and materials for conveying that knowledge… Each side of the triangle strengthens our ability to do the others.

Table 4.4: Ernest L. Boyer's four scholarships

Types of Scholarship	Conceptual elaboration
Scholarship of Discovery	This dimension suggests that being a scholar constitutes being a researcher who explores and creates knowledge (particularly, the Mode 1 knowledge) and so seeks to attain theoretical or generalisable truths around his/her specialised discipline. More specifically, this dimension of scholarship involves conducting research (in a traditional sense) with the aim to extend the academic knowledge frontier. The emergent discourse on the scholarship of research development (see Debowski 2017) is in some ways related to Boyer's scholarship of discovery.
Scholarship of Teaching	This type of scholarship constitutes the roles of scholars as a teacher as well as an inquirer into teaching and learning (i.e. on how to transfer or transmit knowledge and how the knowledge is acquired or mastered). In that sense, scholars at the HE level in any discipline should not only involve in the practice of teaching or instructing but also in researching and reflecting into such issues as pedagogical/andragogical/heutagogical approaches (with the use of action research becoming more popular), curricular designs, material developments, classroom management, assessment, and evaluation, etc. Teaching in HE should be research-based or research-guided, and is grounded in the research-teaching-learning nexus of HE. According to Rice (1991), the scholarship of teaching has at least three elements: synoptic capacity, pedagogical content knowledge, and what the teachers know about learning. This scholarship is increasingly related to the academic, professional, and/or faculty development works. Despite Boyer (1990) used the phrase "the scholarship of teaching", researchers now tend to prefer to use the phrase "the scholarship of teaching and learning".
Scholarship of Application	This type of scholarship suggests that being a scholar constitutes a role of applying knowledge (based on the scholar's research discovery and teaching and learning) into useful resources or practical techniques for the community or society at large. This scholarship is sometimes referred to as the scholarship of engagement and is closely rooted in the service function as the third mission of HEIs. This dimension is utilitarian in principle and goes beyond knowledge for its own sake. The manifestation of this scholarship can be seen in the engagement of scholars in various forms of consultancy services; policy making, dialogue, and advocacy; science popularisation and community developmental activities; or industrial research and development and knowledge commercialisation, etc.
Scholarship of Integration	This final type of scholarship suggests that being a scholar constitutes being a knowledge synthesiser and integrator. Knowledge syntheses and integration allow scholars to go beyond their disciplinary boundary. Analysing, connecting, synthesising, and integrating knowledge materials or objects (from research, teaching, learning, and application) across times, disciplines, and theoretical or conceptual dimensions are in fact a usual scholarly habit of traditional scholars or intellectuals (sometimes referred to as polymaths) before the current state of knowledge and disciplinary segmentation. Although academics nowadays find that hard to achieve, the scholarship of integration is in fact almost impossible to avoid as long as a scholar continues to traverse his/her scholarly path. The integrative inquiry allows scholars to see the connection between the whole and the parts and so construct a more holistic meaning out of their scholarly works. In today HE context, this scholarship manifests into the increasing promotion of inter-disciplinary and multi-disciplinary research.

Source: Author's interpretation, based on Boyer (1990) and relevant literature

4.5.3. The academic professional identities and the idea of "professionalism"

Some researchers doubt whether an academic is a professional at all. One reason is because of the lack of specificity and unity in academic works and roles (see Nixon, Marks, Rowland and Walker 2001). Most researchers, however, consider academic work not only as a profession, but a unique one, as implied in their terms such as "profession of the profession" (Perkin 1987) (or meta-profession) or "producers of the producers" (Carvalho 2017). Research studies on academic identities are almost always discussed in association with the concept "professionalism" in the literature (see Henkel 2000; Henkel and Vabo 2006; Quigley 2011).

There are two theoretical lines of discussion about academic identities from the "professionalism" perspective. They are the *trait* theoretical line and the *functional* theoretical line (Quigley 2011) – seemingly, the former focusing more on immaterial professional qualities and the latter more on the behavioural professional roles and performances. Table 4.5 below summarises key attributes (both the trait and the functions) of the professionals (such as the legal, medical, and engineering profession) in general. Based on the list in this table, the concept of professionalism tends to constitute, among others, (1) the depth and breadth of competency, proficiency, or mastery of the technical knowledge or domain knowledge (generally recognised in terms of qualifications and experiences); (2) a (sometimes imprecise) scope of work assignments and procedures, working norms and habits, and/or work quality standards (generally mentioned in work agreement, contract, and/or terms of reference); (3) an expected high level of ethical and moral attitudes in performing the professional works (e.g. the ethics of integrity as defined in work regulations or codes of conducts); and (4) a collective sense of community and loyalty to the profession (shared among members of the profession and supporting the idea of professional autonomy).

When such professional attributes are incorporated into the academia (which was once the world of scholars pursuing a certain area of learnt interest independently (see Ben-David and Zloczower 1962)), academic work becomes a profession and develops as a formal career. In that sense, academic works begin to be systematically classified, proceduralised, and standardised (with a clear body of ethical and moral codes of conducts self-regulated by independent academic peers). Entering into this profession requires a certain level of proven records of acquired knowledge and experiences and achievements in the discipline, adding to a serious level of interest in learning and pursuing that discipline. Gumport (2007, 19) synthesised:

> Faculty, then referred to as "academic men," were seen as professionals, based on their credentialed expertise, self-regulating norms, and ethos of service, all justifying their autonomy in carrying out their responsibilities.

Table 4.5: Different perspectives on the attributes of the profession

Key sources	Attributes of the profession
Wilson (1942, 114)	• Prolonged and specialised training based upon a systematised intellectual tradition that rarely can be acquired through mere apprenticeship. • Rigorous standards of licensure, fulfilment of which often confers upon the functionary a degree or title signifying specialised competence. • Application of techniques of such intricacy that competency tests cannot be deduced upon any simple continuum scale, nor can supervision be more than loosely applied. • Absence of precise contractual terms of work, which might otherwise imply a calculated limitation of output and an exploitative attitude towards productivity. • A limitation upon the self-interest of the practitioner, and a careful insulation of professional considerations from extraneous matters, such as private opinions, economic interests, and class position. • Certain positive obligations to the profession and its clientele.
Barber (1963 cited in Quigley 2011, 22)	• A high degree of generalised and systematic knowledge, • Primary orientation to the community interest rather than to individual self-interest, • A high degree of self-control of behaviour through codes of ethics internalised in the process of work socialisation and through voluntary associations organised and operated by the work specialists themselves, • A system of rewards (monetary and honorary) that is primarily a set of symbols of work achievements and thus ends in themselves, not means to some end of individual self-interest.
Johnson (1972 cited in Quigley 2011, 22)	• Skill based on theoretical knowledge, • The provision of training and education, • Testing the competence of members, • Organisation, • Adherence to professional codes of conduct, • Altruistic service.
Light (1974, 10)	• It has exclusive powers to recruit and train new members as it sees fit. • It has exclusive powers to judge who is qualified. • It is responsible for regulating the quality of professional work. • It has high social prestige. • It is grounded in an esoteric and complex body of knowledge.

Source: Author's summary

4.5.4. The academic professional identities and the higher intellectual ability

Until now, three points have been made: that the academic professionals have their works centralised in knowledge; that they are identified with the substance of their scholarship; and that their identities are defined by their professionalism. But what is foundational to all these? To answer shortly, it is the ability to perform higher intellectual activities that essentially defines an academic man.

When trying to explain the nature of academic institutions or academic men, previous leading thinkers and researchers of the field always use such terms as "intellect", "intellectual", "learnt", "higher learning", or "higher knowledge" (e.g. Wilson 1942; Jaspers 1959; Ben-David and Zloczower 1962; Humboldt 1976; Freidson 1986; Bourdieur 1988; Barnett 1990; Savin-Baden 2008). To exemplify, Wilson (1942, 223) considered "the human coefficient of intellectual activity" as "the utmost important" quality of an academic man. Eddy and Mitchell (2012) referred to the academic men and their work environment as the "thinking community". And, Humboldt (1976, 242-243), the widely cited Prussian thinker of the idea of university and who was sometimes considered the father of modern university, asserted:

> The idea of disciplined intellectual activity, embodied in institutions, is the most valuable element of the moral culture of a nation. These intellectual institutions have as their tasks the cultivation of science and scholarship (Wissenschaft) in the deepest and broadest sense. It is the calling of these intellectual institutions to devote themselves to the elaboration of the uncontrived substance of intellectual and moral culture, growing from an uncontrived inner necessity.

According to the Marriam-Webster online dictionary, the term intellect is defined as: (a) the power of knowing as distinguished from the power to feel and to will: the capacity of knowledge; or (b) the capacity for rational or intelligent thought especially when highly developed.[1] This dictionary definition of intellect gives weight to the term "high", more specifically, "high" in the ability to think, reflect, reason, or understand things, which is sometimes referred to as cognitive rationality. From a more technical perspective, how the higher intellectual activities work remains to be investigated by researchers (especially, cognitive scientists, neuroscientists, psychologists and learning scientists). Guidford (1988, 3), for example, simply diagrams a three-dimensional structure of the intellect, containing (1) *Contents* (visual, auditory, symbolic, semantic and behavioural); (2) *Operation* (evaluation, convergent production, divergent production, memory retention, memory recording and cognition); and (3) *Products* (units, classes, relations, systems, transformations and implications). Similarly, in educational psychology, a model called "the spiral of knowing" tends to suggest four elements of the intellectual knowing or knowing in general: experience, information, understanding, and knowledge building (Wells 2004, 85). Paul and Elder (2008, 13) further suggested that intellectual traits and virtues include intellectual integrity, intellectual humility, confidence in reason, intellectual perseverance, fair mindedness, intellectual courage, intellectual empathy and intellectual autonomy.

Based on these quick discussions of the dictionary and technical definitions of intellect, we can easily relate intellectual activities or cognitive rationality to academic works. Academics generally use the intellectual ability of their mind (i.e. the higher-order cognitive and meta-cognitive abilities) to learn and produce knowledge. These abilities can range from critical, analytical thinking to imaginative, synthetical thinking.

1 https://www.merriam-webster.com/dictionary/intellect

The analytical thinking (sometimes related to convergent thinking) allows the human intellect to recognise, sensually perceive, memorise, classify, and categorise the knowledge. The synthetical thinking (sometimes related to divergent thinking) allows academics to ideate, reflect, imagine, see the big picture, understand, and so construct the knowledge. Rice (1991, 12) outlines four conceptual chunks to explain how the academic scholars or scientists learn and know, which includes concrete connected knowing, reflective observation, abstract analytic knowing, and academic practices. According to Rice, this conceptualisation of scholarly knowing and learning is based on how knowledge is perceived (concrete-abstract) and how knowledge is processed (reflective-active).

Consequently, the knowledge learnt or produced by the academics is generally considered "higher learning" or "higher knowledge". In the traditional Western thinking, according to Freidson (1986, 3), "higher knowledge [as differentiated from lower knowledge] was formalised into theories and other abstractions, on efforts at systematic, reasoned explanation, and on justification of the facts and activities believed to constitute the world." Barnett (1990), one of the leading philosophers and thinkers of modern HE, considered the idea of HE to be rooted deeply in the idea of "higher learning". Similarly, in the ancient Eastern thinking, knowledge obtained by Brahmins or men achieving the Buddhahood (generally through various approaches of intellectual learning or spiritual seeking) are considered a higher level of knowledge and wisdom.

This is one of the reasons why there have been such terms as the "learnt communities" or "the learnt men" used to refer to Western universities or academics as well as Eastern ancient Buddhist universities and knowledge seekers. Eddy and Mitchell (2012, 294) claimed: "… considering faculty members as learners allows for a chance to reinvigorate passion within the professoriate and results in greater contributions to the knowledge base." According to Savin-Baden (2008), in the midst of a complex and changing HE environment, academics need to secure their free learning space, a space where their intellectual capabilities can be activated at the highest level – a space to think, a space to learn and explore knowledge, a space to engage in dialogue beyond egoistic dimensions, and a space to write and construct conceptual frameworks and objects.

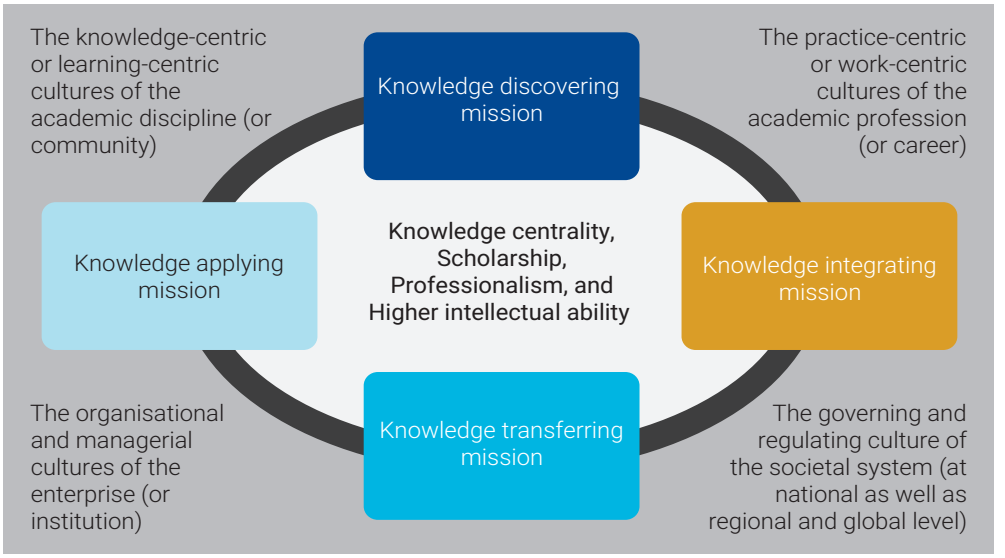
4.6. Synthesis of different dimensions of academic professional identities

Based on the review and discussion of this chapter, we can notice that the extrinsic sources shape and warp the academic profession and give ways to the academic professionals to develop their inner identities. With that said, the extrinsic conditions of academic revolutions, academic cultures, and academic career structures form and reform the academic profession across times and places at a macro level. The intrinsic essences of the academic professional identities are developed in relation to (1) the knowledge-centric nature of the academia, (2) the substances of scholarship, (3) the idea of professionalism, and (4) the higher intellectual ability. These different dimensions and aspects together

construct a comprehensive conceptual framework of dimensions and factors that shape, form, develop, and characterise the academic professional identities (see Figure 4.1). This framework conceptualises the academic professional identities at three levels:

1. ***the cultural level*** – containing the knowledge-centric or learning-centric cultures of the academic discipline (or the academic community); the practice-centric or work-centric cultures of the academic profession (or the academic career); the organisational and managerial cultures of the academic enterprise (or the academic institution); and the governing and regulating cultures of the societal system (at the national and/or the regional and global level). This cultural level is built on the four academic cultures suggested by Burton R. Clark.
2. ***the functional level*** – constituting the different knowledge missions of the academic professions: the knowledge discovering mission (or the scholarship of discovery); the knowledge transmitting mission (or the scholarship of teaching and learning); the knowledge applying mission (or the scholarship of application and engagement); and the knowledge integrating mission (or the scholarship of integration). This functional level is based heavily on the original four types of scholarships suggested by Ernest L. Boyer.
3. ***the essential level*** – constituting the different intrinsic qualities of being an academic professional, which includes knowledge centrality, scholarship, professionalism, and higher intellectual ability. This essential level is built on the various discussions of academic identities and academic professionalism.

Figure 4.1: A comprehensive conceptual framework of academic professional identities



Source: Author's synthesis (influenced largely by Clark's academic cultures and Boyer's scholarships)
Note: Though the figure is presented in a static image, the scope and magnitude of influences of these different aspects on the academic professional identities vary across times and places and should be viewed more as a dynamic of change.

4.7. Developing academic professional identities in Cambodian HE? A quick reflection

4.7.1. Problematising the academic professional identities in Cambodia

As introduced in the beginning of this chapter, a number of policies and previous research discussions signify a need to rethink the academic professional identities of the teaching and/or researching personnel serving at Cambodian HEIs. To rethink and develop the academic professional identities, we in fact need to delve deeply and analyse critically the root causes and contexts that influence the Cambodian academic identities. However, delving deeply and analysing critically are perhaps easier said than done. Doing that may need a whole article or a book on its own. The current chapter may only offer a brief overview and reflection on the Cambodian academic profession, based on the literature review above.

First of all, despite the fact that Cambodian HE has generally developed in a positive way since the 1995 revitalisation – from having nothing in the wake from wars to having certain policies, regulations, plans, institutions, and councils in place, we need to understand and acknowledge that the whole academic profession and academic career environment in Cambodia was and has still been weakened and plagued by a multiplicity of factors. Among those are:

- the mixed blending of foreign HE models and their legacies, including in terms of graduate or advanced education (French, Russian, or Anglo-American models);
- the loss of the educated and intellectual Cambodian between 1975-1979;
- the challenged graduate or advanced education programs as well as the lack of support for post-doctoral years (which is a very important period to prepare early-career academics);
- the undeniably poor academic salaries;
- the lack (or nascent state) of professorship system in HE, perhaps complicated by some conflicts of interest;
- the lack of standardised and performance-based academic performance evaluation and rewards;
- the limitation of academic research tradition, resources, and personnel;
- the research-unfriendly or research-distracting work environment, especially of the outnumbered private HEIs;
- the inactive academic, professional, or faculty development function at HEIs; and
- perhaps the overall limitation of academic, scholarly, scientific, and/or learning cultures.

Besides these more general issues which are also faced by other countries in the region, some Cambodia-specific issues are worth mentioning. The attempts to define the term "academic" conceptually and etymologically are still problematic for laypeople as well as for Cambodian academics. Cambodian HE instructors/lecturers participating in a recent study by Ros, Eam, Heng and Ravy (2020) generally acknowledged the difficulty and complication in trying to conceive and define the term "academic" even though they can share their individual experiences and perceptions. This term is even more complicated and confusing when translated into the Khmer language. The meaning of the term "academic" may carry different meanings from such local Khmer terms as "guru" or "archa", may not be fully equated with the term "intellectual" or "researcher", and is exactly not the same as the term "doctor" or "pundit". The lack of a clear working definition and conceptualisation for each term in both the Cambodian context and the global context leads to an incomplete understanding (if not misunderstanding) of the terms when they are used. Though official titles such as "lecturer", "professor", or "academician" have been currently used in certain Cambodian HEIs to label or rank their academics, to what extent these titles fully reflect the knowledge-centric nature, scholarship, professionalism, and higher intellectual quality of academic works needs more dialogues.

The impact of the lack of a clear understanding and consensus in academic professional identities is not trivial. In the long run, the situation may lead to division and discrimination even among the academics themselves – for example, between Cambodian academics graduating from local universities and those graduating from foreign universities or between those graduating from the Anglo-American model of HEIs and those educated in the Continental model of HEIs. That will further weaken the already limited collectivism and collegiality of the Cambodian academic communities.

4.7.2. Suggestions on how to develop and improve academic professional identities in Cambodia

The understanding of academic professional identities and the promotion of academic profession become highly necessary for Cambodia in the global knowledge economies and societies. This chapter therefore offers a number of broad opinions on how to rethink and develop the academic professional identities at Cambodia HEIs in a more comprehensive way as follows:

1. innovating the knowledge functions of Cambodian HEIs (especially in terms of acquiring knowledge and producing knowledge);
2. providing more supports to develop graduate schools and programs at Cambodian HEIs, paying a special attention to (academic) research education, training and development;
3. enhancing the academic or professional development function at Cambodian HEIs;
4. actuating the roles of independent academic associations and/or professional associations across the countries, making sure that they have adequate resources to preserve, produce, and diffuse knowledge in their areas of expertise;

5. systemically enhancing different aspects of the Cambodian academic career structure (i.e. improving academic recruitment and selection particularly for full-time faculty members, reconsidering their academic ranking and rewards, enhancing their academic and research work conditions);
6. supporting academics to apply their knowledge and expertise beyond their institutional boundaries;
7. continuing to avail and enable different mediums for knowledge exchanges of Cambodian academics (and students) at the regional and international level;
8. revitalising the learning spirit, capability, and habits of the academics (at the early, middle, and late career stages) as well as the students (especially those at graduate/advanced level of education);
9. further advancing research and discourses on the Cambodian academic profession and their identities (both in the ancient time and the present time); and
10. conducting comparative research on structures and cultures of different types of institutions in the Cambodian knowledge sector – HEIs, academies, national institutes, non-governmental research institutes, STI (science, technology and innovation) oriented institutions, vocational or skill training institutions, general schools, and institutions preserving indigenous (religious or cultural) knowledge.

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Chapter 5

A Consideration of Academic Research Education, Training, and Development Model at Cambodian Higher Education Institutions

Eam Phyrom

Abstract

This chapter reviews literature on research education, training, and development (RETD) and draws on the author's own experiences as an early career researcher and research instructor/trainer to consider an academic RETD model for Cambodian higher education institution. The author proposes an academic RETD model that focuses on three integrated domains of research competence: (1) research methodological skillset, (2) organised research-related knowledge-set, and (3) research mindset. This chapter further discusses some research-centric principles that characterise an effective RETD program.

Keywords: Research competence, research capacity, research culture, research education, research training environment

5.1. Significances of research education, training, and development

Research is an important function of higher education institutions (HEIs), especially at the graduate or advanced level of higher education (Clark 1993; 1995). It is engaged by both faculty members and students. Research performance indicators (such as scientific publications, technological patents, and citation counts) determine HEIs' prestige and global standing, their professors' academic ranking, and their students' academic merits. In the emergent global knowledge societies, higher education (HE) policy makers in many countries place research (both academic and non-academic) and research-derived activities (such as application, development, and innovation) high in the list of their priorities.

A growing body of literature has indicated that research is supportive of and connected with other academic or scholarly roles and responsibilities (see, for example, Boyer 1990; Griffiths 2004). First, in HE and advanced education, teaching and research are well connected (Clark 1993; 1995; Arimoto 2006; 2007), and faculty members increasingly find research useful for their teaching (Hargreaves 1996). Second, academics need to engage in continuous professional development, an important part of which is research development (Debowski 2017; Evans, Waring and Christodoulou 2017). Not all universities need to be research-intensive, but they need to develop research knowledge and skills for their academics so that they [the academics] can understand and interpret research results produced elsewhere "for research is at the heart of the modern knowledge-based economy" (Altbach 2004, 29). Finally, other services performed by HE faculty members (e.g. consultancy services, advisory roles for the government, or engagement in knowledge sharing to the public) require a certain level of research evidence to prove the credibility of those services.

Industrial and business employers have also shown interest in increasing research or research-related job positions in their sector, providing more opportunities for research-capable graduate students (Peason and Brew 2002; Cruz-Castro and Sanz-Menendez 2005; Garcia-Quevedo, Mas-Verdu and Polo-Otero 2012). In this sense, research competences are useful beyond the academia. In advanced economies, applied market research and industrial research generate practical knowledge that contributes significantly to product development, high-quality innovation, and sustainable business growth. Japan, for example, has achieved great economic performance due partly to applied technological research projects of its industrial sector which builds a strong linkage with universities (Clark 1995). Likewise, policy research and evaluation as well as practical action research (in certain professional fields such as health science and education) have become a common strategy used by the governmental agencies or the professional work organisations to gather evidence for decision making and to adapt to changes in their domains of work. In the developing world, the governmental, industrial, and commercial sectors have also increased investment in research, development, and innovation in different sectors as they envision a more competitive global economy that requires a stronger base of knowledge and technology.

The explosion of research-based knowledge and the increased need for more research workers in the 21st century revive the quest for high-quality research education, training, and development (RETD). Research training has attracted more attention from both the government and the public (Pearson and Brew 2002, 136). Research training environment is an important factor determining research productivity (Gelso, Mallinckrodt and Judge 1996; Kanh and Gelso 1997). Despite a multiplicity of factors has been detected to have impacts on research performance (e.g. Bland and Ruffin 1992; Ramsden 1994; Eam 2017; 2018; Heng, Hamid and Khan 2020), research training at HEIs and their graduate programs remain a factor of strategic importance (Clark 1993; 1995; Eam 2017) because research training influences research abilities and attitudes in a significant way.

However, RETD at HEIs has been criticised for being inadequate and not enriching in terms of students' experiences and so require new pedagogical and developmental approaches (Boud and Lee 2005; Debowski 2006). How to educate, train, and develop academic researchers with competence and confidence is therefore an important inquiry to pursue, not only for researchers in this field but also for policy makers and academic practitioners. This argument is especially true for HE of developing countries whose academic research cultures and structures are generally curtailed by the lack of resources and traditions and whose graduate or advanced education is less prioritised.

5.2. The need for quality academic RETD at Cambodian HEIs

A number of previous studies on Cambodian research engagement and performance indicate the necessity of research capacity building at Cambodian HEIs (see Eam 2015a; 2015b; 2017; CICP 2016; MoEYS and World Bank 2015; Seng, Carlon and Cross 2020). The evaluation report by MoEYS and World Bank (2015) of Cambodian faculty members who received research grants (between 2010 and 2015) via the Higher Education Quality and Capacity Improvement Program (HEQCIP) pointed to research competence as a major factor, among others, explaining the unsatisfactory achievement of the funded research projects. Only adequately trained and continuously developed academic researchers with an appropriate level of research abilities and research mindsets can produce academic research outputs and sustain their productivity (Eam 2017). Most leading Cambodian researchers with higher research self-efficacy and outputs are generally those obtaining advanced degrees from abroad (Eam 2015a) as they are exposed to a better research and research training environment. Seng, Carlon and Cross (2020) observed the effect of short-term Information and Communication Technology (ICT) training on research self-efficacy of Cambodian undergraduate students. These previous studies to a large extent imply that research RETD is one of the most instrumental strategies to promote research engagement and performance at Cambodian HEIs.

The majority of the Cambodian HEIs have not been identified regionally or globally as leading research institutions. The establishment of centres of excellence is still at the

starting phase. In the 2019-2023 Education Strategic Plan, the government aims to produce three of them by 2023 (MoEYS 2019, 41). Currently, most Cambodian HEIs' graduate programs (which are supposed to be the key player in academic RETD) have been putting more efforts to build a quality research training system. Therefore, a critical consideration of an RETD model to produce Cambodian next-generation academic researchers shall have positive implications for MoEYS in its research promotion endeavour (see MoEYS 2010; 2011; 2012a; 2012b). It should be noted that other sectors and their respective ministries (especially, those whose works are in some ways related to knowledge) have already considered policies and strategies related to research and development, science, technology, or innovation (see MoP 2016; MISTI 2021), and thus a discussion on RETD can also be useful for them.

5.3. The current study

5.3.1. Purpose and conceptual consideration

The main purpose of this chapter is to examine previous research education, training, and development models and identify principles and approaches that allow those models to build research competences in students. In order to begin examining academic RETD, it is necessary to clarify a number of concepts: academic research; research education, training, and development; and research competence.

5.3.1.1. Academic research

Research is quite a broad term and is always conditioned by specific context or specific characteristics of those who try to define it. The Pasteur's Quadrant Model of Scientific Research classifies research based on two attributes: its quest for fundamental understanding and the consideration of its use, resulting in three groups: pure basic research, use-inspired basic research, and pure applied research (Stoke 1997, 73). Similarly, the Frascati Manual 2015 of the Organisation for Economic Co-operation and Development (OECD) offers its own classification of Research and Development (R&D). According to the manual, there are three broad types of R&D activities: basic research, applied research, and experimental development (OECD 2015, 50).

In this chapter, rather than discussing research in general, the author focuses more on academic research at HEIs. The term academic research used in this study is close in meaning to the idea of "basic research" in both the Pasteur's classification of scientific research and the OECD's classification of R&D activities. Sometimes the term "fundamental research" or "theoretical research" are also used to refer to academic research. Academic research is generally conducted at HEIs or academic institutions and aims at advancing knowledge and seeking truth.

Although non-academic research training or development activities outsides of the HE sector are not considered directly in this study, the discussions can be applicable to research works and training at those non-academic organisations to some extent.

Non-academic research can come in many forms – including policy research, industrial R&D, market research, institutional research, or even action research – all are close in meaning to "applied research" and/or "experimental development" in the Pasteur's Quadrant and the Frascati Manual discussed above. These different kinds of non-academic research are generally performed by government agencies, industrial firms, or business enterprises and aim at producing utilisable outputs.

It should be noted that the changing research environment in contemporary HE makes the boundary between the academic research and the non-academic research blur as academics are increasingly encouraged to engage in research that is also useful for policies, relevant to industries, or impactful for the larger society. Universities and academic institutions are also encouraged to link their missions to the non-academic sectors (especially, the government and the industry). Research in different academic disciplines is therefore oriented towards the "use-inspired" principle in different ways and to different extents, sometimes requiring inter- or multi-disciplinary approaches to achieve the research purpose.

5.3.1.2. Research education, training, and development

There is a clear lack of strong public discourses on the pedagogy of research education (Boud and Lee 2005, 502). The lack of a conceptual framework for research education or training makes it hard to identify appropriate priorities, strategies, and responsibilities for different research training stakeholders (Pearson and Brew 2002, 137).

So far, research education, research training, and research development are terms that have not been clearly distinguished. Based in the Australian HE context, Boud and Lee (2005) differentiated between research education and research training. Boud and Lee (2005, 502) claimed that the discourse of research education is based on the view that sees post-graduate research having the educational or learning nature, while the discourse of research training is based on the view from the government that sees post-graduate research as a medium for practical skill training and so the production of skilled researchers (see also Kemp 1999). The author of this chapter hence prefers to use both terms together – i.e. research education and training.

Along with the discourses of research education and training, there has been an emerging discourse of research development. Evans (2011, 82) defined research development as "the process whereby people's capacity and willingness to carry out the research components of their work or studies may be considered to be enhanced, with a degree of permanence that exceeds transitoriness." In this sense, research development can be considered an extended part of research education and training. Debowski (2006; 2017) further coined the idea "scholarship of research development" to extend the inquiries, applications, and reflections on how to develop research knowledge, skills, or abilities of researchers or research students at HEIs, which adds more substances to the emerging area of research development in the larger field of HE and academic development.

Thus, academic research education, training, and development (RETD) is used together in this chapter to refer to the whole process of educating, training, and developing academic researchers and research students in HE and/or advanced education context. As done in other subjects or professions, the education, training, and development of academic researchers require a clear body of knowledge; guiding educational policies and curriculum; textbooks and learning materials; defined teaching and learning approaches; supervising and mentoring approaches; assessment methods; evaluation tools. The discussion of RETD in this chapter will cover some of these educational aspects.

5.3.1.3. Research competence

Different disciplines have different rules and methods to define research competence. Previous studies in the field of psychology prefer to use the concept of research self-efficacy as a proxy measure of research competence (e.g. Krebs, Smither and Hurley 1991; Gelso, Mallinckrodt and Judge 1996; Kanh and Gelso 1997). Research self-efficacy (or sometimes referred to as research confidence) is generally conceived as a belief in one's ability to perform research tasks and measured by self-rated psychometric scales (Phillips and Russel 1994; Brancolini and Kennedy 2017).

Based on the so-called "competence goals" perspective, a recently published work by Wessels, Gess and Deicke (2019, 60-61) defined the concept of competences/competencies as "context-specific cognitive dispositions relating to performance". With such a conception of competences/competencies, the authors (2019, 60-61) further suggested two approaches "to modelling research competence": (1) receptive research competence *(which was referred to as engagement with research by Borg (2010))*, and (2) generative research competence *(which was referred to as engagement in research by Borg (2010))*.

According to the authors, for the receptive research competence, the required skills include information literacy, statistical literacy, and critical thinking. In this sense, the receptive research competence is similar to the idea of research literacy. According to Ophoff, Schladitz, Leuders. J., Leuders. T. and Wirtz (2015), research literacy should constitute information literacy, statistical literacy, and evidence-based reasoning. And, for the generative research competences, the required skills are based on cognitive, affective-motivational, and social facets:

- Cognitive facet:
    - For social sciences, the cognitive facet includes research process knowledge, research methodological knowledge, and research methodical knowledge.
    - For natural sciences, the cognitive facet includes formulation of research questions, development of hypotheses, planning of data collection, and analysis and interpretation of data;

- Affective-motivational facet: including research related self-efficacy, research interest, and uncertainty tolerance; and
- Social facet: including relationship within the team and with the supervisor, relationship in the field, and relationship within the scientific community.

Besides these receptive and generative research competences, the authors further view other three competence goals (Wessels, Gess and Deicke 2019, 60), which include:

- Researchers' mindset,
- Metacognitive competencies, and
- Discipline- and theme-specific goals.

Based on these discussions, the concept of competence is not merely a "belief" which is used to define research self-efficacy, nor is it a mere "understanding" of a number of skills (as defined in research literacy). Rather, competence, an individual's psychological character, is (of people) having the necessary ability, authority, skills, and knowledge (Zhao 2014, 168). Competence generally indicates a comprehensive and concrete set of ability that constitutes knowledge, skills, abilities, and authorities on a certain field of study or profession which allow a person to ideate, plan, implement, reflect, improve, and solve problems of an educational or professional task or project. In this chapter, therefore, academic research competence refers to a systemic and observable set of knowledge, skills, abilities, and authorities to behaviourally perform an academic research study or project independently, professionally, and effectively. (Unlike some previous studies, this chapter does not delve into the differences between competences and competencies).

5.3.2. Methodological considerations

The composition of this chapter is based on literature review and reflective practices of the author on his own experiences as an early-career researcher and research instructor/trainer. The author conducted a literature review of selected academic studies and practical documents related to the following themes: research education, research training, research development, research-based learning (RBL), research training systems, research training environment, scholarship of research development, and research competences.

The purpose of the review is to synthesise key themes and best practices of RETD programs. The review method is more narrative than systematic. Most review methods – be it narrative or systematic, comprehensive or selective, exploratory or confirmatory – to some extent stands on the principle of hermeneutics and interpretivism, which means that the reviewer depends largely on textual information to construct meaning. This principle applies to this study.

The researcher also partly employed reflective practices based on his own educational and professional experiences with academic and policy research between 2011 and 2021 – from being a research student in an academic program in Japan between 2011 and 2017 to becoming early-career researcher, research instructor/trainer, or research consultant at different institutions in Cambodia since 2017. The experience-based reflection shall add some practical perspectives on academic RETD at Cambodian HE.

Hence, this chapter does not claim the use of scientific or systematic approach to research. Despite subjectivity and potential biases, the use of reflective practices generally enriches the interpretation of the textual information and constructs more meaningful lessons. Creative reflective methods, closely related to action research approaches, have been proven useful for psychological and educational research, especially for those researchers who are also a practitioner of their field (see, for example, Del Carlo, Hinkhouse and Isbell 2010; Thomas 2013).

5.4. RETD models that build academic research competence

5.4.1. Various RETD traditions and models

A number of previous studies offer some frameworks to consider the development of RETD programs. Among them are research training models in diffrent disciplines; research traditions in different countries; and practical models used specifically at particular HEIs.

5.4.1.1. The Scientist-Practitioner Model in the field of psychology

The Scientist-Practitioner Model, or the Boulder Model, is a well-known training model of graduate students in the field of psychology (e.g. Shapiro 2002; Chwalisz 2003; Jone and Mihr 2007). The discussion of the Boulder Model has been done in relation to Research Training Environment (RTE) studies (e.g. Gelso, Mallinckrodt and Judge 1996; Kanh and Gelso 1997; Krebs, Smither and Hurley 1991; Abrams, Patchan and Boat 2003; Gelso 2006; Brancolini and Kennedy 2017). For some researchers, this model is an ideal for research training in psychology. Despite some criticisms, this model has been applied and proven effective in improving research methodological knowledge, building theoretical and conceptual knowledge of the trainees, and enhancing practical application skills in performing specific research work procedures and tasks.

What makes the Boulder model significant and applicable is its integrated nature. According to Overholser (2007), the central uniqueness of the Boulder model is its attempt to integrate the world of science and the world of practice. However, that is also the central point of problem because it is uneasy to make sure such integration is really functional. Gelso (2006, 6) therefore suggested six factors to determine the success of the Boulder model in training researchers:

- Faculty model appropriate scientific behaviour and attitudes;
- Scientific activity is positively reinforced in the environment, both formally and informally;
- Students are involved in research early in their training and in a minimally threatening way;
- It is emphasised during training that all research studies are limited and flawed in one way or another;
- Varied approaches to research are taught and valued; and
- Students are shown how science and practice can be combined.

5.4.1.2. Research training traditions and models in different countries

German research training during the graduate or advanced education level of education has long enjoyed a global leading status (Clark 1993; 1995). Clark (1995) called the German research and advanced education system the "Institute University", which is built on the Humboldtian ideal of university, emphasising the teaching-research-study nexus and characterised by such well-known organisational tools as "seminar" and "laboratory", adapted by many countries around the world. These organisational forms and practices provide a space for inquiries, experimentation, dialogues, and co-construction of knowledge to supervisors and graduate students alike.

Recently, more innovative programs have been introduced in Germany in response to the growing impact of American graduate school model internationally and the rapid increase in research outputs of HEIs in other parts of the world. The Research Training Groups (RTGs), for example, are introduced to fix some gaps in the traditional system of German research training (Kottmann 2015). What differentiates between the RTGs and the traditional German model of research training is the introduction of internationality, interdisciplinarity, innovative supervision, and speed in program completion. To explain, RTGs aim to make doctoral research training more structured and systematised, create more collaborative and interdisciplinary research projects, allow more constant exchanges among researchers, and establish transparent conditions for selection and supervision (Kottmann 2015, 30).

Furthermore, a series of emerging research studies by German (as well as British and Australian) researchers have also introduced themes such as research-based learning, inquiry-based learning, research development, and scholarship of researcher development (e.g. Borg 2001; 2010; Debowski 2006; Evans 2011; 2012; Murray and Cunningham 2011; Deicke, Gess and Rueß 2014; Evans, Waring and Christodoulou 2017; Gess, Wessels and Blomeke 2017; Wessels, Gess and Deicke 2019). All of these provide comprehensive conceptual frameworks for development of social scientific research competencies (Gess, Wessels and Blomeke 2017) and for designing teaching and learning approaches for RETD programs based on research and inquiry in Germany and in other parts of the world.

In the context of Australia, Willison and O'Regan (2007) and Willison, O'Regan and Kunh (2018) introduced the Research Skill Development (RSD) model. The model claims that students actually perform research when they can spiral through different activities. This spiral model incorporates such skills as embarking and clarifying knowledge; finding and generating data and information; evaluating and reflecting on the quality and credibility of the data; organising and managing information and data; analysing and synthesizing information and knowledge; and communicating and applying research process and results. According to this RSD model, achieving research competences depends on the level of students' autonomy in engaging in research – from prescribed to open research.

In the United Kingdom (UK), its traditional research and advanced education are characterised by a very small body of students, a residential way of life, and the very practice of tutorship (Clark 1995). As the system of HE in the UK has expanded, so much changes on RETD have been made recently. The well-referred Vitae's Researcher Development Framework (RDF), for instance, has been created a decade ago as a holistic framework to support and develop academic researcher, especially those at the graduate education level. This framework was developed along with the UK's attempts to promote research capability and excellence of its HEIs through the Research Assessment Exercises (RAE) (see RAE 2008) and the Research Excellence Framework (REF) policies (see REF 2021) in response to the European HE agenda driven by the Bologna Declaration and the Lisbon Strategies. The Vitae framework constitutes four backbone domains (see Vitae 2010):

- Domain A: Knowledge and Intellectual Abilities;
- Domain B: Personal Effectiveness;
- Domain C: Research Governance and Organisation; and
- Domain D: Engagement, Influence, and Impact.

Each domain further contains specific components and sub-components. The RDF comprehensively considers multiple dimensions that can improve not only academic research competences but also professional or practical research skills. Given its well-thought substances of research competences, the Vitae's RDF has increasingly become a research topic explored, tested, and investigated by academic researchers.

In the United States (US), research training can be as diverse as its HEIs and is designed for a mass, market-driven HE system. Clark (1995) noted that the US research training is centered at the graduate school or graduate department whose programs are organised in a way that well balances between the research component and the teaching and learning component. Besides the well-adopted graduate school tradition and model (Clark 1993; 1995), other models have been created.

The AP research training program, for example, has recently been developed (College Board 2020) for students in general. The program constitutes two courses: the

theoretical AP research and the practical AP seminar. The two courses aim to make students master skills such as reading and analysing academic texts; gathering information; making arguments; analysing data; writing articles; presenting findings; and most importantly conducting a research study independently. The AP research training program is composed of five big guiding themes, which include: 1) Question and Explore; 2) Understand and Analyse; 3) Evaluate Multiple Perspectives; 4) Synthesise Ideas; and 5) Team, Transform, and Transmit. These major themes are central to the whole mechanism of design and development of curriculum, materials, teaching, learning, assessing, and evaluating approaches to train researchers. The AP program tends to divide research competences between the more generic and the more specific kind of competences and seemingly tries to balance between the theoretical knowledge based in the academic setting and the practical skills that may be useful in the working context. Like other models, the AP program is comprehensive in terms of the focused research competence areas as well as integrated in how the different training topics connect with each other, how the theories and practices are linked together, and how the integrity among cognitive, affective, and behavioral dimensions of a researcher is well developed.

5.4.1.3. Practical models of RETD at HEIs

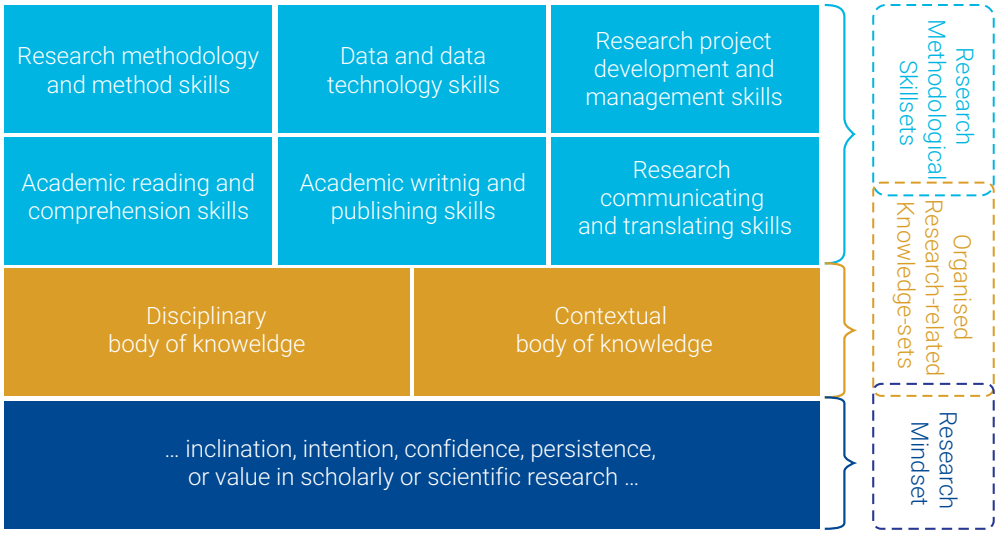
An HEI providing advanced education may develop its own RETD model which is unique and practical for its own context. A model called Researching Professional Development Framework (RPDF), for instance, has been developed and shared recently by Lakeside University (Lyndsay and Floyd 2019). This model sets up three dimensions: (1) Developing ways of thinking, (2) Working as a researcher, and (3) Moving on with your research. In the "Developing ways of thinking" dimension, this practical research training program aims at building students' competence to reflect on and understand theory and practices, develop their research identity, and build their resilience. In the "Working as a researcher" dimension, the purpose is to build supportive relationships, develop research study skills, and blend theory and practices in real actions. In the "Moving on with your research" dimension, the missions are to disseminate research results, contribute to making a difference, and engage with new opportunities.

Similar to the Lakeside University, different universities in other parts of the world have developed and innovated their traditional research training programs and approaches. La Trobe University has developed its Research Education and Development (RED) program, and similarly University of Technology Sydney (UTS) has built its Research Education and Development (REaD) program. At the office of research of Griffith University, there is the so-called Researcher Education and Development team. These programs are somehow contextual and not designed in silo from the reality of these universities' conditions. These various programs generally implicate the necessity of contextualisation and whole-institution support of RETD activities at HEIs.

5.4.2. Conceptualisation of a comprehensive and integrated RETD model

Based on earlier discussions, a graduate (or undergraduate) program providing only few courses on research methodologies does not make students become fully competent in research. A more comprehensive and integrated RETD model is needed. Such model needs to ensure that research methodological skillsets, organised research-related knowledge-sets, and research mindsets are covered and entwined together. These three domains further derive nine sub-domains (see Figure 5.1), including (1) the ability to comprehend diverse types of research methodologies and methods, (2) the ability to use different types of data and data technologies, (3) the ability to use research project management and development tools and techniques, (4) the ability to read and comprehend academic research materials, (5) the ability to write and publish academic research outputs, (6) the ability to perform research communication and/or translation works, (7) the ability to master the disciplinary (and/or professional) body of knowledge of a focused research area, (8) the ability to master the contextual body of knowledge of the focused research topic, and (9) the demonstration of a positive scholarly or scientific research mindset.

Figure 5.1: A comprehensive and integrated framework of academic research competence



Source: Author

5.4.2.1. Research methodology and method skills

Research methodology and method skills are used here to cover research philosophical paradigms (both the more natural science-oriented paradigm and the more humanity-oriented paradigm) and research operational dimension (including research approaches, research designs, research methods, and/or research tools). Research methodology and method skills are a key competence area compulsory for students who want to pursue a career as a researcher or work in the academic setting. In other

words, it is impossible to become a researcher without having adequate knowledge and skills of research methodology and methods.

Though academic researchers may be specialised in just one particular research approach, understanding or being aware of other research approaches are essential in order for them to engage in scholarly, scientific, and professional debates or discussions in a meaningful, ethical, and open-minded manner. The inability to understand the variation in research philosophical paradigms, approaches, designs, and methods of different disciplines is a big challenge for inexperienced undergraduate or graduate students wanting to pursue a research area. For a master's degree program in information technology, for example, the students generally engage in a very practical kind of research, which is not purely scholarly research but a form of information technology project development. For a master's degree program in Khmer studies, on the other hand, the students are required to write their thesis in a very scholarly (and literary) style as they, for example, analyse a particular novel. If these two researchers are asked to explain their research approaches, designs, or methods, they will not share the same (or even similar) ways of thinking and reasoning because the philosophical paradigms underlying what they do are different. That is why it is vital for researchers to continute learning the different paradigms, approaches, designs, and methods, especially in the context of collaborative multidisciplinary and interdisciplinary research projects, in order to avoid falling into a situation of being "methodologically ignorant".

To extend the explanation, it should be noted that research approaches in social science fields are generally agreed to have three or four major orientations (i.e. quantitative approach, qualitative approach, mixed-methods approach, and/or action research approach (which is sometimes considered part of the qualitative approach)). Each orientation has different research designs; for example, in the quantitative approach, there are experimental and non-experimental research designs. These different approaches and designs are rooted in different epistemological, ontological, methodological, and axiological paradigms of philosophy. Until one can understand or define what true knowledge is (epistemology), whether an object exists in reality (ontology), how to prove that a piece of knowledge is true or an object is real (methodology), and whether there is value attached to how one considers knowledge or existence (axiology), one cannot really engage at the most advanced level of research and inquiry – i.e. the level whereby the evaluation of knowledge or truth derived from research can be made.

Built on or attached to the different designs, approaches, and philosophical paradigms, the research methods in the social science fields are observable through behavioural action, performance, or operation of research works and procedures. For example, the use of questionnaires is a data collection method. Likewise, the use of linear regression to predict an outcome variable is an analytic method. So, in the field of social science, students need to understand and master a number of methods, designs, approaches, as well as the philosophical foundation in order to be considered competent in research methodology. This brief exemplary explanation of these research methodology and

method skills in the field of social science does not apply to other disciplines such as natural science (e.g. physics) or formal science (e.g. mathematics).

In the practice of RETD, students are generally guided to focus on only a number of specific methods or techniques necessary to conduct their research project (such as a thesis or a research report), not on the philosophical paradigm guiding research or other approaches of research not relevant to their project at hand. Although some knowledge and know-hows of methods are enough for such assignment, for students to master research methodology and method skills and become a competent academic researcher, a strong philosophical foundation and a dimensional way of comprehending research are needed. Students therefore need to spend a serious amount of time reading and thinking through research methodology texts and/or discussing with academic supervisors and colleagues.

5.4.2.2. Data and data technology skills

Data (and information) are the core life energy (or the currency) of research because they are the building blocks for formulating and creating knowledge, especially scientific knowledge. Not knowing how to locate, gather, generate, manage, analyse, and interpret data, one cannot become a researcher regardless of the type of research one conducts. Although the data and data technology skills can be considered part of the research methodology and methods skills (discussed earlier), the data and data technology skills are far more easily updated or changed than are other aspects of research methodologies and methods. Working with data also takes the majority of the time of a researcher or his/her team's time. Thus, the data and data technology skills should be one of the separate key areas of research competence on its own.

Clearly, research is a profession that requires a lot of data and data technology related skills and experiences. Staying informed about new data technologies is necessary for researchers because a disruptive data technology can tremendously change the whole research work process and production system and allow the researchers to stay on top of the field. Training on data and data technology skills shall cover various topics such as different types of data, data collection planning, data collection, data cleansing, data storage and management, data analyses and interpretation, and different technological tools to support working with data at different research stages.

Advanced and/or users-friendly technologies in the form of digital software applications in the market are always updated. In the research field of social science, for example, data technologies used by different researchers and research institutions have been diverse and changing – from using data-planning software such as CSPro or certain computer-assisted applications to using online data planning and collection platforms such as Google Form, SurveyMonkey, or Qualtrics; from using Microsoft Excel, SPSS, or JASP to using more programmable computer languages such as Stata, Python,

and R (especially, for more complex quantitative data analyses); from using Microsoft Excel to using Power BI or Tableau for data visualisation; from manual references in word-processing software to using specialised referencing software such as Endnote, Zotero, or Mendeley; and from using Microsoft Word or Excel to using Computer Assisted Qualitative Data Analysis Software (CAQDAS) (such as Nvivo, MAXQDA, ATLAS.ti, or Delve) for qualitative data analyses. To engage in a constantly creative and innovative profession as a researcher, one needs to be aware of knowledge, skills, and technologies related to data, which used to be understood only by specialised computer scientists, information technologists, or statisticians. Although a researcher may not perform the analyses him/herself, some knowledge and skills are important in order for him/her to work in the same team with the statisticians, computer scientists, or data scientists or when s/he needs to change to a new workplace and works with a new team and/or a new technology platform.

5.4.2.3. Research project development and management skills

In the real world of work, research needs to be operated as a project, which means that project development and management skills (i.e. initiating of project idea, planning, design, development, operation, monitoring, evaluation, and closure) are needed for implementing and performing research works. Thus, students in an RETD program are supposed to master project skills to a certain extent.

However, in most research training courses at universities, project development and management skills in general, and research project development and management skills in particular, are not officially trained. That is contrasting with the requirements at workplace. At a workplace, researchers are strongly required to understand and be able to perform activities related to project development and management at least at the basic level. Those skills need to be developed and upgraded subsequently at workplace when the size or the level of complexity of the project becomes larger.

Skills such as research project initiation, project planning, project costing, and project monitoring and evaluation are highly needed for principal investigators (PI) or research managers (or leaders). In practice, researchers and research managers work in team and so have to involve a lot in institutional, managerial, administrative, logistic, financial, and coordinating works. It is the ability to see the whole project from its start to its potential end that allows leaders, managers, and members of a research project team to function collectively and efficiently. Intensive training on research project development and management shall cover various themes such as research conceptualisation, research proposal development, fund-raising and financing sources for a research project, project planning, project costing and financial management, project coordination, project monitoring, project evaluation, and the uses of technology to support the management and coordination of research projects.

5.4.2.4. Academic reading and comprehension skills

Generally, students with little exposure to reading cultures from a young age are not likely to perform well in research-oriented graduate (or undergraduate) programs at HE. Even for students who are general readers, the academic and scientific texts can be hard for them to understand. Reading academic texts may not be the same as reading news or novels because the approaches and styles of writing employed by the academic writers and those by the journalists or novelists are different in many ways.

Academic and scientific reading involves a lot of high-level intellectual activities such as analytical thinking, synthesizing, critical and evaluative thinking, and reflective thinking. These high-level intellectual activities exercised during academic reading are necessary for researchers and students to recognise, memorise, understand, and realise research concepts, theories, themes, arguments, or literature gaps. Mastering a body of academic research literature (and relevant facts, information, and knowledge) require serious component skills of critical reading; comprehending; intellectual mapping and organising; conceptualising; and/or synthesizing materials written in the academic and scientific languages and styles. These are in fact prerequisite skills to start traversing the research path for graduate (or undergraduate) students. For experienced and professional researchers, these skills allow them to increase the speed and volume of reading.

In fact, academic reading in a scholarly and scientific context is closely related to academic writing, debating, or dialoguing. Many people cannot engage in academic debate or dialogue because they do not adequately read and master the necessary facts, frameworks, opinions, and insights available only through academic texts. How the academic researchers communicate (in either written or spoken medium) is done at a highly technical, formal, rational, and ethical level, which is not fully practiced in other forms of writing or speaking.

The inability to read and understand academic texts suggests that a student is unlikely to master the body of knowledge in a research area, and so s/he cannot write critically and become successful in an academic career or a research career. Therefore, the skills of academic reading and comprehension need to be well developed for students and researchers. In terms of training, whether to start from basic reading skills and academic reading skills, or from critical thinking and critical reading skills, depends largely on the real conditions of the students (especially, their existing knowledge of and attitudes towards reading).

5.4.2.5. Academic writing and publication skills

For research-based knowledge to ensure its validity, reliability, and quality, it has to be expressed through writing (critical or constructive, depending on the kind of knowledge to be communicated by the author) and peer-reviewed academic publications. Scholarly and scientific writing is an independent set of skills that is core and cannot be detached

from an education and training program to build academic research competence. Most of the time, researchers can clearly understand their research only at this stage of writing as they try to express their ideas or explain their findings through written words. To write properly, scholars and scientists need to understand academic terms and concepts, academic writing styles and mechanics, and structures and elements of an academic article (and its variants applied in different research fields or different research approaches).

Academic writing is not an easy task for inexperienced researchers and experienced researchers alike. It takes a great amount of time to publish an academic article or an academic book. The whole writing process has to go through multiple stages: thinking, writing, rewriting, editing, reviewing, and revising. The process is not simply linear but iterative, requiring the writer to switch between working with data and literature and working on the manuscript again and again. Academic writing requires scientific criticality and meticulous works as well as constructive creativity and a clear sense of direction. Checking if a particular concept is appropriately defined or whether a particular quotation is properly cited are tasks that all critical researchers need to engage in when writing, even though these works can sometimes be tedious. Academic writing requires researchers to make clear and convincing arguments or decisions; otherwise, their manuscripts do not pass through the peer-reviewing process. As a result, writing may raise researchers up to the top or bring them down to the bottom of their field of research, based on the quality of the contents produced. Something that has been academically published is subject to being accessed, scrutinised, and evaluated by other researchers, from within or outside of their field, at the same generation or from the next generation.

That is why academic writing requires adequate training and experience and is highly intertwined with academic reading and thinking. In an RETD program, whether to train basic writing skills and academic and scientific writing or to train critical thinking and critical writing to students depends on their prior knowledge and their conditions.

5.4.2.6. Research communicating and translating skills

For scholarly and scientific research to be impactful, researchers need skills to communicate the research results and to further translate the research results into actual application, development, or innovation. Otherwise, academic research knowledge (or the Mode 1 knowledge) is not very useful for milieus outside of the academia. Academic research is no longer an isolated work done by scholars or scientists in their ivory towers. Use-inspired academic research results have been influenced by the utilitarian and pragmatic thinking in certain ways. In other words, research results need to have real-world significance and be useful not only in academic but also professional, policy, and practical contexts.

In order to ensure such impacts, researchers need to have the ability to communicate their research findings or to translate their academic or scientific research outputs into usable tools, innovative systems, or certain forms of applications and developments. Research students and researchers alike are increasingly required to engage in such use-inspired basic research and to present and share their research results to peers or to the public. Researchers, for example, need to understand how to synthesise, summarise, and visualise their research outputs in the form of policy brief, research-based news articles, infographics (for sharing on social media platforms), quick video summaries of research findings, policy dialogues, evidence-based manuals, patent filing, research digest intended for the public (for example, at a science café), etc.

These skills are generally not taught adequately during doctoral programs or in other academic settings. Thus, communicating and translating research works should be part of a comprehensive RETD program and may focus on such skills as presentation skills, explanation skills, debating and defending skills, strategic communication skills, entrepreneurial skills and attitudes, event organisation skills, and organisational and institutional development skills. Currently, research communication and translation of knowledge are guided by areas related to science popularisation as well as science communication, the principles of which are to make research results more accessible to public audiences and policy makers and practitioners.

5.4.2.7. Disciplinary body of knowledge

Students of RETD programs need to master the body of disciplinary (or professional) knowledge of a specific academic research area. If their academic knowledge components are not well-organised, it is likely that they will face multiple difficulties and chaotic situations in conducting their academic research studies. Academic research studies are always situated into, or referenced to, well-established and existing literature. To argue that there is a certain research problem and that it is an academically researchable problem, an adequate amount of evidence and justification is needed, along with an appropriate discussion of the existing gaps or controversies in the whole landscape of the literature of that particular research area.

Scholarly and scientific knowledge is generally dissected into at least four major disciplines (the natural discipline with subjects such as physics and biology, the formal discipline with subjects such as mathematics and computing, the social discipline with subjects such as politics and economics, and the humanistic and artistic discipline with subjects such as philosophy and history). From a methodological point of view, some of these disciplines are more scholarly (as they do not fully depend on scientific methods); some are more scientific (as they draw on purely scientific methods). Those disciplines are further divided into research fields – for example, in physics there are research fields related to quantum mechanics or general relativity theories; in mathematics there are fields related to number theories or those related to set theories; in economics research fields may include financial economics or industrial economics; in philosophy

researchers may be interested to explore the field of epistemology if they are interested in knowledge in general, or the field of ethics if they are interested in morality issues. Each field has multiple research areas, and each area has multiple themes/topics to research. For each research theme/topic, researchers can pose multiple research questions or research (hypo)thesis to guide their investigation.

Therefore, to master the component knowledge-set in a disciplinary field of expertise in an organised way, an RETD program needs to at least ensure that students:

- recognise and understand key themes, topics, concepts, and theories created by previous researchers;
- recognise and understand key research approaches, methods, tools, and techniques used by previous researchers;
- recognise leading scholars in the field or the area of research, their works, and their key theories or arguments;
- be able to perform different approaches of literature review (from a non-systematic to a more systematic approach);
- be able to analyse, criticise, or evaluate an existing body of academic or relevant knowledge and be able to identify gaps or controversies with appropriate reasoning and justification; and
- be able to synthesise, integrate, or re-construct the reviewed knowledge.

5.4.2.8. Contextual body of knowledge

While scholarly or scientific research in principle seeks to understand generalisable truths expressed as theories, most research results, in practice, end up finding only conditional truths. Conditional truths here refer to the truths that are conditioned by contexts, situations, assumptions, biases, and/or other unexplored factors. The contextual knowledge of the topic being researched is therefore very important for researchers and students in their research conducts. Such contextual knowledge is highly relevant in fields related to social sciences and humanities because studying concepts such as culture, art, religious practices, national politics, education system, economy of an institution, or perception of people requires an open mind to accept subjectivity, social construction, and local interpretation.

Explicit and tacit knowledge and information related to a research topic of the context being studied (i.e. knowledge from policy, market, industry, region, nation, institution, workplace, or field) need to be well understood along with the existing body of academic (or professional) knowledge. Even if a researcher has the necessary level of skills in methodology and demonstrates mastery of knowledge in their academic field of expertise, it does not guarantee that they can successfully conduct a research study in any national or sub-national context if they do not adequately understand the practical and local body of knowledge and know-hows.

To grasp the practical knowledge and know-hows in a particular context or situation of research, students in the RETD program should be guided to:

- access, collect, and read reliable and valid policy-related, media-generated, or practice-based documents on the specific research area or topic being explored;
- engage (as an observer or participant) in real works of the research area or topic being explored with a professional team that is working in that area or topic;
- discuss or consult specialists, professionals, experts, or seniors who have many years of experiences researching or working in that particular context; and
- continue enhancing networks and sharing knowledge with the local practitioners or stakeholders in order to receive feedback and validate their [the students'] understanding.

5.4.2.9. Research mindset and/or mindedness

It can be hard to exactly define research mindset and/or mindedness. The concept can be as important as (or even more important than) the relevant knowledge-set or the research methodological and methodical skillset. Eam (2017) suggested that research mindset is an important explaining factor on why a small number of researchers in the resources-truncated Cambodian HEIs continue producing research outputs. Wessels, Gess and Deicke (2019, 61) recently suggested that a researcher's mindset covers reflective distance (habitual behaviour, theoretical understanding, reflection of one's experiences, and critical reflection); epistemic curiosity (interest-type and deprivation-type); and epistemological beliefs (beliefs on the structure of scientific knowledge and the origin of scientific knowledge). Evans, Waring and Christodoulou (2017) similarly asserted that the research training process shall ensure a greater self-awareness of the students' own conceptions of research and supervisory practice or an understanding of what constitutes a productive research learning environment.

Researchers have still worked on the definitions and scope of the construct "research mindset" or "research mindedness". In this study, the research mindset can be thought of as the abstract qualities of the mind of the researchers or students with regards to research, shaped by identities and experiences with scholarship, science, and professional research practices. The mindset and/or mindedness for research can broadly constitute mental inclination and habitus expressed in attitudes, affections, intention, interest, or disposition towards research. Research mindset and/or mindedness is not about overt research practices, but more about the intrinsic qualities or inner essences of the researchers.

The development of research mindset and/or mindedness is foundational in making students perform reliable, high-quality, and professional research activities and so stay in the academia or the research profession in the long run. Educating, training, and developing academic researchers in a way that ensures they embrace scholarly, scientific, and professional research values and continuously aim for a high level of

research quality will help keep the researchers motivated, satisfied, and dignified and not getting lost in their research world. When students or researchers are allowed to engage in a research area of interest to them and ensured that they have the capability and time to learn, they will progressively develop a sharper intention and will to further engage in the research activities and passionately disposition themselves as an expert researcher in that area. Having a research mindset and/or mindedness is different from merely wanting to do research or valuing research in a superficial way. The latter does not generally help the researchers stay motivated in the long run.

Scholarly, scientific, and professional research mindset and/or mindedness can be observed in researchers with some of the following tendencies:

- embracing truth as the core principle of research and allowing it to rule and guide research conducts;
- using reliable information and data as evidence and reason for arguments;
- acknowledging that scientific concepts and notions, theoretical or conceptual frameworks, and philosophical inquiries are necessary for the pursuit of scholarly and scientific knowledge and to solve problems;
- being ethical and full of integrity in planning a study, conducting the study, analysing data, and reporting results;
- being clear in expressing ideas and making arguments or claims;
- being open, fair, and just for different opinions and critiques from experts in the same field or from other fields;
- understanding that research (even the scientific research) is limited in some ways, and the process of research conducts is far from being simple and smooth; and
- showing interest in exploring things, learning relevant knowledge and skills, or collaborating with others in order to uncover truths about research topics or themes being studied.

5.4.3. Research-centric approaches of RETD model

The comprehensive and integrated thematic research competence areas (discussed above), if to be developed into an actual RETD program at HEIs, require the program designers and developers to adopt the principle of research-centrality or inquiry-centrality. Applying the research-centrality approach in the Cambodian context of HE or graduate education further requires existing programs that remain teaching-centric (and have research only as an add-on entity) to re-design their structures and practices in certain ways. This is not a mere change in overt practices but a shift in paradigm, comparable to the change from the teacher-centred approaches to the students-centred approaches of education in the 20th century. In Cambodia, this paradigm shift can establish a differentiated graduate school model and an advanced educational

culture that uses research to promote research, which may not have been well developed in Cambodia since its HE revival after the collapse of Khmer Rouge in 1979.

As discussed above, the model that is originally research-centric at HE is the German Humboldtian model, developed around 1810, which has impacted HE systems all over the world. Throughout the 20th and into the 21st century, this idea of research-centrality or inquiry-centrality has been, and will be, key to HEIs that sincerely attempt to promote research cultures, capacities, and excellence, especially in a social and educational context with very limited traditions of scholarly and scientific research. Although the research-oriented Humboldtian model was not successful until the 20th century (Pasternack 2019, 19), in the 21st century achieving the research-centric or inquiry-centric model in practice can be faster and more likely because (1) abundant research resources are now openly available for uses, (2) practical understanding on inquiry-based methods, scientific methods, or research methods have been accumulated, (3) advanced research-related technologies are available, and (4) the movement towards the global knowledge economies and societies provides more spaces and freedom for research-, data-, information-, and knowledge-related workers.

It is beyond the scope of this chapter to discuss in detail the program development, program organisation, instructional methods, assessment and evaluation standards, supervisory and mentoring models, and/or institutional support to design and develop a research-centric RETD program. Still, based on the review of the literature, we can notice a number of core principles of the RETD program that are of research-centric or inquiry-centric nature.

5.4.3.1. The research-centric approach promotes researching-learning-teaching-developing nexus.

A research-centric program should be based on, or aim to, promote the nexus among teaching, learning, researching, and developing activities. Built on Burton R. Clark's discourse of teaching-research-study nexus, Arimoto (2006; 2007) projected that the future model of university in the knowledge society needs to realise the link among teaching, learning/study, and research. Pasternack (2019, 25) referred to the teaching-research nexuses as part of the necessary tensions or paradoxes in HE which happen along other tensions (for example, between theory and practice, between academic freedom and social responsibility, or between natural sciences and liberal arts) and should be bridged and balanced. In fact, unlike the school education at the lower level which focuses more on imparting the secured knowledge, the idea of university education or advanced education has always been research-related, allowing its students to thoroughly examine existing knowledge, reflect critically into how knowledge is created or applied, ideate independently, and have freedom to inquire into the depth or width of knowledge objects of their interest. That is not to say that university education or advanced education should not focus on teaching at all, but that its teaching functions should be operated in relation to research in some ways – i.e. research-related, research-based, research-led, and/or research-oriented teaching and learning.

To connect among teaching, learning, research, and/or development, an RETD program may consider various inter-dependent activities. Pasternack (2019, 24) noted that the inquiry-based learning – which allows research to connect with teaching and learning at HE – has been observed empirically to include, for example, teaching research projects, research workshops, research seminars, project modules, case studies, practice projects, intervention projects, action research or practice research, and even service learning. Which set of activities is used depends largely on how fitting they are with a particular setting of education and the characteristics of students, trainers, or mentors/advisors/supervisors. To design and develop an RETD program that stands on the research-teaching-learning-developing nexus, we also need a collective work of multiple groups of experts (such as curriculum designers/developers, instructors/trainers of the focused discipline/field, scientists/scholars/researchers of the discipline/field, professionals/practitioners of the discipline/field, and research and/or data science experts). Otherwise, the teaching, learning, developing, and researching angles cannot be well-defined, integrated, connected, and synchronised, which may only creates a rather inefficient nexus.

5.4.3.2. The research centric approach cultivates the love of research, knowledge, and learning.

In general training courses of research methods, trainers may not be sure in the outcomes from learning, generally because the time is too short to create any meaningful and foundational research outputs that are useful for students in the long run. In a research-centric RETD program, educators and students should not experience that. They should not develop a mentality that their pursuit of a university or advanced degree or their participation in a particular research course is just to complete the program requirements and get the degree.

Meaningful research experience is achieved only when, either in solo researching/learning space or in collaborative work with others, the students can obtain a clear understanding of the knowledge objects they have inquired, sharpen their intellectual capabilities, and experience the joy of learning and inquiring. Generally, only through producing real research outputs (especially, the written published journal articles or review articles) can students develop a clearer understanding of how their academic communities collectively understand, perceive, and evaluate research. The lone endeavours to create a research output (by managing knowledge of the area, mastering the relevant methods, expressing oneself clearly in writing, and reflecting on one's written work), plus the collective endeavours to construct accurate knowledge (by dialoguing or debating with peers and supervisors or communicating with expert reviewers), are the most important learning experience of students in the research-centric RETD program. Constructive criticisms and positive feedback from the expert reviewers are an important strategy to improve the quality of research outputs of the students, which allows them to come to terms with the real academic joy when their

written works get accepted. As a result of these research experiences, the students develop an academic research mindset and/or mindedness, regardless of whether they choose to stay in academia.

The supervisors and mentors, therefore, need to guarantee that students do not invest their time and efforts in performing research works without knowing whether they are on the right track, although tolerance for ambiguity, uncertainties, and errors is needed in the research-centric model of education. Holistic, critical, and serious feedback from the supervisor, advisor, or mentor is strongly encouraged. A deeper and more transparent level of collaboration – such as joint publication, co-authorship, or co-researching – also provides a golden opportunity for students and young researchers to engage and produce real, meaningful research outputs, which in the long run may encourage and motivate them to become a professional researcher.

5.4.3.3. The research-centric approach should be guided and assessed by professional research work situations.

Research expertise is not generally achieved at school but at workplace after the researcher has spent an adequate amount of time with authentic research experiences in a professional setting. That is why it is important and necessary that universities and professors have research projects being implemented, so that they can engage their students in authentic research works. Such ideas of situated learning (which means situating the students into the real professional context of research) – despite more commonly practised in technical and vocational education contexts – is in fact useful for academic research training in the 21st century because well-trained researchers who can perform research works in both the academic and the non-academic professions are increasingly needed. Without the guidance from a professional perspective, research training may not develop employment-ready graduates to serve in the research, data, information, or knowledge sector.

As a preliminary requirement, organisers of an RETD program need to ensure sufficient time and an appropriate training environment which allows active engagement and real practices, focus on production of research outputs (with quality at par with the professional research outputs), prepare all the work-based technologies required, improve the ability to access professional resources, and provide opportunities to collaborate in real research projects or to be mentored by professional researchers. These activities provide the students an opportunity to learn by observing how the professionals work and solve real challenges and hence improve their confidence in future engagement in research career, realistic thinking about explicit knowledge, systemic and systematic working attitudes, skills in analyses and syntheses, and collaborative attitudes. All of these attributes will allow them to gradually become more masterful in research works, and at the same time, ready to deal with new problems or challenges they face in different research projects or research situations.

An important aspect of the RETD program to be guided by the professional work situation is the assessment of the program. A recent competence-oriented assessment model of inquiry-based learning was proposed by Reinmann (2019, 103). The authors suggested that the assessment should include (1) assessment on research which should focus on the knowledge about research (for example, through written exam, interview, presentation, and term papers), (2) formative assessment which should focus on feedback decisions, and (3) assessment in research which should focus on ability in research (for example, through demonstration, production, and presentation). Such a research-centric assessment may develop into a clear evaluative benchmark that is appropriately applicable in the professional context. In a professional setting, researchers are required to have a number of core competencies and to perform a number of research routines or new research assignments, all of which are subject to performance evaluation.

5.4.3.4. A research-centric approach requires a whole-institution research support.

Supportive inputs and involvement by the organisation's governance, leadership, management, and administration bodies are an important driver for the research-centric RETD program to prosper. A large body of literature on factors promoting research training has made it clear that the institutional environment is important. In a case study on psychiatry residency research training, the regulatory, institutional, and personal factors all have influences on research training (Abrams, Patchan and Boat 2003, 1). Boud and Lee (2005) similarly discussed the pedagogy of research education, using a lens of "environment as pedagogy" through which they perceive researcher learning depends largely on the network of learning or peer learning within the whole environment.

Supporting the education, training, and development of academic researchers has to be a whole-institution (or even a whole-system) approach. Institutional research support and involvement should be well ensured since the start of planning the program to the evaluating stage of the program. Different facets of an HEI (from research office to library) have well-defined roles to play in the larger research supporting system. Space for practice, supporters (such as librarians, information technology officers, and grant administrators), permission for students to conduct research, and other supporting activities during the research education, training, and development shall be provided upon necessity. Materials such as general research policies, general research guidelines, specific research guidelines (e.g. on ethics), internal research information and management systems, research support offices, and research support events (e.g. workshops, seminars, conferences, symposiums, exchanges, training) are also important materials and resources to support RETD. The HEIs or the graduate programs need to have different functional support units as a system to enrich students' research experiences.

No one great researcher or research leader can practically support a whole RETD program alone, and neither does it means that a selfishly led, fakely committed, unidirectional, irresponsible, and dependent team can achieve this goal. Pseudo-leadership and unorganised institutional cultures are among the most common factors inhibiting quality RETD, research performance, and research sustainability.

5.5. Final thoughts

This study explores research competence domains and research-centric principles of academic RETD programs. The study suggests that the Cambodian academic RETD at its HEIs shall cover different research competence domains (and sub-domains) in a comprehensive and integrated manner, from the ability to master diverse types of research methodologies and methods to the demonstration of a positive mindset towards academic research professionalism. Also, attaining the different domains of academic research competences requires an educational approach that is more research-centric or inquiry-centric. Research centrality or inquiry centrality in academic RETD should be developed by ensuring the teaching-research-learning-developing nexus; the cultivation of a deep interest in pursuing higher learning and advanced knowledge; the attachment of research training to professional research work situation; and the use of a whole-institution approach to research support.

Research competences are an important asset in the knowledge economies and societies and have become necessary for many professions in the changing world of work (especially, those related to knowledge, information, or data). For HEIs and graduate or advanced education programs, it is almost impossible to promote research culture or ignite the spirit of academic research in the individual faculty members or students without allowing them to see the holistic and connected picture of academic knowledge segments, the substance of scholarly or scientific research approaches, as well as the applicability and usefulness of those knowledge and approaches within and beyond the academia. Doing so requires time and a sincere change in perspective.

Following is a number of implications for Cambodian HEIs and advanced education programs in terms of future promotion of RETD:

1. Academic research competences cannot be developed through a fragmented and unintegrated training model. Academic RETD programs need to be developed in a way that connects research to other different dimensions of the programs – e.g. program planning, teaching, learning, development, or assessment.
2. Officials serving in positions related to research education or research training at Cambodian HEIs or graduate education programs shall engage in actual research projects and continue to join professional development training and seminars related to research to stay abreast with new updates in the field of RETD.
3. Students and young researchers who want to engage in academic research as a career should be oriented well into the world of the academia. They seriously

need to build foundational skills and habits related to academic learning, thinking, reading, and writing.

4. Departments dealing with HE and graduate education under MoEYS may consider embedding quality research education, training, or development components into the foundation year program; creating student support units to guide students on the academic body of knowledge and scholarly and scientific methods; and continuously hosting knowledge-sharing platforms for researchers and academics serving at HEIs or graduate schools.
5. Last but not least, and not specific to Cambodia, in order for RETD to become a professional field trainable to a larger number of audiences, a professional body of knowledge for researchers and research educators is needed.

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Chapter 6

Understanding Concepts and Approaches of Accountability in Higher Education: Some Perspectives on Cambodian Higher Education Institutions

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Abstract

Accountability is increasingly recognised as an essential concept and mechanism for higher education institutions (HEIs) to justify their position in a society. It is closely linked to the concepts of efficiency, effectiveness, and quality as well as central to the practices of governance, management, administration, quality assurance, and evaluation of higher education (HE). However, the concepts, mechanisms, and instruments of HE accountability are multiple, contested, and complicated. Current studies on the governance, finance, and quality assurance of Cambodian HEIs (both at the system and the institutional level) somehow point to concerns on HE accountability and how to achieve it. This study, therefore, reviews and discusses HE accountability concepts and approaches, using existing literature and official documents, with a purpose to provide a clearer frame of thoughts for understanding the concepts and for moderating the complexity underlying accountability mechanisms.

Keywords: Accountability triangle, accountability diamond, higher education governance, managerialism, quality assurance

6.1. The necessity and complexity of accountability in higher education

Strong, well-organised, and well-managed institutions are needed for a nation to grow. Without a critical mass of functioning institutions in different social sectors, a nation cannot become an economically advanced and a globally leading country. For an institution to function efficiently and effectively in the global knowledge economies and societies, the institutional culture and system of accountability need to be developed, especially for the institutions in a society that decides to embrace democratic values, rules of law, and systematic working principles. Accountability is important for an institution because its virtues and mechanisms underlie the input-throughput-output process of organisational operation and management, resulting in clear planning and direction, resource efficiency, satisfactory work performance, and justified reward or punishment decision.

For higher education institutions (HEIs), especially universities, accountability is needed to understand the positions they occupy in society (Temple 2011, 107). Higher education (HE) accountability schemes deserve even more critical attention and examination in the context of increasing HE internationalisation and the more competitive and entrepreneurial HE environment. The notion "accountability" has also become important as the government starts to interfere more with HE and academia for economic or strategic reasons. In his analysis of the contribution of accountability to economic growth and citizen welfare, Burke (2005a, xvii) notes: "… higher education is the source of economic success for states and their citizens in a knowledge and information era… [and it is] largely for this reason that accountability is here to stay."

Accountability in HE is a complex notion, however. Across different disciplines and different languages, accountability does not share the same meaning or interpretation (UNESCO 2017, 2). In general, accountability can be conceptually confused with other related terms such as responsibility, transparency, and answerability, and, in the HE sub-sector, it can be further confused with various technical terms such as HE quality, quality assurance, performance evaluation, accreditation, or academic audit. Sometimes, accountability is discussed in relation to the financial aspect; sometimes, it is used in the discourse of governance; and some other times, it is used to discuss the legal aspect. There are also multiple stakeholders, schemes, and tools involved in the mechanism of accountability (Burke 2005a; Linberg 2013; Zuniga 2018). Moreover, because accountability is socially rooted in Western democratic countries (Stensaker and Harvey 2011, 15), both understanding it and/or putting it into practice can be challenging in countries without such social structures and cultures.

Due in part to such a lack of understanding of accountability, HE accountability affairs in some countries have had limited systemic support (Stensaker and Harvey 2011, 2). This situation is costly. Any attempts to set up accountability strategies without understanding the complex concepts, goals, and implementation schemes can be inadvertently misleading (Burke 2005a, x).

6.2. Challenges in achieving accountability in Cambodian HE

In previous research studies on Cambodian public administration and governance (e.g. Pak and Craig 2008; Horng and Craig 2008; Eng and Craig 2009; Pak 2011), the notion "accountability" has been well explored and documented, generally leading to the detection of neopatrimonialism in public institutions. This traditional and deeply rooted patron-client culture at Cambodian workplaces is believed to clash with the newer democratic culture introduced by international development partners in the 2000s.

While the practice and concept of public accountability have been and continue to be discussed, the notion of accountability in Cambodian HE has received scant attention. This points to an intellectual gap in Cambodian HE research and policy making as the topic of accountability has been theorised at length and well discussed in international literature as a consequence of the changing government-university relationships, the increasing privatisation of HE, the massification of higher education, the internationalisation and regionalisation of HE quality assurance, and the increasing importance of HE in a technology and data-driven knowledge economies and societies (see, for example, Huisman and Currie 2004).

Some related works on HE accountability in Cambodia (see, for example, Sen and Ros 2013; Touch, Mak and You 2014; Un and Sok 2018; Mak, Sok and Un 2018) offer insights on the structures, processes, and conditions surrounding the governance, accreditation, quality assurance, and financing of Cambodian HEIs. A recently published qualitative study by Eam, Ros, Heng and Ravy (2020), which interviewed 29 deans at six Cambodian universities on their perceptions and experiences with accountability in HE, further highlights some barriers that may hinder the achievement of accountability mechanisms at Cambodian HEIs:

- ***Lack of conceptual clarity***: There emerge in the data some profound unclarities of the concept of accountability and its relation to other concepts, which requires the HE policy discussion at the policy and institutional level to deal with those ambiguities. The concept of accountability may not yet be considered as an important value in the working culture and therefore not discussed candidly at the workplace.
- ***Limited applicability of accountability instruments***: While the lack of thorough conceptual understanding is an issue, limitations in the enforceability of accountability instruments (particularly, the accreditation scheme and the internal quality assurance scheme) are also a serious concern. Some institutions still do not have formal job descriptions (or competency framework) for their faculty members and staff. Resources and delegations may not be consistent with the expected performance and working conditions. And appropriate sanctions and rewards in response to the performances are not easily implemented. Sometimes a more informal approach is used to solve problems, rather than to impose formal sanctions. A considerable number of the study's participants (who are deans of different faculties) are also concerned about their inadequate decision-making power on certain aspects (academic or administrative), which restricts their ability to respond efficiently, effectively, and so accountably to different stakeholders. For them, no decision-making power can result in the lack of seriousness of commitment of the deans.

All of these issues and challenges warrant the need to clarify the concepts and mechanisms of accountability of HEIs in general and of Cambodian HEIs in particular. The discussion and clarification of accountability concepts, approaches, and principles remain and will continue to be relevant and necessary as long as performances of faculty members remain challenged and the trust in Cambodian HEIs is still low in the eyes of their students, faculty members, middle managers (such as deans), the public, and the international academic communities. The efficiency, effectiveness, and excellence of Cambodian HE governance, management, and administration hinge on the notion of accountability and its strategies and mechanisms.

6.3. The current study

The purpose of this study is to discuss and clarify HE accountability concepts, approaches, and principles. The information used in writing this chapter comes mainly from theoretical and conceptual literature and relevant policy documents. The authors used a rather narrative review approach to answer two questions: (1) What does the concept of accountability constitute? and (2) What approaches, schemes, instruments, and/or tools are commonly used to implement the HE accountability mechanism? This review shall promote a broader understanding of accountability at the profoundly market-oriented Cambodian HEIs in light of general accountability conception and mechanisms in other countries' HE and therefore shall raise more policy dialogues on how to better use accountability mechanisms and instruments to promote Cambodian HE performances.

6.4. Concept of accountability

The original idea of accountability is rooted in the field of bookkeeping and accounting (Bovens, Schillemans and Goodin 2014, 2), but borrowed and used in many other areas including governance, public administration, political science, international relation, and education. Clearly and adequately defining accountability is not easy because accountability involves different stakeholders and is multifaceted in both concept and practice. For many researchers, accountability is an ever-expanding concept and is used for different purposes in different fields (Burke 2005b).

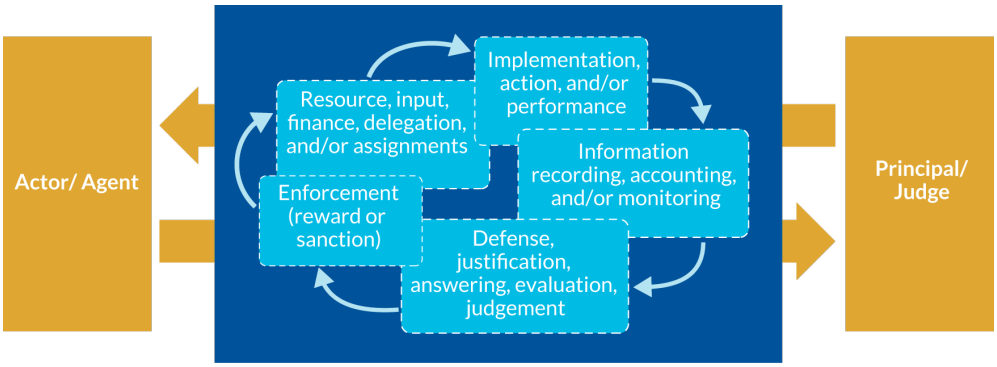
To understand what underlies the concept of accountability, we need to observe its general mechanism. Accountability involves the whole mechanism of interactions between the ***agent/actor*** (who does the action or who is accountable) and the ***principal/judge*** (on whose behalf the agent is supposed to act or to whom the agent is accountable) about the ***domain*** (for what the agent/actor is accountable) (Linberg 2013; Zuniga 2018). This whole mechanism of interactions or relationships happens in a framework that materialises into a number of activity sets: (a) resourcing, financing, assigning, and/or delegating; (b) implementing, acting, or performing of the assignments; (c) information recording, accounting, and/or monitoring; (d) answering, justifying, and defending of actions or performances; and (e) enforcing

the decision (rewards or sanctions) based on the evaluation and judgment (see, for example, World Bank 2003; LeMahieu 2003; Partners in Leadership 2010). The World Bank (2003, 47) exemplifies this accountability procedure in an employment setting as follows:

> In a typical employment relationship, a person is given a set of tasks (delegation) and paid a wage (finance). The employee works (performance). The contribution of the employee is assessed (information). And based on that information, the employer acts to reinforce good or discourage bad performance (enforceability).

In practice, this whole mechanism of interactions or relationships between the agent/actor and the principal/judge is not necessarily linear (see Figure 6.1). It highly depends on how the actor/agent, the principal/judge, and other stakeholders collectively agree on the accountability operation mechanism prior to the implementation.

Figure 6.1: The mechanism of accountability as an interaction between agent/actor and principal/judge



Source: Authors' synthesis

As we conduct a comprehensive literature review on this whole mechanism of interactions in general and in the HE sub-sector, a number of characteristics emerge as the core of accountability concept: the answerability of the agent/actor in the accountability mechanism; the enforceability of the judge/principal in the accountability mechanism; and the multi-dimensionality of the accountability domain.

6.4.1. Answerability of the agent/actor

In the mechanism of accountability, the agent/actor needs to be answerable to the principle/judge (or sometimes referred to as the accounting agencies). Answerability is not responsibility, the term that is generally equated with accountability in everyday usage. According to Nilsson (1979, 139): "There are many things I am responsible for which I am not, as it happens (but only

as it happens), accountable for." Being responsible does not necessitate "the liability to be called into account" for what one does (Nilsson 1979, 139). One can claim responsibility without the need to be accountable (legally, politically, professionally, or morally) to any external judges. In this sense, responsibility is a concept based on the idea of ownership, while accountability is based more on the idea of responsiveness and judgement.

Unlike its everyday uses, accountability in technical terms is generally understood as "answerability for performance" (Romzek 2000, 22) or as "an obligation… to provide an account…" (UNESCO 2017, 2). This phrase "answerability for performance" or "an obligation … to provide an account" goes beyond the mere equating of accountability with responsibility (as discussed earlier). The idea of answerability gives the actors/agents a role (and right) to give an answer, clarify the details of what has been done, and justify their actions and performances (Kaler 2002, 328).

6.4.2. Enforceability of the judge/principal

Answerability is not the only essential characteristics of accountability. Another important characteristic of accountability is enforceability which also differentiates accountability from other similar concepts. Accountability does not just end when the agent/actor gives the answers to justify their actions. Forced confession or defence of one's faults, for example, is not an act of accountability. Accountability also involves how the judge/principle makes a decision and takes action in response to the answers or justifications given by the agent/actor.

In this sense, accountability is defined as "something that connects responsibility to governance" (Kaler 2002, 327). "Connecting responsibility to governance" suggests that, after the actor/agent gives an account to the principal/judge, there will be resultant decisions and/or actions of enforcement (Schedler 1999; World Bank 2003). The idea of enforcement here simply means that the actor/agent may receive rewards from the judge/principal if they meet or exceed the performance expectations, and punishments if they fail to meet the performance expectations. While answerability is more about monitoring and justification, enforceability is more about rewards or sanctions (Schedler 1999, 14). Zuniga (2018, 3) explains that through accountability the principal/judge is able to hold the agent/actor responsible for their actions (or performances) and to ensure the agent/actor properly executes their powers (or authorities).

6.4.3. Multi-dimensionality of the accountability domains

Scholarly attempts to define and conceptualise the accountability concept have generated different types and/or levels of the accountability (see Table 6.1).

Table 6.1: Different domains of accountability in different fields

Sources and Field	Accountability Domains and Explanation
Trow (1996) Higher Education	There are four types of accountabilities: External, Internal, Legal/Financial, and Academic Accountability (see Trow 1996, 7-8): • *External accountability* is the obligation of colleges and universities to their supporters, and ultimately to society at large, to provide assurance that they are pursuing their mission faithfully, that they are using their resources honestly and responsibly, and that they are meeting legitimate expectations. • *Internal accountability* is the accountability of those within a college or university to one another on how its several parts are carrying out their missions, how well they are performing, whether they are trying to learn where improvement is needed, and what they are doing to make those improvements. • *Legal and financial accountability* is the obligation to report how resources are being used: is the institution doing what it is supposed to be doing by law and are its resources being used for the purposes for which they were given? • *Academic accountability* is the obligation to tell others, both inside and outside the institution, what has been done with those resources to further teaching, learning, and public service and to what effect.
Vidovich and Slee (2001) Higher Education	There are four types of accountability: Inward, Outward, Downward, and Upward (see Burke 2005b, 3, and Stansaker and Harvey 2011, 13, citing Vidovich and Slee (2000)): • *Upward accountability* represents the traditional relationship of a subordinate to a superior. It crosscuts procedural, bureaucratic, legal, and vertical accountability. This is about the answerability of the actors/agents to the principals/judges. • *Downward accountability* focuses on a manager (i.e. the principal/judge) being responsible to subordinates (i.e. the actor/agent) in the participatory decision-making of collegial accountability in HE. • *Inward accountability* focuses on agents acting on professional or ethical standards within an institution and often appears in organisations dominated by professionals, such as in colleges and universities, where it becomes professional accountability. • *Outward accountability* means responding to external clients, stakeholders, supporters, and ultimately to the public at large (in a democratic society). It includes market and political accountability.
Romzek (2000) Administration, Governance, or Political Science	There are four types of accountability: Hierarchical, Legal, Political, and Professional (see Romzek 2000, 23-28): • *Hierarchical accountability* relationships are based on close supervision of individuals who have low work autonomy and face internal controls. The underlying relationship is that of supervisor–subordinate. • *Legal accountability* relationships involve detailed external oversight of performance for compliance with established performance mandates, such as legislative and constitutional strictures. • *Political accountability* relationships afford managers the discretion (or choice) of being responsive to the concerns of key stakeholders, such as elected officials, clientele groups, and the general public. Civil servants in this relationship have the discretion to decide whether and how to respond to key stakeholder concerns. • *Professional accountability* relationships are reflected in work arrangements that afford high degrees of autonomy to individuals who base their decision-making on internalised norms of appropriate practice.

Sources and Field	Accountability Domains and Explanation
Kaler (2002) Administration, Governance, or Political Science	There are two types of accountability: Informative and Coercive: • According to Kaler (2002, 329), ***informative accountability*** considers the act of answering or justifying one's actions to be either voluntary (upon the actor's individual agency) or involuntary (by external forces). In this sense, informative accountability is not necessarily imposed by external judges with a certain kind of punishment or reward but comes more from within the actor. • Another of Kaler's conceptions of accountability is ***coercive accountability***, which controls and prevents misconduct by imposing disciplinary sanctions (Kaler 2002, 329). Coercive accountability in this sense is enforced on the subject to be accountable by external forces. Misconduct or outstanding performance will result in punishments or rewards accordingly. Instances of coercive accountability "go beyond blame to inflict substantive punishment and are also very much extra-organisational in the manner in which that punishment is inflicted" (Kaler 2002, 330).
Bovens (2010) Administration, Governance, or Political Science	There are two views of accountability: as a virtue and as a mechanism: • Bovens' idea of ***accountability as a virtue*** is "a sense of responsibility", "a desirable state of affairs", "a set of standards for the behaviour of actors", or "a willingness to act in a transparent, fair, and equitable way" (Bovens 2010, 949). With this kind of conception, accountability is almost synonymous with the idea of responsibility. • *Accountability as a mechanism* refers to a "social relation or mechanism that involves an obligation to justify or explain conduct". This is more of the instrumental and practical side of accountability.

Source: Authors' summary

Stansaker and Harvey (2000, 13-14) synthesise the various types of accountability and suggest that there should be two broad classifications of accountability: the stylistic form of accountability and the delegated form of accountability:

- *Stylistic accountability* constitutes all the above-discussed types or forms of accountability. All those earlier discussed types of accountability (internal, external, legal/financial, or academic) are rather horizontal or vertical in classification.
- *Delegated accountability* refers to a new form of accountability that goes beyond the separate classification of accountability. The idea of "delegated accountability" aims to generate "new immediate agencies or bodies consisting of representation from both internal, external, academic, and legal/financial constituencies". In the delegated accountability mechanism, therefore, the relationships among stakeholders become more diagonal.

We can further notice that the variations of the stylistic form of accountability are based on how the researchers view the different domains of accountability – for example, in terms of *aspects* (financial, legal, political, professional, moral or social), *directions* (upwards, downwards, inwards or outwards), or *existential nature* (whether it is an abstract virtue or whether it is an observable process). In the same line of discussion, Linberg (2013) assumes that accountability domain – in this sense, the stylistic form of accountability – can be viewed in terms of accountability source

of expectation/control (internal or external); accountability strength of control or degree of autonomy (high or low); and accountability direction of relationship (vertical or horizontal). In Table 6.1, for example, the difference between Trow (1996) and Vidovich and Slee (2000) is that the former focuses on different *aspects* of accountability while the latter focuses on different *directions* of accountability. Likewise, in the field of administration, governance, or political science, Kaler (2002) and Bovens (2010) tend to view accountability from its source and its intensity in a dualistic view, whereas Romzek (2000) views it from the different aspects (as well as directions) of accountability.

When discussing or attempting to achieve accountability, it is necessary for researchers, policy makers, and practitioners to have a clear understanding of the concept of accountability, the specific domain of accountability being discussed, the specific indicators of the domain, and an overarching accountability framework from a specific discipline or paradigm (Horng and Craig 2008; Stansaker and Harvey 2011). A clear distinction in the different forms or types of accountability domains being focused helps mitigate the complexity in trying to achieve accountability.

6.5. Approaches of accountability

6.5.1. Accountability as a co-operating mechanism

The term accountability has rarely been understood or used as a lone concept in its research or in the implementation of its mechanism. In general, this term is always related to or used together with such terms as accounting, quality assurance, performance, evaluation, audit, and so on. While most of these terms are historically rooted and used in the government, business, and industrial sectors, they are quite recent for the HE sub-sector. In HE, accountability is especially discussed together with quality assurance, accreditation, academic audit, governance, etc., which are not traditionally related to this sub-sector. That makes the term accountability highly confused with those other terms in the managerial environment of the HE organisation.

Historically, the HE sub-sector and its academics, especially those in the Anglo-Saxon HE governing model, have embraced a rather independent and free attitude to its learning and inquiry works. Too much interference or control from the government is viewed as a threat to academic freedom. But since the start of the massification of HE after World War II, the government starts to concern the whole HE sub-sector and HEIs more with the market, with the economic competitiveness of the nation, and even with the international strategic intent of the nation. This happens even in those countries with the Anglo-Saxon or Anglo-American HE systems. This phenomenon is generally associated with concepts or ideologies such as neo-liberalism of HE, new managerialism, new public management, or

academic capitalism. What these concepts mean is that more steering and control from the government on the HE sub-sector begin to prevail and new HE approaches (in terms of system policies, institutional strategies, managerial practices, evaluative tools, etc.) emerge and expand. "Managerialism is a set of ideological principles and values that one group of actors imposes on another in an attempt to control their behaviour" (Meek 2003, 11). This new belief system on HE governance was strongly advocated in the 1980s by the international organisations, such as the World Bank, the OECD, the European Union (EU), and the European Council (Findikli 2017, 395).

However, bringing accountability into the HE domain has been like injecting a new set of values, beliefs, and assumptions into an existing culture (e.g. Burke 2005b; Trow 2011). That leads to an unavoidable clash between those who try to control and those who try to be free. The main reason for the clash is that accountability rooted in the managerial or corporate culture values transparency, answerability, responsiveness, and cost-efficiency and effectiveness (i.e. stewardship) in performance, whereas HEIs naturally embrace the so-called academic or collegial culture which values individual academic freedom and discipline-based professional expertise and autonomy. These clashing values have many implications in the HE sector, for example, on the question of who should manage academic institutions – i.e. the academics, the bureaucrats, or the so-called academic entrepreneurs? or on the question of evaluation and assessment – i.e. who can assess and evaluate academics in certain fields and what should be assessed?

Because of such clashes, new concepts and indicators for HE governance and management, which can be hard to understand by non-experts and non-practitioners of HE have been discoursed. Sometimes, a term that means one thing is used to mean the other, and at other times, related (but not synonymous) terms are used interchangeably. The mingling between accountability and other related concepts and mechanisms in HE is a clear example. They are used together and arise together due to the tension between the traditional academic freedom and the expected social responsibility of the HEIs and their academics.

Distinguishing these concepts and mechanisms is, therefore, a critical task for researchers, policymakers, quality assurance agencies (external and internal), accreditation committees, academic auditing bodies, or other forms of oversighting bodies in order for them to develop institutional accountability policies and strategies, implement efficient and effective accountability schemes, and support the quality assurance and performance of HE at the institutional and system level. Table 6.2 offers an explanation for a number of accountability-related terms and mechanisms: quality assurance, performance evaluation, accreditation, auditing, ranking, and autonomy and freedom.

Table 6.2: Concepts and practices related to accountability in HE

Concepts	Explanation
Quality assurance	Quality assurance is not the same as accountability despite their inherent relationship within the domain of HE. Stensaker and Harvey (2011, 246) noted that HE accountability in most countries is associated with quality assurance procedure, and Wells (2016) furthered that accreditation, academic audit, and accountability "dynamically relate and overlap under the umbrella of quality assurance". This dynamic relationship allows quality assurance to be sometimes used as an approach to ensure accountability, and vice versa (for example, Stensaker and Harvey 2011; Wangenge-Ouma and Langa 2011, 58). To differentiate, quality assurance is more of a holistic concept that refers to the "systems and processes to ensure higher education quality" (Suskie 2015, 11). Quality assurance mechanism can be internal, with an internal committee or an independent office, or external, with an independent quality assurance body or a governmental body. Accountability, on the other hand, is not intrinsically aimed at ensuring quality. It aims at providing an account or justified answers to what has been done with the resources and authorities given.
Performance evaluation	According to Hazelkorn, Coates and McCormick (2018, 6), performance is related to assessment and/or evaluation of higher education institutions or programs. Evaluation generally focuses on some objects such as productivity, funding, and standards. A faculty's research performance, for example, is about measuring how many papers are published or how many citations of those papers. The actions of evaluating result in a clear judgement on whether it is a poor, a fair, or a good performance. In this sense, performance evaluation is used as a mechanism to check accountability. Different from the mechanism of accountability itself, the mechanism of performance evaluation does not necessarily go further to include enforcing actions.
Accreditation	Accreditation is an inspection or evaluation process with the purpose to approve, legalise, authorise, or license an institution, a program, or a degree (e.g. Saarinen and Ala-Vahala 2007). To do that, the accrediting body needs an appropriate framework and standards. In HE, accreditation can be an initial means or process to ensure the minimum standards for programs and universities to be established or to run. These generally involve institutional self-reporting, field visits and observations by peers or officials, interviews, and discussions. Accreditation is not synonymous with accountability, quality assurance, or performance. According to Temple (2011, 101): "… accreditation processes are usually about setting a minimum standards threshold…; whereas quality assurance is about examining institutional processes, usually by means of an audit, rather than of the standards achieved by the teachers and students…".
Auditing	Auditing in HE is generally done by external expert auditors to evaluate the efficiency and effectiveness of the institution; whether the finance is used properly (i.e. financial audits); and/or whether academic programs have quality (i.e. academic audits). HE institutions can have both financial audits (with expert financial and/or organisational body of auditors) and academic audits (with disciplinary or professional body of auditors). Auditing can be used to improve institutional management. Brown (2000 cited in Temple 2011, 101) states "… the audit approach concentrates on finding out whether institutional management has in place, and is using effectively, systems that allow the management itself to answer questions about standards".

Concepts	Explanation
Ranking	In the field of HE, university ranking has attracted and influenced universities and countries all over the world as they try to achieve academic excellence and become world-class. There are multiple justifications behind this attempt, from economic to strategic reasons. Ranking is market-driven (e.g. Marope, Wells and Helzekorn 2013), with its goal to provide information for students, parents, and governments to make decisions on choice for, and funding to, HEIs. The mechanism of ranking automatically goes together with classification, typology, and/or diversification of HEIs.
Autonomy and freedom	Unlike the other terms discussed above, autonomy or freedom is related to the concept of accountability in an opposite direction or a contrasting way. Academic freedom is a term generally viewed from the lens of liberalism through which the academics see themselves and their institutions as having exclusive rights to be free from outside controls and interference and can pursue their own self-determined inquiries. Autonomy, more commonly professional autonomy, is also viewed through the paradigm of liberalism by the professional communities (traditionally the Guild in Europe) who believe that they have rights and responsibilities to control the works of their own profession and no outside power has the ability or authority to determine that for them. As one may understand, both the academic freedom view of the academic communities and the professional autonomy view of the professional communities aim to avoid outside control and may only be developed in the purely democratic society, particularly the ancient Greek. In the contemporary HE context, freedom or autonomy can be used to refer to different domains of HE affairs such as financial autonomy, academic autonomy (freedom to teach or to research), institutional autonomy, etc.

Source: Authors' syntheses
Note: These terms vary in practices from a nation to another, depending on a number of factors such as the HE governance model, the resources available, the working tradition and culture, etc.

Thus, the same way that the accountability domain can be viewed in many ways, it is wise to understand that the mechanism of accountability co-exists or takes place along with other mechanisms. Likewise, the accountability mechanism takes place within the tension between the two extremes of freedom and control, which, in the 21st century, should be debated not in a way that eliminates one but to progressively transform the contrast.

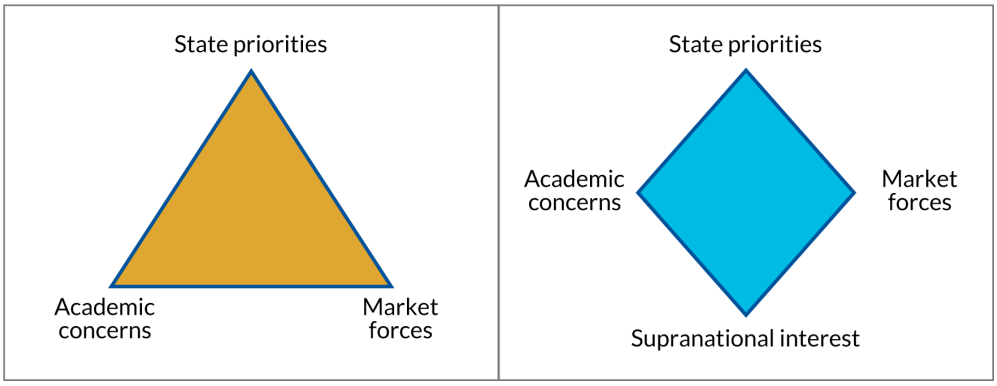
6.5.2. Different HE governance models, different accountability instruments

The discussion of accountability is arid without a clear understanding of HE governance models of different countries and their social cultures. There is a huge bag of historical and cultural realities underlying how a government of a country decides how to approach accountability.

To explain the coordination of HE systems, it is best to start with Burton R. Clark because his seminal work was observed to be the starting point of further social scientific analysis of HE governance (Burke 2005c; Findikli 2017). Clark (1983) looked at the organisational system of HE from the forces that influence

it, resulting in the framework of *Accountability Triangle*, which includes the state priorities (political), the academic concerns (professional), and the market forces (market) (see Figure 6.2). Middlehurst (2011) extended the framework and added the supranational interest corner, creating what the author refers to as the *Accountability Diamond* (also see Figure 6.2). The different corners are rooted in and shaped by different cultures: the state in corporate, civic, and/or managerial culture; the market (in fact, quasi-market for the case of HE) in entrepreneurial and industrial culture; the academia in the academic and collegial culture; and the supranational stakeholders perhaps in the political and strategic culture. How the HEIs orient towards these different cultures results in new models and approaches of institutional governance. Askling and Henkel (2006) identified four emerging institutional governing models: the corporate enterprise (see Jarratt 1985), the entrepreneurial university (see Clark 1998), the adaptive university, and the learning university. These different institutional governing models will further influence which schemes or tools to achieve accountability.

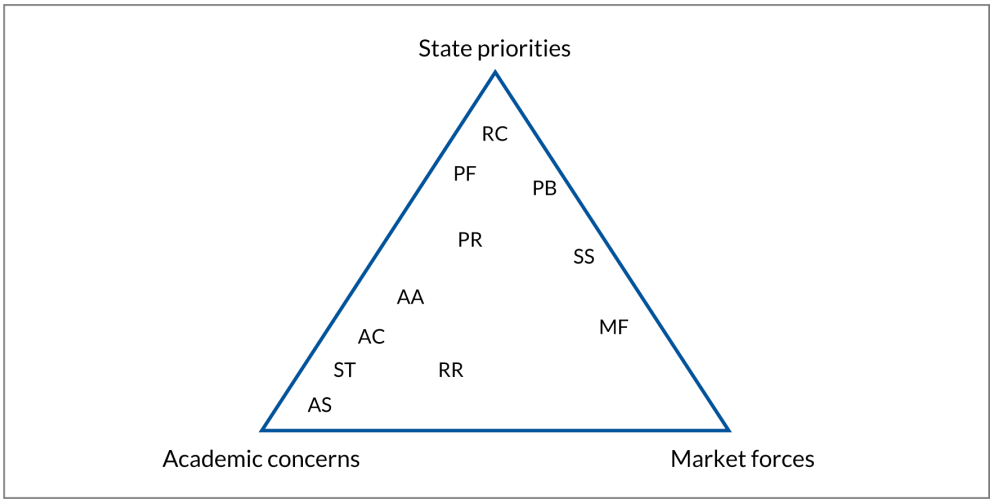
Figure 6.2: Accountability Triangle and Accountability Diamond



Source: Eam et al. 2020 (based on the original and secondary sources of Clark 1983, 143; Burk 2005c, 23; and Middlehurst 2011, 184)

Tools used to ensure accountability vary according to the governing model and their orientation towards different angles of the Accountability Triangle (Burke 2005b; 2005c). That said, for state priorities, accountability instruments can be Report Card (RC), Performance Funding (PF), Performance Budgeting (PB), and Performance Reporting (PR). For market forces, accountability instruments can be Student-Alumni Surveys (SS) and Market Forces (MF). For academic concerns, accountability approaches can be Academic Audits (AA), Accreditation (AC), Assessment (AS), Standardised Test (ST), and Reputational Ratings (RR) (see Figure 6.3). Temple (2011, 101) further highlights other tools such as accreditation, league tables, benchmarks, research indicators, and audit as a means for universities to be accountable towards political process, markets, and international audiences. Specific tools should be used for specific goals of accountability that correspond to specific contexts and problems.

Figure 6.3: Various tools of accountability in the Accountability Triangle



Source: Burke 2005c, 307

Burke (2005b) further analyses different instruments and tools for different accountability models and structures. He develops a comprehensive matrix to frame a number of complex accountability models (bureaucratic, professional, political, managerial, market, and managed market) which are conditioned by ten features: levers, agents, goals, indicators, conditions, techniques, consequences, governance, theory, and programs (see Table 6.3). According to this comprehensive matrix, Accreditation and Assessment are, for instance, proper for the professional accountability model, while Report Cards and Performance Reporting are generally used for the political accountability model. If a system is oriented towards the market accountability model, tools such as Student-Alumni Satisfaction Surveys and Reputational Ratings are good measures to employ.

Instruments or tools of accountability can also be guided by different dimensions of academic problems or fraudulent practices related to academic integrity, financial integrity, resources, quality and relevance, and equity, according to Salmi (2009). It should also be noted that there are many types of fraudulent and unethical practices in HE (Hallak and Poisson 2006, cited in Salmi 2009, 113), including in the areas of financial management (embezzlement/inappropriate spending, fraud in public tender, supplier collusion); academic management (examination fraud, unethical behaviour of faculty, non-compliance with admission standards, research fraud, unethical management of faculty careers, and fraud in quality assurance); and information management (false credentials and data manipulation). From a policy perspective, Salmi (2009, 10) formulated a table (Table 6.4) to list various instruments of accountability due to the many practical problems in HEIs that may threaten accountability and quality goals.

Table 6.3: Typology of different accountability models and related aspects

	Bureaucratic	Professional	Political	Managerial	Market	Managed market
Levers	Rules	Expertise	Policies	Management	Markets	Market policies
Agents	Bureaucrats	Peers	Policymakers	Managers	Entrepreneurs	Entrepreneurs Policymakers
Goals	Efficiency	Quality	Priorities	Productivity	Responsive-ness	Responsiveness Priorities
Indicators	Inputs process	Processes	Outcomes	Inputs Outputs	Outputs	Outputs Outcomes
Conditions	Stability	Autonomy	Consensus	Dynamic	Demand capacity	Demand capacity Incentives
Techniques	Regulation	Consultation	Planning	Cost-benefit analysis	Customer satisfaction	Customer satisfaction Priority planning
Consequences	Continuation Sanctions	Participation Neglect	Incentives Losses	Promotion Demotion	Profits Losses	Profits Incentives Losses
Governance	Centralised	Collegial	Direction Decentralised	Decentralised	Market forces	Public-private partnerships
Theory	Scientific management	Collegial governance	Public policy	Reinventing government	Market economics	Market steering
Programs	Financial program audits	Assessment Accreditation Academic audits Standardised testing	Report cards Performance reporting Budgeting Funding	Performance reports	Student-alumni satisfaction surveys Reputational ratings	Charter colleges Vouchers Financial aid

Source: Burke 2005b, 12, 13

Table 6.4: Instruments of (and related to) accountability

Instruments \ Dimensions	Academic integrity	Fiscal integrity	Effective use of resources	Quality and relevance	Equity
Strategic plan				X	X
Key performance indicators			X	X	X
Budget			X		
Financial audit		X	X		
Public reporting			X	X	X
Licensing	X				
Accreditation/ academic audit/ evaluation	X			X	
Performance contracts			X	X	X
Scholarships/ student loans/ vouchers			X	X	
Rankings/ benchmarking				X	

Source: Salmi 2009, 10

Salmi (2009, 3), more from a policy perspective, added:

> Accountability may take many forms: legal requirement such as licensing, financial audits and report, quality assurance procedures such as program or institutional accreditation, benchmarking exercises to compare programmes across institutions, professional qualification examination results, budget allocation mechanisms that reward performance, and oversight structure such as governing boards with representation from external stakeholders.

Adding to the triangle, the tools or instruments for the supranational dimension (in the accountability diamond) may include, for example, the regional qualification frameworks and the global ranking of HE. Across Europe, ambitious standardised tests for higher education such as the Assessment of Higher Learning Outcomes (AHELO) has been developed, and qualification frameworks and rankings are increasingly becoming an instrument of accountability (Marope, Wells and Hazelkorn 2013). Other likely tools include the European U-Map (which is used to construct a typology of higher education institutions) and International Organisation for Standardisation standards.

Therefore, no single accountability instrument alone is enough to ensure HEIs and academics are held accountable. Different countries and regions prefer different schemes and instruments. It should also be noted that these tools and instruments can be either from government or private agencies employed at either institutional or national level. We have seen changes in the practices of each country as well. Accreditation has proved popular in North America, while New Zealand has opted for performance contracts (Stensaker and Harvey 2011, 16). In the UK, extensive national accountability schemes have adopted various approaches from surveys to performance indicators (Stensaker and Harvey 2011, 18).

6.5.3. The mechanism of accountability and the idea of empowerment

Accountability is a virtue. Even though the outcomes of implementing accountability are not always positive, the intended use of accountability as a controlling mechanism is generally based on good reasons. The two essential characteristics of answerability and enforceability imply the need for social (and institutional) relations and interactions between the actors/agents and the judges/principals as "part of the continuous dialogue in a democratic society" (Stensaker and Harvey 2011, 15). UNESCO (2017, 2) similarly sees accountability as: "… a process, aimed at helping individuals or institutions [i.e. the actors/agents] meet their responsibilities and reach their goals." Whether conscious or unconscious of the impacts of accountability ideas and culture, countries and institutions in the globalised, internationalised, and networked society are more or less influenced by them. This way of viewing accountability has increasingly introduced something called the shared governance model or what Stensaker and Harvey (2011) considers as a diagonal form of accountability. Reflecting this approach of accountability back to the governance model of HE, we can notice that the governance equaliser model (proposed by de Boer, Enders and Schimank 2007) provides the conceptual ground to allow different stakeholders to engage in the accountability mechanism (see Findikli 2017, 396-397).

This also results in an idea that accountability should empower, rather than restrict the practices. If there is no empowerment, there is no trust. Accountability schemes should contain clear expected outcomes that can be measured (Massy 2011, 240), but those measures cannot be something detached from the realities and the contexts faced by the agents or actors. Accountability schemes, according to Stensaker and Harvey (2011, 15), should be assessed by four principles: perceived as relevant by central stakeholders, contain fair judgement of performance, be open for feedback and dialogue, and stimulate trust. Proper assessment and evaluation of accountability schemes are important for future improvement of the scheme, and that has to be the assessment or evaluation that empowers rather than restricts changes. It is based on this positive, virtuous, or empowering intention that accountability can stay as a functional concept. Imagine if the government rationalises accountability as a means to exploit or destroy the agents or actors under it; then, no one will acknowledge or accept the notion of accountability in the first place. In this sense, accountability is meant to empower, improve, or support its objects, not to cause them troubles.

6.6. Conclusions, implications, and suggestions

In short, accountability is a required concept, principle, and mechanism for an institution with super-complex cultures and systems, such as HEI. To understand and make operational the idea of accountability in HE, it is necessary to understand that it has many faces (Burke 2005b) and that it should be treated both as a virtue (absorbed into the mind of all academics and staff serving HEIs) and a mechanism for the institution (with instruments and clear schemes for practice) (Bovens 2010).

The concept of accountability goes beyond the idea of self-determined responsibility because accountability involves external judges. Such involvement generates three essential characteristics of accountability: answerability (providing a clear account), enforceability (either sanctions or rewards), and multidimensionality (being used for different goals and having different aspects and instruments). The three characteristics of accountability need to be clarified for relevant HE stakeholders (policy makers, institutional leaders, administrators, evaluators, assessors, and academics) if accountability is to be realised and achieved.

In practice, accountability instruments and schemes (e.g. accreditation, standardised testing, student and alumni surveys, academic audits and performance reporting) generally need to be well-directed, well-framed, well-defined, co-functional, and enforceable. Otherwise, accountability goals of HEIs cannot be achieved in a rigorous and check-and-balance manner. Selection and design of the accountability instruments and schemes require serious consideration of technical, institutional, and national system contexts. In HE, a clear understanding of the overarching governance model and institutional working cultures are needed. Also, the design of an accountability scheme of HE needs to serve and respond to different agencies (i.e. state priorities, academic concerns, market forces, and international agenda) in a balanced way to avoid detrimental effects from cultural clashes (e.g. collegial vs managerial vs entrepreneurial). In Burke's words (2005c, 296), HEIs need to "serve all but submit to none". In this sense, accountability should embrace and empower, rather than restrict, exploit, or destroy the actors/agents. Rather than being discoursed as a tension between a controlled system vs an open system, therefore, accountability should be viewed in terms of a collective, evidence-based, and reliable system of operation that adds values to the HE organisational performance and transforms the work performance of HE workers.

The current status of Cambodian accountability intervention has been challenged by many structural issues, and especially by the unclarity of accountability concepts and principles and the inapplicability of the accountability-related schemes. Continuing to approach Cambodian HE accountability with a business-as-usual principle may only bring more complicated issues. It is important for the steering body of Cambodian HE to take adequate studies, consultations (with all relevant stakeholders), and empowering actions to curb both the structural and non-structural problems. The following points merit understanding and consideration if the accountability concept and mechanism are to become an important part of Cambodian HEIs' performance culture in the future:

1. *Understanding:* embracing the answerability, enforceability, and multidimensionality characteristics in the discourses of HE accountability is necessary, so that all stakeholders can see clearly the purpose and procedure of implementing the accountability schemes. A clear perspective is needed in the context of growing complexity, ambiguity, and rapid changes in the Cambodian HE sector.

2. *Consolidating:* the nature of HE governance and accountability rooted in a democratic society and driven by the market of Anglo-Saxon or Anglo-American HE system is not the same as that rooted in the state-run and socialistic traditions of Continental HE (such as French and Soviet) system. As both HE models have influenced Cambodian HE in some ways, the existence of contradictions (for example, between market orientation and state orientation, between academic orientation and state orientation, or between local market standards and international market standards) is inevitable. Yet, currently, the market seems to become dominant. Eam et al. (2021) observed that the perception on accountability among Cambodian university deans have been oriented more towards market, and some scholars (e.g. Sam 2015) have already imagined the entrepreneurialisation of Cambodian universities. Thus, the HE policy makers and steering body needs to align their accountability strategies with the flow of the market and the enterprising cultures, not in a way that devalues the academic and state needs but in a way that generates mutual benefit and collective growth. The same applies to institutional governance and leadership. If accountability is to be embraced by the academics and non-academic staff, the institutional governors, managers, or leaders need to keep updated with the market trends, provide more support, reduce too rigid regulation, improve check-and-balance, and avoid too much negative influence of patron-client relationship and organisational politics on work performance.
3. *Enhancing:* Cambodian HE currently depends on the mechanism of quality assurance (particularly, the accreditation scheme and the internal quality assurance scheme) and the participation of different kinds of stakeholders in the governing boards in order to improve accountability of the HEIs (although there has been variation in terms of practices among different types of institutions). It is recommended that more accountability instruments are used in a diversified but connected way. New market-oriented accountability schemes (such as annual students-alumni survey, employer survey, and reputational rating) can be promoted as part of the internal quality assurance scheme. Quality assessment and academic audit of the educational program or institution (which focuses on evaluating their academic and learning outputs and outcomes) should also be introduced to ensure academic quality in light of regional and international benchmarks. As for the supra-national and international dimension, the Cambodian HE may take into consideration accountability-related schemes, such as regional qualification frameworks, HE diversification and classification, and global ranking. Likewise, indicators of internationalisation (such as number of leading foreign professors, amount of international funding, number of international students) should be considered in relevant performance evaluation. In terms of financing, in response to the current centralised block funding from the government to the public HEIs, introducing a more data-driven, performance-based funding on certain aspects (e.g. teaching improvement or

research performance) is also recommended. Diversifying and then integrating and connecting these different kinds of accountability instruments are needed to respond to different accounting constituencies and cultures and achieve different purposes. Using diverse and well-integrated instrument schemes at the institutional level will formalise and qualify the accountability approaches in Cambodia (which have remained informal (Eam et al. 2021)) and in the long run will allow the country to develop a systemic accountability framework of HE at the national and institutional level.

4. *Empowering:* in the implementation of accountability schemes, empowerment is needed along with enforcement. UNESCO (2017, 2) claimes: No approach to accountability will be successful without a strong enabling environment that provides actors with the resources, capacity, motivation, and information to fulfil their responsibilities. In this sense, achieving HE accountability requires trust from HEIs, academics, and other relevant stakeholders.

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Section II

Cambodian Post-Secondary Technical and Vocational Education and Training in the Changing World of Work and Connected Societies

Chapter 7

Splashing Water at One Another: Public-Private Partnership in Cambodian TVET

Song Sopheak

Abstract

In an increasingly connected society, Public-Private Partnership (PPP) has become a popular mechanism to expand development activities and add values in different sectors (e.g. business, industry, public investment, public governance, national innovation). In Technical and Vocational Education and Training (TVET), PPP has also been a popular discourse. However, the concept of PPP in TVET remains broad and vague, and how the partnership is concretely organised and experienced is little known, even among policy makers and practitioners. The current study seeks to explore perceptions of representatives from TVET providers, Cambodian government agencies, the private sector, and other social partners on their understanding and engagement with PPP. The study employed thematic analyses on in-depth interviews with 20 key informants. The findings suggest that the conception of PPP is quite broad and that stakeholders' understanding is diverse. The level of formality of the PPP mechanism is not perceived the same way by the participants. Most of PPP initiatives in Cambodian TVET focus on training – from internship to skill development workshops. The analyses further show a lack of mutual trust and a disarray of role expectations, stemming from poor coordination and lengthy processing time on the government side and superficial engagement and profit-seeking orientation on the private sector side. Altogether, the findings offer some insights into future design, operation, and evaluation of the PPP mechanism in Cambodian TVET.

Keywords: PPP, TVET, stakeholder collaboration, role expectation, Public Governance Model

7.1. Background

7.1.1. The importance of Public-Private Partnership

The world of work has been changing, and the changes are catalysed by knowledge-driven policies and strategies (from simple automation to advanced data and digital transformation and to knowledge management and diffusion) and complex networking arrangements at different levels (local, national, regional, and global). Public-Private Partnership (PPP) is an important networking and collaboration mechanism at both the system governance level of government and the management and implementation levels of business and industrial enterprises. Both in the advanced and emerging economies, PPP has been viewed as an innovative approach for public sector reforms (Verger and Moschetti 2017).

The connected roles between the public sector and the private sector in the production of goods and services have long been discussed in the history of economy, especially with the free market model of economy advocated by Adam Smith (1723-1790) in his classic volume "The Wealth of Nation". In the capitalistic and market-oriented economy, the market or the private sector is expected to support public institutions in improving the economy; fulfilling the economic and social needs of the public; solving sectorial and social problems; or providing services that the public cannot afford due to technical, financial, or workforce limitation. The engagement of multiple players in the market has been theorised and emphasised as an effective way to ensure national economic development for common goods. According to that theory, common goods can be achieved by allowing individual owners to pursue their wants in selfish economic gain through what Adam Smith called "the invisible hand".

The roles of the market or the private sector in shaping the production of goods and services have been promoted by many countries adopting the idea of free market to guide their economic development and advocated by most influential multinational agencies such as the United Nations (UN), the World Bank, and the Asian Development Bank (ADB) for the development of developing and least-developed nations. A strategy to activate this principle of free-market-based economic development is to transfer the production system from the shoulders of the state to the hands of the private sector through privatisation. So, works which are previously considered to be the responsibility of the state, such as building roads to connect cities and providing education to children, have been increasingly performed by the private sector. It has been argued that public services can be performed more efficiently and effectively by the private sector as they have more experiences in managing projects and know better how to save costs.

However, assuming that the private sector does this better than the public sector is a downplay of the government roles and capacity, which are so important and valuable in its own right. To bridge the polarisation between the state-planned economy and the

market-based production system and to avoid the prejudice that one is better than the other, the PPP model of governance – i.e. the new management model – emerges as a great option. In this model, instead of being transferred, the roles, responsibilities, and resources are shared in a way that yields collectively satisfactory outcomes. That said, the public and private sectors have to work collaboratively, share resources (especially, the ones that the other side does not possess), and be accountable to one another. The assumption here is that both sectors have respective strengths, which can be synergised to optimise the delivery of goods and services to the public.

7.1.2. Public-Private Partnership in TVET

Different models of partnerships have emerged in the field of education long before the concept of PPP entered the field of TVET. Those partnerships can be seen in the form of privatised institutions, triple helix, university-industry linkage, and multi-stakeholder partnerships. In TVET, PPP has emerged quite recently, after being rigorously promoted by Western governments and the World Bank in other sectors (such as construction, energy, and waste management) since the 1980s, and in the education sector in the late 2000s. The promotion of PPP in TVET is based on the development logic that sees TVET and skilled human capital as the main driver for the industrial and economic growth of the country. The promotion of PPP can be seen clearly through the seminal publication by the World Bank's Patrinos, Osorio and Guáqueta (2009), and other subsequent works by the ADB and other development agencies.

In fact, the nature of TVET is partnership-oriented. TVET has in itself the educational element and the vocational element. Training, labour, employment, and economy are terms that come together in the field TVET. The transition from school to work requires a well-designed model of partnership between TVET providers and employers, generally coordinated by the government. Managing industry-based training, re-skilling, and up-skilling activities and mobilisation of workers in the labour ecosystem also require the involvement of multiple stakeholders.

In most countries adopting capitalism and market economy, their TVET system can only function through shared roles and partnership among different stakeholders. The dual TVET sector of the German-speaking countries is a clear example. The dual TVET basically comprises two spaces for training: at school and at the workplace. Sometimes, other venues of training are used. In Switzerland, for example, TVET students (generally referred to as apprentices) are based and trained at workplace, attend classes at school on a part-time basis, and sometimes are exposed to other training programs jointly organised by professional associations and local governments. Such practices imply that training providers, firms, and other stakeholders (such as the professional associations) play equally important roles in providing education and training in a systematic way and in ensuring qualifications, work experiences, skills, and competencies of the trainees. Such a PPP model of the dual TVET has influenced policies and practices in many countries, especially in the current context

that the business and industrial sectors are viewed as the possessors of new forms of knowledge and the main players in ensuring economic development.

But what makes employers in countries practising the dual system engage actively in the training and the TVET sector? In fact, employers do not engage if they do not see the benefits from such engagement. The most cited benefit is the contribution in terms of actual work services and productivity during the training. While obtaining an acceptable level of work productivity, costs incurred by apprentices is lower than that of experienced and highly skilled workers. Second, firms can recruit high-quality workers right after their training. Even poaching can be the case after training, apprentices generally stay working for their training firm that offers appropriate work conditions. Third, firms can reap multiple benefits from being a member of a professional association. In order to be a member, the system makes firms train. Finally, countries in Europe highly value the idea of vocation and profession, regarding it as a calling. In simple terms, work is an important part of life, and quality of work is a pride. These benefits of properly managing the PPP mechanism allow the dual TVET to prosper and the industry to grow.

Yet, existing models of PPP in TVET sectors have been criticised, generally for being too dependent on the market-based principles and for not fully representing a collaborative mission in terms of shared goals, roles, responsibilities, and resources. Also, the educational principles and values may clash with the business principles and values, for example in terms of the extent of profit-making. In that sense, partnerships between TVET providers and other stakeholders that do not find the consensus in terms of principles and values may invite gaps and discrepancies, leading to the inability to achieve convergence and shared objectives. These critiques raise questions on which models of PPP in TVET sectors work, and in which context.

7.2. Why Cambodian TVET needs a functional PPP model?

In Cambodia, including in the TVET sector, PPP has now become a popular concept. PPP is considered as a progressive way for solving various TVET issues such as skills gaps and skill shortages which have plagued the country's labour sector over the past decade. Seeing the potential of PPP in improving the quality and sustainability of the provision of public services, and, with the recommendation of the ADB and relevant organisations as reflected in a report of a study (ADB 2012), the Ministry of Labour and Vocational Training (MLVT) devotes one of the four strategies of the National Technical and Vocational Education and Training 2017-2025 on building a strong PPP for TVET.

Why does MLVT choose the PPP mechanism as a way forward for TVET? Why does it not choose the privatisation mechanism as adopted by MoEYS in reforming Cambodian higher education (HE) in the late 1990s, which has seen the mushrooming of private universities in Cambodia two decades afterwards? One of the answers is that the private sector does not see TVET as a viable business case. The private sector

is not interested in investing in TVET since the investment would require a huge capital for training facilities and equipment and there is a potential risk of low enrolment as Cambodians do not value TVET as much as HE. So, investing in TVET does not sound promising. Another reason is that the government realises that the industry and employers know better in terms of skills and skill-demand in the labour market. The enterprises are the platform for real-world vocational practices. They understand well what training is or is not practical. Finally, from a broader perspective, it can be argued that PPP model and mechanism, if implemented well, will improve Cambodian TVET by extracting resources from the private sector to build TVET infrastructure and capacity and by bringing this isolated sector closer to the changes in business and industrial world. At the same time, the state-led Cambodian TVET can also reduce the burden of using too much public budget on its sectorial development.

However, to implant a system of partnership and collaborative work in a land that has always been defined by separate roles and responsibilities and by the differences in perspectives and capacity, there seems to be a lot of challenges ahead. For one thing, the question of ownership has to be addressed. As noted earlier, the PPP in TVET is driven by international partners, and, while the local stakeholders tend to embrace it, it is not yet clear who will ensure the policy initiative is implemented. Another issue relates to the coordination of the seemingly diverse stakeholders implied by the policy. These various stakeholders are yet to be mapped out, and their roles and responsibilities are not yet clarified. This is not to mention the capacity of the stakeholders to contribute their available resources and play their required roles in the collaborative platforms for TVET.

The issues of ownership and coordination come down to various basic questions on how to successfully implement PPP in TVET. The first is the question of concept. Is there a collective understanding among different TVET stakeholders on the meaning of PPP? The second is the question of design, implementation, and evaluation of PPP. How should the PPP projects be planned, designed, and operated in the TVET sector? What challenges do stakeholders face in implementing PPP programs? What roles do they expect themselves and other partners to play in PPP? And how to appropriately evaluate the success of PPP projects? These are the major questions this study attempts to investigate.

7.3. The current study

7.3.1. Objectives of the study

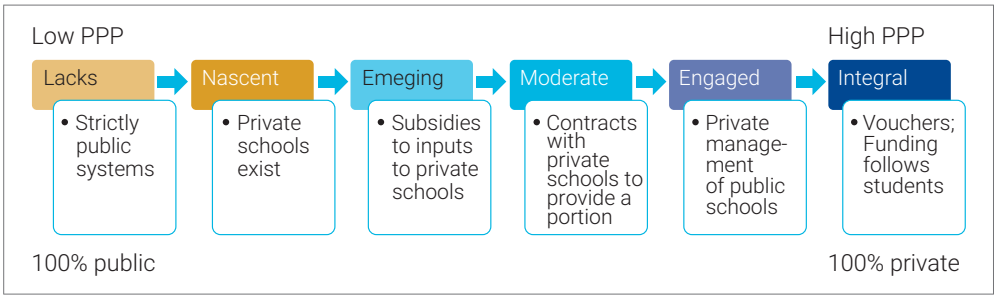
The study seeks to explore perceptions and experiences of PPP stakeholders in Cambodian TVET sector – including representatives from government bodies, TVET providers, the private sector, and other social partners – on (1) their conceptions of PPP, their justifications, and role expectations for engaging in PPP, (2) the different models and forms of PPP, and (3) the challenges the stakeholders face in implementing PPP.

7.3.2. Previous literature

7.3.2.1. PPP concepts and justifications

PPP has become a significant medium for the public sector in general and the education sector in particular. PPP can be broadly defined as collaborative arrangements between public and private sectors for the delivery of goods, services, and/or facilities (Verger and Moschetti 2017, 2). In the field of education, PPP has a diverse range of meanings and is portrayed as incorporating many different policy tools and mechanisms of governance (Robertson, Mundy, Verger and Menashy 2012, 5). PPP is conceptualised as a continuum ranging from low to high engagement of the private sector in the provision of education, as indicated in Figure 7.1. The level of engagement of the private sector in education varies significantly from country to country. In countries adopting the Anglo-Saxon model of post-secondary education and training (such as the United Kingdom and the United States), the proportion of private institutions in the system is high, whereas countries with the Continental model (such as France), state-run institutions still dominate.

Figure 7.1: PPP continuum showing the level of private sector's engagement



Source: Patrinos, et al. (2009), citing Verger and Moschetti 2017, 9

PPP can be considered as part of policy reforms in Cambodia since the country opened its economy and adopted the democratic political agenda. The decline of Official Development Assistance (ODA) to Cambodia as the country's economy has performed vibrantly over recent decades is another factor that explains why the participation of the private sector becomes even more important in major public investment projects. Such a situation suggests the need for strong PPP legal and policy frameworks. In fact, PPP projects have been implemented even before the legal and policy frameworks are set up. Generally, those PPP projects were in the form of concessions, divestitures, management and lease contracts, and greenfield projects, with the first evident project reported in 1992 and mostly in sectors such as electricity, telecoms, airports, and roads (ADB 2012, 8-11).

Currently, the policy and legal frameworks for PPP projects in Cambodia have been centric to the area of public investment and management and are being prepared by

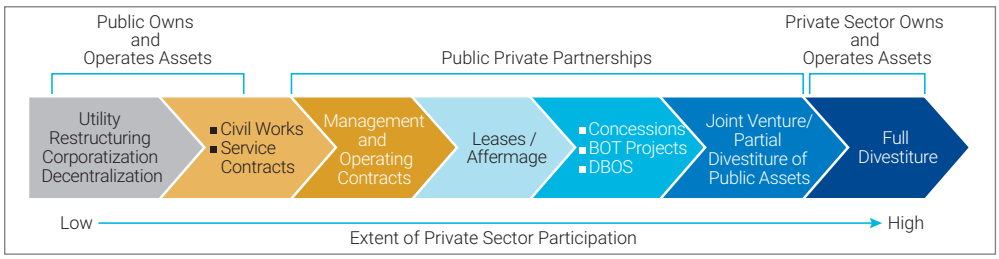
the Ministry of Economy and Finance (MEF), particularly by the Central Public-Private Partnerships Unit (CUP) acting as secretariat to the Inter-Ministerial Committee for PPPs (IMC). Clearly, the legal and policy frameworks at the system level do not exist in a functional way currently, and so institutional frameworks of PPP may also be absent. Only a few formal documents are available for use as the basis for the development of the PPP framework – among which are the 2007 Concession Law, the 2012 ADB's PPP assessment report, and the 2016 Revised PPP Procurement Manual. The Cambodian CPU, for example, defines PPP in a formal and highly project-oriented way as:

> an agreement between the State and one or more Private Partners to restore, repair, expand, build, operate and/or maintain public infrastructure, Project Assets or to provide public services within a certain period of time, under which the Private Partner shall invest, bear risks and receive benefits based on performance and all of which shall be stipulated in the PPP Contract.[1]

7.3.2.2. Models of PPP

The World Bank offers a framework to define different types of PPP. One way to differentiate between the different types of PPP is to observe how the private sector takes responsibilities in the project and the level of risks it takes, which have to be stated clearly in the contract. The different models of PPP also vary by duration of the contract, capital asset ownership, and the value on return on investment (RoI) (Wolmer 2002, cited in Olele 2016, 2). These different indicators result in different types of PPP: management and operating contracts; lease/affermage contract; concessions, Build-Operate-Transfer (BOT) projects, and Design-Build-Operate (DBO); and joint venture/partial divestiture of public assets (see Figure 7.2 below). Cambodian classification of PPP in the public investment sector shares a similar definition. From the CPU's public investment perspectives, the commonly-acknowledged project models of PPP include: 1) Build-Operate-Transfer (BOT); 2) Build-Own-Operate-Transfer (BOOT); 3) Build-Own-Operate (BOO); 4) Management Agreement; and 5) Design-Build-Finance-Operate-Maintain (DBFOM) (CPU, n.d.)[2].

Figure 7.2: Forms and traits of PPP arrangements or agreements



Source: https://ppp.worldbank.org/public-private-partnership/agreements

[1] CPU (n.d.) on What are PPPs? Retrieved from https://ppp.mef.gov.kh/ppp-frameworks/what-are-ppps

[2] CPU (n.d.) on What are PPPs? Retrieved from https://ppp.mef.gov.kh/ppp-frameworks/what-are-ppps

7.3.2.3. Key principles and challenges of PPP

The success of PPP is driven by certain principles and factors. Hayford (2004), as cited in Olele (2016, 2) argued that three principles should guide the implementation of PPP: attempting to foster private sector confidence, safeguarding the public and stakeholder interest, and assuring an appropriate, competitive tendering process. With these guiding principles, the engaging partners should ensure as well that the coordination and communication process is open and direct; the contract should not be vague and unclear or spoiled by hidden agenda; clear lists of roles, responsibilities, deliverables, and timeline; and appropriate monitoring and evaluation plan and actions should be in place.

Divergence from these core principles will cause problems and many challenges for any PPP project. Olele (2016, 8) comprehensively reviewed existing literature and pointed to the following challenges that generally come to the fore when implementing PPP projects, among which are:

- conflict of interest of the partner organisations,
- diversity of underlying goals among partner organisations,
- insurance of power balance,
- communication barriers among partner organisations,
- difficulty in resource commitment,
- ambiguous definition of contracts and agreements,
- high upfront cost,
- high procurement cost,
- inadequate expert knowledge, and
- citizenry rejection and public opposition.

With these challenges, PPP projects are likely to fail, or the impact of the project is not significant. It is also likely that the trust in future partnerships between the government and the private sector can be deteriorated if most of the prior PPP projects face the above challenges.

7.3.3. Research methodology

The data for this chapter are drawn from a qualitative research study aiming to provide a preliminary picture of what the existing practices, experiences, and understanding of PPP are like among key stakeholders of Cambodian TVET. These stakeholders are composed of government ministries (e.g. MLVT, MoEYS), TVET providers (institutes and schools), private enterprises and business associations, and NGOs/IOs and

development partners.[3] Twenty key informants were selected purposively based on their prior engagement in PPP in TVET. Most of them are based in Phnom Penh although some have their scope of works expanding to some provinces of Cambodia.

The interviews lasted from forty minutes to one hour and focused on how each of the stakeholders defined the PPP in TVET, their experience with it, the value they associate with it, the challenges they face in working with others, the approaches they used, and their expectations of other stakeholders. When thinking of approach of engagement, the interviewees are prompted to think of various roles and functions they can play in TVET. These include training content development (programs, curriculum, or materials), training delivery (classroom instruction, internship, or apprenticeship), monitoring and evaluation, funding and governance, and policy formulation.

The primary data of the interviews consist mainly of interview transcripts and field notes by the research team. The interviews were transcribed verbatim and translated into English by the research team members. These data were then analysed by means of thematic coding using Nvivo 11. The coding was done in four stages. At Stage 1, the transcripts were segmented and rearranged so that the chunks of texts fall into proper main themes as represented by key questions of the interview. Stage 2 was an open coding stage whereby the researchers went through each transcript and assign a code or codes to a meaningful sentence or paragraph of the segmented texts. At Stage 3, the codes were compared within and across cases, and similar codes were combined into categories. Finally at Stage 4, relationships among categories and codes were identified and classified into main themes that respond to the guiding questions.

7.4. Findings

7.4.1. Conceptions and justifications for engaging in PPP

7.4.1.1. Conceptions of PPP

Based on their real-world experiences, TVET stakeholders share a general conception on what PPP is. To most of them, PPP is the formal form of collaboration, partnership, and/or joint activities of the state and the private sector.

> In my opinion, PPP is the participation of different parties from private and public institutions in order to cooperatively train youth to attain a certain skill, so that they can work at private companies... The cooperation needs proper goals and strategies. [KII_09]

[3] NGOs/IOs and development partners are not included the literature on PPP in VET in European developed countries but are included here because of their important contribution to the skill training and development of Cambodian youth. Labour union is said to be an important body to represent workforce in the skill training systems in some countries but interviews with some of Cambodian labour unions prove that their roles in skills training are very minimal or non-existent.

Most of the participants see training and capacity development as the most common themes and objects for collaboration.

> The cooperation and participation from private sectors are essential for: 1). training students to acquire knowledge and skills so that their future will be bright… that is, human resource capacity and development; 2). familiarising students with real work environment, which can be done through internship and apprenticeship often offered by the private sector and stakeholders… and 3). applying theory into practice … new signs of innovation [KII_16]

Not all of the participants experience PPP in a formal sense or in relation to only training. Some stakeholders experience PPP merely as a discussion platform to find solution to particular problems, to ensure good policies, or as a business exchange activity in response to different needs of the stakeholders.

> The good point is that the government has allowed the private sector to be part of the working group with the government to engage in discussions… making laws, or drafting policy regarding capacity development or human resource development… [KII_12]

Interestingly, some participants notice the differences in PPP forms among different ministries in Cambodia. They observe that the PPP model adopted by MEF for TVET focuses on obtaining financial contributions from partners, which is not the same as the conventional form of PPP practiced by MLVT, which is conceptually more of a general form of collaboration on training. An interviewee claimed:

> PPP of MLVT and PPP of MEF are different. PPP of MLVT is for only the purpose of sustainable development, while PPP of MEF aims to ask for financial contribution from private companies… MEF has initiated the Skills Development Fund project that aims to encourage joint training with an expectation of 50 percent of cost being shared by the private sector. [KII_17]

7.4.1.2. Justifications for engaging in PPP

A number of practical reasons have been raised to justify the engagement in PPP. Among those reasons are the needs to voice concerns and exchange information and resources (particularly, quality human resources) and to build brand names. Such mutual needs and expected benefits of the stakeholders guide the initiation and implementation of PPP-related activities. Generally, the needs are raised by the private sector which needs skilled workforce with industry-related knowledge and know-hows.

> … if the schools do not have any channels to listen to concerns or expectations of the employers, what the schools will produce will be like what it is now. Universities just produce thousands of graduates for the market, but they don't know how qualified the students are… we have only general knowledge schools or general knowledge universities… So, we think of PPP in TVET as something that's necessary, and we will always welcome when the TVET providers are open for the private sector to participate in sharing our opinions and suggestions. [KII_04]

> I also think that they [the companies] can open up for students to learn at their workplace. Even when people go to learn and the company does not get anything back, they will at least build the brand name for their company among the general public. … The company should be more willing to do that sort of work in order to show the customers that they are engaging with the community by means of knowledge sharing. [KII_05]

Training providers also play important roles in supporting the multi-stakeholder PPP mechanism which creates a scenario for mutual benefits. They are particularly good at curriculum development and training delivery. Some of their representatives claimed:

> I think the main drvier is from the industry side; the industries receive information regarding their businesses from the Industrial Advisory Committee… So, they can set the standards. However, they still need to collaborate with schools… For example, when a company receives an information that there will be an investment on oil drilling in 2040, the company can set clear standards and ask the schools to develop a curriculum that fits into the required standards. [KII_10]

Another reason for the private sector to engage in PPP programs with the training providers is to develop quality workers through a robust pre-employment training as a strategic, long-term mission, rather than just to offer a few days of orientation to new recruits. Public training providers have necessary training facilities and resources that would be too costly for companies to invest in.

> If we have an approah to support companies in their training … then I think it will be easier. If not, the private companies have to spend a lot on training. You need to hire teachers, have rooms, buildings, and equipment in order to train. Companies will not do that. It's easier for them to just accept the available human resources. Some companies only do orientation for a few days and then workers start their job. [KII_09]

7.4.2. Forms of engagement

Unlike the formal classification of PPP models of the MEF's public investment sector, the forms of PPP which are most common in the Cambodian TVET sector are training-oriented. Based on the interviews, those forms of PPP include scholarships, internship, training (contract-based formal training and Swiss modelled dual training), and workshops and seminars on skill development.

Internship: Internship is viewed as the most important and common form of training collaboration. A representative of a private company noted that the company offers internship opportunities annually to students from National Polytechnic Institute of Cambodia (NPIC), Institute of Technology of Cambodia (ITC), Industrial Training Institute (ITI), Preah Kossomak Polytechnic Institute (PPI), Phnom Penh-based Don Bosco Technical School, and other universities to work and get training on car machines. Another company representative said that his company received around five or six interns from NPIC and other universities. Likewise, a representative of a business association claimed that his institution generally receives at least one (sometimes two

or three) intern(s) every year, believing that internship is good for them:

> My place usually has at least one intern. Sometimes there are two or three interns… we don't have a clear internship program... But I still think that internship is beneficial; that's why I encourage my team to find a new intern after one has completed his or her training. At least the student will be familiar with the real working environment. [KII_12]

Internship is viewed as a platform for mutual benefits. And it seems that for most companies and training providers, internship programs are favourable for both sides. A bank representative noticed:

> The reason why the internship program is created is not only for the company benefits, but we also want to share knowledge with the students. So, the bank tries to support them as much as we can. [KII_14]

Interns work under direct supervision of a supervisor or a team of supervisors. They are treated as people who are learning to work, and the companies are reportedly considerate of their [the students'] academic workloads at schools.

> We have different teams [that the interns can join]. If the student comes to be trained on design skills, they will sit side by side with our designers. Our designers will give them assignments for the students to learn to draw and design. After that, it will be checked by the designer to see if their works can be used. [KII_07]

From the perspective of the training providers, internship is highly valuable, and they highly acknowledge the importance of internship opportunities given to students. However, they also noted some challenges. A representative from a post-secondary education institution claimed:

> The private sector helps a lot. 800 students every year get the chance to be an intern. That's remarkable... The reason they accept our students is that they know us. We have students who have already worked there. … Luckily, we have UILO (University Industry Linkage Office) whereby one officer handles works related to building connection with the private sector. [KII_06]

Occupation-specific contract-based training: One of the public TVET providers has a formal training program with a long-term contract with the industry. Its representative explained:

> We have implemented 2 PPP plans. The first one is our work with Camko Hyundai… We have to train students for a year, which includes training at our school and engagement in practice at the Hyundai factory in Koh Kong… We organise the training here for three months. After that, we send the students to the factory for a month. Then they return here for further training. The company constructd a building for us and equipped it with necessary facilities. But we have to spend on the students' training and living expenses. And the factory pays once the students are trained at the factory… The factory also has buildings for training and accommodation. The buildings are all in good conditions... We work together on curriculum and on training time allocation for theory and application... There's also another plan that

> we're implementing with Chip Mong. We're implementing this second plan by providing training for three years. All the students are chosen by the company, but under the supervision and assessment from NPIC. We have a program that trains them for two years in class and fieldwork, but for the entire final year, the students have to be at the factory to see how the work they learn through training is applied in the real world. [KII_09]

Some training mechanisms of the reported PPP programs are similar to the idea of Swiss-modelled dual vocational education and training, whereby the public TVET providers, the business or industry stakeholders, and the trainee (or apprentice) enter into a training contract. In fact, such a training model is part of the skills development program supported by the Swiss Development and Cooperation Agency (SDC) since 2015. A representative of a development partner offered an explanation while noting the challenges of introducing this dual model to Cambodia:

> We chose 32 students to join our training program, and they studied directly with the master craftsman while also studying soft skills at school. That means we simultaneously matched their practical training with the school curriculum. However, it was extremely difficult in managing such a curriculum. Based on our experiences, we couldn't teach in alignment with the curriculum structure all the time. So we decided to change it to a four-month training at school and a two-month internship at workplace instead. From a PPP perspective, even if it was not official as done by how the government, we still contributed in terms of job opportunities to the students from the start. [KII_03]

Workshops or seminars on skill development: Attending workshops or seminars, free or fee-paying, is also a common form of PPP among firms. Sometimes, representatives from private firms are invited to speak; sometimes, they attend the workshop or seminar as participants or trainees. Following are some of their comments:

> It was a kind of workshop although we didn't actually have them [the participants] practice what they learn. We talked about the production process in our presentation and showed them tools and equipment that would be used in real work… Generally, we spend from two hours to four hours. Next month, we have a plan to go to three schools. … so that once they finish, they know how to find a job and how to behave, how much knowledge and skill they have learnt… We also joined the SSC (Sector Skills Council). It talks about policy and law… [KII_11]

> When there is a workshop in our construction industry, there are a lot of actors, including MEF, MLVT, Sector Skills Council, schools, and private companies. Private companies have to go through the Sector Skills Council. The Sector Skills Council is like a business association, but it provides consultation for each sector. [KII_02]

Scholarships: Finally, scholarship is offered to students either through recommendations from a university or directly (to the students) through an open scholarship program of the company. For instance, at the time of the study, a participating company was sponsoring two students for a bachelor's degree.

7.4.3. Challenges and stakeholders' role expectations

7.4.3.1. Stakeholders' reported challenges

Stakeholders reported various challenges of PPP programs or activities they have engaged. Those challenges imply a critical problem of misunderstanding or dissatisfaction by the private sector side on the public sector side and vice-versa. While the participants in the interviews try to be diplomatic and polite in expressing their feelings and explanations, their remarks call for a serious consideration on the conflicting position among the different stakeholders.

Lack of government support, lengthy processing time, and untrustworthiness: The collaborative and engaging spirit among the different stakeholders in the PPP programs is considerably low. To explain, a representative from a business association offered a long remark:

> When we talk about partnership, there needs to be support. Cooperation is one thing, but we need mutual support. Government already has TVET institutes and centres. However, have these centres served the demands of the private sector? For example, I'll talk about the textile sector. Are there any public TVET providers that are able to provide the skills for the textile sector? Up until now, GMAC has created a training institute for tailoring skills by itself. At this current stage, I think that there's still a challenge regarding training; the government is still unable to meet the needs of the private sector... [KII_12]

The representative continued reiterating that the skills and knowledge imparted by the post-secondary education and training institutions are more generic rather than occupation-specific and thus producing students with similarly low level and limited scope of knowledge despite the difference in their academic majors. And that is not helpful for firms:

> Skills and knowledge that are trained at school do not reach the basic level of each skill, meaning that what the students learn are the same for all majors. They are just general knowledge… whichever school the students go to, the knowledge provided is almost the same. What the students learn in an accounting program is the same as what the students learn in a marketing program, and knowledge from the marketing program is the same as that in the HR program. [KII_12]

Moreover, the private sector stakeholders indicate in their responses that they are frustrated with the slow and lengthy working process and that they have low trust in the intention to work together.

> The working process of the public sector (from administrative procedure to decision making) is problematic for the fast-pacing working culture of the private sector. Sometimes the invitation from the public sector to the private sector asking for a representative to join their events is not properly arranged in terms of time. They may think that it's a waste of time and money... I see that most private companies feel that they [the public sector] are being

> forced to do it, and they don't know how much preparation and confidence they should have before taking any actions. [KII_11]

> One time, the Departments of Agriculture, Industry, and Food Chemistry of RUA invited us to join them to check curriculum and offer advices. However, sometimes we cannot prepare ourselves to participate on time. [KII_05]

Accountability and transparency are strongly needed by the private sector, as one participant noted:

> It is about honesty; if we take the money, we need to perform it accurately. There needs to be transparency for all, and we need to inform each other back and forth. [KII_12]

In fact, some representatives from institutions in the government sector also acknowledge the slow process and the lack of efficiency of some public institutions:

> Slow performance and long processing time from the government… that is what I said. Our public schools do not have a specific platform to deal with businessmen. "I have to ask for permission first" is always a response… they [the private sector] work with us today, they want us to reply as fast as possible so that they can plan well. In fact, our state's office work is slow, and so we do not gain trust… We do not have any specific plan right now, but they [the private sector] are still willing to pay 50%, so in 2018, if we have the plan, the private sector will be willing to pay even more. [KII_02]

Lack of engagement from the private sector and profit-seeking orientation: The public sector, on the other hand, sees the private enterprises as not being part of the skills training process and are not convinced of the benefits from providing or engaging in training support. An NGO training centre's representative said:

> The main thing is willingness, and the cooperation from them [the business owners]. They are not open [to more knowledge] because they think that they are already successful, so there is no reason that they should get more training. But there is a new generation of trainers that try to push their business to perform better. [KII_15]

The private sector sometimes does not engage meaningfully as expected by the training providers.

> We want their participation so that they tell us what their market demands are in terms of skills and occupational areas. Then we can place them into our curriculum and discuss whether the new curriculum is appropriate for the new demands. But often, when we invite different parties to discuss… they don't send the participants with proper skills; instead, they send people such as the administrators to discuss with us... So we cannot have a proper discussion about what should be trained. [KII_10]

The lack of mutual understanding and support could be caused by a lack of information sharing. The following remark was from a business association's representative:

> The government doesn't know exact numbers and types of staff big companies will need in the next three years. Partnership means that you need to know each other... The government needs to know what Cambodian banks will need in five years, but if you go to ask the government officials now, they do not know. The reason that the government doesn't know can be either because of the government or because of the private sector. Some private companies don't give answers when they're questioned or surveyed. Sometimes they think that providing the information is like revealing their future strategies. So, it's not a problem from just one side; it's from both sides. [KII_12]

Another private sector representative further complained on how disconnected the public training providers and the private business firms can be.

> We do not even know what those training institutes do in terms of skill training. We only know certain points, but we have never communicated or discussed with each other about things like how many students are graduating or how many students are interested in getting a job at our member companies. Also, they have never asked us about things such as the skills our workplace is currently looking for. I think every year, they have plans to set up a new curriculum, but they have never invited us for a discussion. [KII_05]

The level of participation of the private sector in the PPP platform is also questioned by the public stakeholders, especially in issues related to costs incurred and profits gained. Representatives from two training providers raised concerns as follows:

> When I ask other institutions, they also raise the same concern that the private sector only wants quick profits. So, they [the private sector] have no interest in investing in training. They are unsure if the training results will actually benefit them. But for Chip Mong, it's kind of different…Chip Mong has a very long-term perspective. [KII_09]

> They just wait for us to train. When they need workers, they just interview and hire them… They think too much about profit, not about sacrificing for society... such as providing opportunities for students to engage in internships or to deliver presentations. [KII_10]

However, the private sector acknowledges that thinking of costs, time, and benefits is natural for all private businesses. For them considering profits does not suggest that they do not want to offer training but that they have to do it based on their real business and institutional contexts. A bank's representative described the various issues to be considered in offering training:

> … because almost everything we do depends on our workforce, and we have to spend on their salaries… from the starting point of the announcement, selection, shortlisting, orientation… After that, when we get the report [from the interns], we have to give them a certificate as well… the trainers who mentor the interns also have their own work to do at the bank, and we have to pay them as well [for such mentoring services], but it was an invisible expense. [KII_14]

Quality and sustainability of collaboration: Quality of the process and outputs of collaborative engagement are also of concern to some participants in the study:

> In the structure of the NTB [National Training Board], we believe that members of the NTB are not supposed to vote on many things that are technical. But if the government wants to organise PPP… and if the NTB opens up for participation from employers and other stakeholders in their sub-committees to offer opinions and to review competencies, I think it will be more realistic, because I believe that the programs developed by the private sector is more on point with the market. [KII_04]

Discontinuity of PPP is a very likely situation, especially when funding or support from the developing partners is terminated. One participant said:

> Overall, we think that PPP in TVET is good, but the actual practice is not good yet. We need commitment to improve the PPP process. To put it simply… if there weren't any supporting financial packages from the ILO or the ADB, the work of TVET wouldn't have been so active. This is how we see it. But we still encourage more collaboration between the private sector and government to avail room for us to talk about our concerns and what we want. [KII_04]

7.4.3.2. Stakeholders' role expectations

When inquiring about their needs, their expectation, or their suggestions to promote PPP in TVET, the participants in this study offered a pool of opinions and perspectives that can be informative for different stakeholders (government, private sector, TVET providers, and development partners) in their engagement in or contribution to PPP projects.

Government: The government is currently the leading stakeholder in establishing PPP strategies and mechanisms. The government is expected to adjust its approaches to ensure responsiveness, efficiency, and effectiveness and to regain trust from other PPP stakeholders.

> The government has now recognised the need for PPP, and it also needs investments from the private sector, but before the private sector is willing to invest, the government has to contribute something. The Ministry of Economy and Finance is collaborating with the Ministry of Commerce to organise the mechanism in order to guide investors on the PPP concept. [KII_03]

With the introduction of Skills Development Fund in 2018, the government has made changes in terms of resource sharing as a representative from a ministry noted:

> It [the fee spent on students] is half the responsibility of the state and half the responsibility of the company. The state helps minimise the expenditure. Kubota in Battambong, for example, needed more mechanics since a lot of locals had migrated to find jobs in other places. That was when the interaction [between the government and Kubota] occured… which means that PPP has benefits for both the suppliers and government. [KII_02]

But the government is expected to do more to improve the level of funding the private sector is willing to contribute and the benefits the private sector gets in return:

> ... when I was in a meeting organised by the Sector Skills Council, I made a serious comment in order for it to improve its operation. The Council has to set a clear benchmark on the level of funding needed from the private companies and to specify what benefits the companies can gain if they provide such funding. Also, the outcomes have to be guaranteed. [KII_11]

The government also needs to be more supportive to the private training providers' initiatives on skills training and the private firms' practices of staff training. An association's representative suggested:

> … we think that if the government encourages more of this [PPP], it will be even better. For example, a company has a corporate or private partnership with the purpose to train technical skills to the company's workers... if the government supports this initiative, such as providing incentives by cutting down taxes, it will be good... Secondly, there should be a policy for incentivising the companies and enterprises that are currently willing to train their staff. … Thirdly, if companies have a clear report to show that they have acceptd students to be trained at their workplace, there should be a policy to incentivise them. [KII_04]

Private sector: The private sector is keen to take more decision-making roles in their engagement in the PPP platform. A business association's representative claimed:

> … in our most recent project, with ADB providing the financial package and DGTVET the implementing agent, the private sector is allowed to make decision. The ADB doesn't let the government be the leader alone. This concept is good, but we need to discuss the internal structure a little more… [KII_04]

What the TVET schools strongly expect the private sector to do is to allow their skilled technicians to take part in PPP activities because those technicians stay updated with the current industrial knowledge, which the TVET trainers are not exposed to.

> We want technicians from them because each company doesn't keep its labour force with the same knowledge and skills all the time… technology is always changing. So, we want their participation so that they can tell us what their market demands are in terms of skills. Then we can add those skills into our curriculum and discuss whether the new program is appropriate for the new demands. [KII_10]

While expecting the government to understand their conditions, the private sector is also willing to be more communicative to the government and more engaging in order to avoid misunderstanding.

> It's like the obligation to pay taxes. So, it [training] is also a part of the obligation of the private sector. If the private company doesn't know, they should find out more about it. If the company already knows that, they should participate, and not ignoring it… I think that the private sector can initiate an idea or cooperate with the government to organise job fair relating to technical skills. [KII_04]

Sometimes the private sector can be creative in PPP. For example, quoted below is a partnership between a private training provider and a private company.

> Some companies have collaborated with technical training schools. For example, in Siem Reap… there are MOUs with a private school... That school trains technical skills for tourism and hospitality… The school is not under the auspices of the ministry. The partnership is between the private sector and the private sector. [KII_04]

TVET providers: From a training and educational point of view, the training providers are the central agent in the PPP. They are also the ones that receive the most blame when the country faces skill shortages or skill gaps and if the companies cannot properly find trainers to up-skill and re-skill their employees. Generally, the training providers are expected to change their approaches and become more active and responsive in the PPP mechanism. The roles of public TVET institutions are highly necessary in qualifying the workforce at the pre-employment stage.

> … it is the school that has to enhance the quality of the students it produces because we [the private sector] have already contributed. We have provided comments on the programs, curriculum, and quality evaluation. We have provided workshops for sharing knowledge on technicality and career guidance. So, we now need to depend on the schools to take our comments and implement them. [KII_11]

> I sent a proposal to offer their students an orientation workshop but there was no follow-up reply. I contacted the same number, but they didn't know what I was talking about… Recently, I've seen that they've made changes and they're doing a lot better, but they're still performing at low quality level. [KII_11]

Under the current context, TVET providers are obviously limited in authority in attracting more firms into the partnership. So forming partnerships with the private sector through government-led mechanisms is strategically important, but much support is needed.

> It is the national government's role because, as a vocational training centre, we do not have the power to negotiate... the companies will engage if there is an official regulation from the government that requires the companies to check for license or certificate from a recognised training institution before they employ a skilled worker. [KII_15]

> Skills Development Fund project uses incentives to encourage training providers to find their private sector partners and writes a proposal for joint training. [KII_02]

Development partners: Teacher training is an area where the development partners can contribute in order to build a strong TVET system in Cambodia in the future. A TVET provider's representative discussed the plan as follows:

> We have been cooperating with GIZ on research related to technical skill trainers. Our plan is two years. We try to improve the teachers' ability. Here we don't train technical trainees, but we train technical trainers around the country… GIZ has helped us upgrade the skills of technical trainers because it believes that in order to improve the trainees' ability, we need to improve

> the teachers' ability first. We have also cooperated with the Francophone, focusing specifically on inspections… Recently, we have collaborated with the Schneider Foundation... [KII_10]

Another training provider reiterated similar needs for partnership on training of trainers.

> Our teachers do not have the required experience yet; they've just finished school and started teaching, so their real-world experience with machines at factory is still limited. That's why we invite the (non-governmental) organisations to help the trainers… There will be a lot of benefits from such supports, for both the students and the trainers. The experts from JICA and other (non-governmental) organisations are very experienced. [KII_09]

Development partners are also needed to help with trainer development at private firms.

> GIZ has worked on in-company training standards. It means that it [GIZ] is creating trainers for companies. The trainers are developed so that they can share their experiences with staff. Sometimes, those trainers do not study at a high level, but they possess real working skills. So, the company needs to create something like that to allow the specialists to learn how to train and share their knowledge effectively with other workers. [KII_05]

There is also a need for more assistance from the development partners for training and guidance on how to participate in and operate the PPP platforms and mechanisms.

> … EU, with SIDA, has already acceptd a project proposal to create the PPP platform. There are a lot of institutions joining this platform. When I joined one of the workshops, the Ministry of Commerce, Ministry of Tourism, PPIU, donors, the Cambodia Tourism Federation, and the MEF participated. [KII_03]

Curriculum development at the TVET providing institutions is also an area that the developing partners may need to engage more in the future.

> In the beginning, we worked with KOICA on training. They sent their experts as volunteers to work with us… They helped organising the events… developing the course syllabus, organising the training for trainers, teaching software application to the students. They helped a lot. Then we had JICA… Other organisations have helped in a similar way. We collaborate with all of them, as volunteers or as experts. [KII_09]

7.5. Overall discussion, conclusion, and ways forward

To build a strong PPP mechanism in TVET, a clear understanding of how stakeholders conceive the idea of PPP, how they rationalise their engagement, how they implement it, what they think about roles of other stakeholders, and what they see as enduring challenges are important. The current study explores these aspects of PPP in Cambodian TVET, situating the exploration into the larger framework of PPP as set out by the Cambodian MEF in the public investment sector and the popular PPP models used by international development agencies such as the World Bank.

Insights into these various aspects of PPP in TVET are highly relevant at the moment in order to ensure that national efforts to engage the private sector in workforce training progress in the most informed and coordinated ways. These insights will help stakeholders to develop relevant policies and operating mechanisms that are shareable, implementable, and acceptable to all Cambodian stakeholders, thus, embedding a sense of ownership in the collaboration. The term "sharable" is very important because it represents the core value of any partnership and it has to be emphasised here in Cambodia because it presumes a change of direction and approaches of the governance system of Cambodia.

The conceptualisation of PPP in TVET, as the data suggests, is still broad and unevenly understood among Cambodian stakeholders. The level of formality of PPP mechanisms and projects are not perceived the same way by different stakeholders. Current engagements are not ruled by formal legal and policy frameworks and concrete regulatory regimes, making the stakeholders see PPP in a more general sense, operationalise the concept in their own ways, and use it for specific and practical collaboration purposes in accordance with their perceived threats and opportunities. The lack of shared understanding of PPP has also caused a disarray of expectations and engagement among the stakeholders, all caught in a game of responsibility avoidance and blaming, as expressed by a popular Khmer phrase – **សាចទឹកដាក់គ្នា** (splashing water at one another). The study, therefore, suggests that Cambodian PPP in the TVET sector should become more formal. The suggested mechanism of the CPU may offer a good model for the implementation.

The justifications for engaging in PPP are common among stakeholders, i.e. for shared information and resources. However, the sense of urgency and necessity of PPP in TVET is not justified in actual practices. The current governing and operating mechanisms of PPP in Cambodian TVET seem to be not strategic and depend more on the PPP policies and strategies designed for the public investment sector in general.

The study also finds that PPP in Cambodian TVET focuses only on training. In fact, most reported forms of PPP are more or less a type of training. Those training-oriented collaborations tend to be ad-hoc, unstructured, and not sustainable. The study confirms that skill specificity, skill generality, and professional attitudes are still important for the stakeholders to consider when conducting joint training.

Systemic and long-term exchanges of trainers and large and sophisticated TVET infrastructure projects are also not yet common in the Cambodian PPP environment. Likewise, the more social and community-oriented PPP projects are not observed in this study. Billet and Seddon (2004, 63) suggest that social partnership within the TVET sector may offer new opportunities to 1) address apparent failures in the capacity of centralised agencies to be policy sensitive to needs arising away from the centre; 2) expeditiously advance government initiatives (e.g. school to work transition); and 3) encourage capacity building in regions away from the centre. As a vision, this

social partnership idea can contribute largely to enhancing the outreach capacity of TVET providers as well as transforming workplaces and communities to be learning agents. To achieve such a vision, the social PPP project requires a strong trust-building ability of the coordinating agency. It is recommended that the PPP framework of the TVET sector should extend its reach from just focusing on training to other productive collaborations among stakeholders.

In terms of challenges of PPP, the current study further implies that trust and communication issues are among the biggest concerns for all stakeholders. While the government accuses the private sector for being short-sighted and too profit-oriented, the private sector questions the government's real intention to promote the private sector's participation, the lack of investment in PPP, and the inefficient working culture of the government/public sector. The trust-building mechanism needs to be enhanced.

The study suggests that the current PPP practices in TVET are neither structured nor well coordinated. Stakeholders' true willingness and shared responsibilities and roles are needed at different stages of PPP process, suggesting a necessity for PPP design, operation, and evaluation framework. The government is expected to be more responsive in correspondence and investing more into the partnership to share the burden of training costs and to be more supportive to private training providers and private firms that can prove they have outstanding track records in training workforce and staff. TVET providers must focus more on improving the quality of their training delivery and strengthening their capacity to engage and work with the private sector to offer joint training programs. The private sector should be more pre-emptive in passing information on skill demands and share industrial expertise with TVET providers. Development partners are also needed in strengthening the foundation of the system such as trainer development, curriculum design, and establishment of PPP platforms.

In a nutshell, PPP in the Cambodian TVET sector needs to improve the formalisation of the coordination and communication approach, improve the quality and clarity of PPP contracts, build trust among stakeholders, find strategies to allow stakeholders to commit resources based on contract and improve the monitoring and evaluation process. Speeding up the issuance of PPP-related legal and policy frameworks and regulatory systems (that apply across sectors and training business and industrial sectors) are highly recommended. Among the training themes, the ODA and public investment environment; professional project development, management, and monitoring and evaluation, and best practices of successful partnerships should be included.

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Chapter 8

Rethinking Talent Development for Industry 4.0

Song Sopheak, You Saokeo Khantey, and Khieng Sothy

Abstract

This chapter takes a brief look into the defining features of Industry 4.0, its effects on the economy and labour market and the implications of those for education and training, and how the education system can be adapted to respond to the need for new talent. The study uses document and literature review approaches to achieve its objectives. The key takeaways for policy reforms include rethinking education and training approaches, lifelong learning, transferability between technical and vocational education and training and higher education programs, and public-private partnerships as a platform.

Keywords: Blended learning, talent development, future skills, profession, Industrial Revolution

8.1. Introduction

Cambodia aspires to become a knowledge economy with the ambitious development vision of achieving upper-middle-income country status by 2030 and higher-income country status by 2050. To that end, one of the main national development strategies is to diversify away from export-driven economic growth and labour-intensive industry by (1) improving logistics systems, energy, and digital connectivity, (2) developing new main sources of growth, (3) getting ready for the digital economy and the fourth industrial revolution, and (4) promoting the finance and banking sector (RGC 2018). Recent studies of the Cambodian labour market indicate an increased demand for higher level knowledge and skills, although low-skilled occupations still account for the vast majority of jobs. In an employer survey conducted in 2017 by the National Employment Agency (NEA), the required skill level was moderately low, with plant and machine operators accounting for 62.2 percent of total jobs, while technicians accounted for just 4.8 percent, managers 3.7 percent and professionals 3.4 percent (NEA 2018a). That said, according to the World Bank (2019a) report *Cambodia's Future Jobs: Linking to the Economy of Tomorrow,* the share of knowledge-intensive jobs increased significantly between 2009 and 2015 while that of manual jobs was stagnant or declined. Sectors that require high levels of knowledge such as information and communication technology (ICT) and finance and insurance are estimated to have the fastest growth rates at 5.7 percent, led by the food and beverage sector (7.5 percent) (NEA 2018b). The NEA (2018b) also reported that workers are in most demand in the areas of computing science, information technology, and multimedia. This change in occupational profile is a positive sign of development towards a knowledge economy. Even so, there is still a long way to go before Cambodia can realise its economic aspirations.

The quality of Cambodia's labour force has been a persistent constraint on its economic development and diversification. Poor labour quality parallels low labour productivity, which then hinders modern business development and restrains diversification gains from foreign direct investment (FDI) beyond garment and textile industries. Eighty-five percent of today's labour force did not complete upper secondary education, and there is a certain degree of uncertainty about the capabilities of the future workforce currently in schools. As jobs become more knowledge-intensive, new entrants to the labour market will be at a particular disadvantage because they will be unable to engage and thrive in unfamiliar jobs (World Bank 2019a).

This chapter briefly delves into the essence (defining features) of the fourth industrial revolution, its effects on Cambodia's economy and labour market and the implications of those for education and training, as well as how the education system can be adapted to respond to the need for new talents.

8.2. Industry 4.0

8.2.1. Definition

'Industry 4.0' is usually used as an umbrella term for the perceived tech-enabled transformation of industry. Here are several examples of how different authors have described the term:

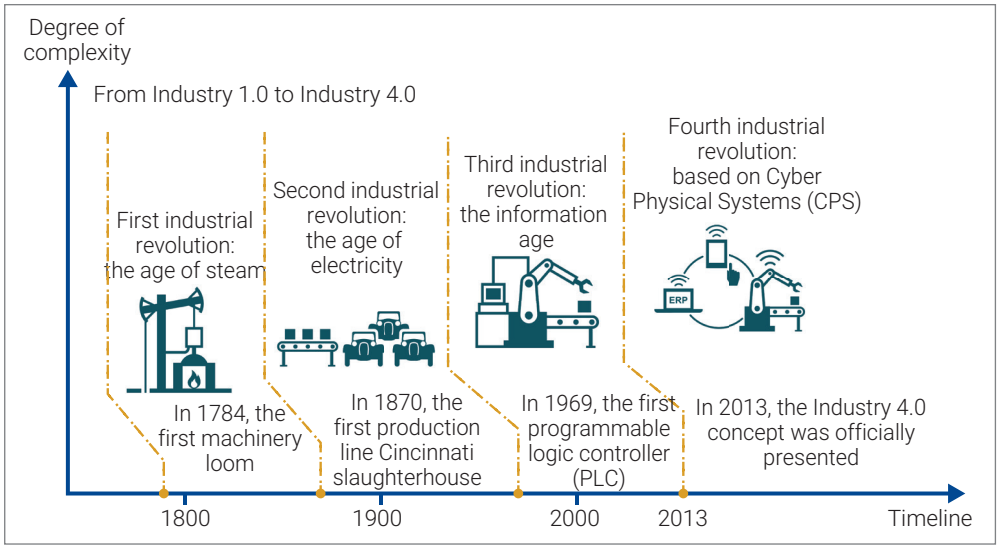
- Industry 4.0 […] "can be described as the advent of 'cyber-physical systems' involving entirely new capabilities for people and machines" (Davis 2016).
- It is "a new level of value chain organisation and management across the life-cycle of products" (Kagermann et al. 2016, 20).
- It is an encapsulation of "future industry development trends to achieve more intelligent manufacturing processes, including reliance on Cyber Physical Systems (CPS), construction of Cyber-Physical Production Systems (CPPS), and implementation and operation of smart factories" (K. Zhou, Liu and L. Zhou 2015, 2147).
- It can be "a revised approach to manufacturing that makes use of the latest technological inventions and innovations, particularly in merging operational and information and communication technology. Industry 4.0 deploys the tools provided by the advancements in operational, communication, and information technology to increase the levels of automation and digitalisation of production in manufacturing and industrial processes. The goal is to manage the entire value chain process by improving efficiencies in the production process and coming up with products and services that are of superior quality" (Gilchrist 2016, 197).

Overall, Industry 4.0 is expected to be the realisation of smart manufacturing and smart industries that make use of advent technologies to automate all or part of production and operational processes to optimise productivity, quality, and efficiency.

8.2.2. Industry 4.0 in comparison with previous industrial revolutions

As depicted in Figure 8.1, Industry 4.0 results from the technological developments of the preceding three industrialisations, each one advancing to a higher level of complexity. Steam engines and electricity generation powered the first and second industrial revolutions in the late 18th and 19th centuries and enabled massive growth in textile industries. Information technologies, computers, and the internet led to the rise of the third industrial revolution which was marked by substantial growth in service industries. The fourth industrial revolution began at the turn of the 21st century and is mainly led by cyber-physical systems with the aim of achieving the digital transformation of industry. An important difference is that whereas the previous revolutions focused on the mass production of goods, the coming revolution focuses on mass customisation (Gehrke et al. 2015; K. Zhou, Liu and L. Zhou 2015; Pereira and Romero 2017).

Figure 8.1: The four industrial revolutions



Source: German Research Centre for Artificial Intelligence (2011 cited in K. Zhou, Liu and L. Zhou 2015)

8.3. Economy 4.0

Industry 4.0 is not only ushering in engineering changes in manufacturing systems but is also transforming the essence of today's economy. "Economy 4.0", or the digital economy, converges with major changes in commercial transactions, interactions, economic structures, and activities influenced by digital devices, the internet of things, and other emerging technologies. The following sections provide insights into structural economic shifts at the global level and the changing employment and labour market landscape resultant of shifts in business practices and production processes.

8.3.1. Change of economic structure and power

8.3.1.1. Productivity growth and the rise of the service economy

The adoption of technologies plays a transformational role in business and market performance. New production technologies allow firms to innovate, increase productivity, improve resource allocation, and strengthen competitiveness, which in turn enable them to expand market shares and improve profit-making ability Heng 2018; World Bank 2019b). Technologies also promote competition in the marketplace by reducing information asymmetries and market imperfections. Market competition benefits consumers through greater access to more goods and services at lower prices.

In contemporary economies, service industries, with their growing importance in the global market, play a vital role in national economic growth. Facebook, eBay, Uber,

and Airbnb, to name a few, are well-known global corporations. As digital platforms, they can provide a wider service over longer distances than was previously possible. They could also significantly disrupt traditional business industries. Additionally, digital platform-based businesses can quickly grow and increase profits. A case in point is Alibaba, a Chinese multinational company, which took just two years to reach 1 million online users and merchants and achieve annual sales revenue of USD700 billion. By contrast, IKEA, a Swedish multinational conglomerate, took 30 years to expand its market in the European Union and 70 years in the world and generate annual sales revenue of only USD42 billion (World Bank 2019b).

8.3.1.2. Main types of industries and businesses

As technology becomes more sophisticated and cost-efficient, a variety of new business models emerge. ICT in particular has contributed to business advancement across many industries by improving communication and data processing capability and lowering transaction costs to extend global market reach. The business models listed in Table 8.1 are not meant to be all embracing; rather, they reflect rapid business model innovation in the digital economy, which makes traditional business models obsolete.

Table 8.1: Emerging business models

Type	Illustration	Example of company/platform
E-commerce	The buying and selling of goods and services via internet transactions	**Goods e-commerce**: Amazon, Alibaba, eBay, Jumia, Lazada, Mercado, Libre, Souq, Etsy **Service e-commerce**: Agoda, Airbnb, Booking.com, Google AppStore
Online payment	Electronic payments provided by a third-party payment interface between banks for real-time payment	Alipay, PayPal, M-Pesa, bKash, Visa, Amazon Payment, Mastercard
Crowdfunding	Generation of a small amount of capital from a large number of individuals to finance a new business venture	Catarse, Costeame, GetMeFund, Kickstarter, Indiegogo
Social media	Websites and applications allowing people to share contents in real time quickly and efficiently	Facebook, Twitter, Instagram

Source: Prepared by the authors

8.3.2. Impact on less developed economies

8.3.2.1. Opportunities for leapfrogging

The economic opportunities and benefits of Industry 4.0 are not evenly distributed. The ability to manage radical change and absorb maximum benefit from technological innovation is key to realising Industry 4.0. A country's digital readiness is determined by examining seven components – technology infrastructure, technology adoption, ease of doing business, human capital development, business and government investment, basic human needs, and the start-up environment (WEF 2016).

The declining cost of technology can enable developing countries to bypass steps in the traditional development ladder (WEF and ADB 2017). Indeed, online and mobile banking reduce the need to construct expensive bank branches; similarly, mobile phones reduce the need for fixed landline telephones. Although technologies hold the promise of leapfrogging for developing countries, leapfrogging strategy is unlikely to be successful if organisations and workers fail to properly prepare for and adapt new technologies. Ultimately, this requires individual countries to take strategic actions to enable their people and organisations to be adaptive to change.

Two main factors pose immense challenges to developing countries' ability to harness the potential of economy 4.0. First is the lack of digital infrastructure, especially in vital industrial and manufacturing areas. The installation and upgrading of digital infrastructure require political will and leadership. Failure to do so will not only leave developing countries lagging far behind in the global transition but also hinder efforts to improve social wellbeing. Second is the shortage of human capital. Cheap labour will no longer be significant for national competitiveness as robots and machines become cheaper and more autonomous. It is therefore paramount that each country ensures their workforce is equipped with adequate skills and expertise to optimise the benefits of new opportunities brought about by digitalisation.

8.3.2.2. The potential for reshoring manufacturing

While previous industrial revolutions have moved manufacturing processes from developed to developing economies, the fourth revolution will strongly affect current global value chains as countries lose their comparative advantage of cheap labour. Some firms are projected to reshore manufacturing processes to their home countries because the use of robots and advanced machinery in the production process will reduce dependence on mass human capital (Graetz and Michaels 2015). In the United States, for example, reshoring plus inward-bound foreign direct investment added about 250,000 jobs between 2010 and 2015 (Reshoring Initiative 2015). This study also highlighted that companies that invest in advanced technologies are unlikely to move or relocate overseas. These trends could pose a threat to developing economies where employment and national productivity rely heavily on manufacturing.

8.3.3. Employment and the changing labour market

8.3.3.1. Job gains and job losses

As in previous industrial revolutions, digital transformation enabled by Industry 4.0 will eliminate some jobs, create new ones, and change the composition of the labour market. The World Economic Forum and Boston Consulting Group (2018) estimate that by 2025 about 75 million jobs will have been eliminated due to artificial intelligence (AI) alone and about 133 million new positions will have been created in return. Another estimate suggests that by 2030, 75 million to 375 million workers will need to switch their occupational categories and learn new skills (Manyika et al. 2017). Most of these new jobs will be created in emerging sectors such as AI, robotics, blockchain, and green technology, as well as in non-tech occupational categories such as customer services, sales and marketing, training and skills development, elderly care, and consumer goods and services (Rifkin 2014; WEF and BCG 2018). In this regard, unemployment and income inequality will get worse if no policy actions are taken to help disadvantaged workers access training and skills development opportunities for future employment.

8.3.3.2. Shift from manual to knowledge workers

The first and second industrial revolutions demanded workers who were physically strong to do manual factory work. However, advanced computing technology and robotics can largely substitute human workers by eliminating the need for heavy lifting and taking over repetitive tasks. Human workers will therefore increasingly concentrate in jobs that require a high level of knowledge and expertise. Future workers must therefore possess an array of skills including the ability to think creatively, solve problems, and adapt quickly in a fast-changing workplace (Groupe Média TFO 2017).

8.3.3.3. Rise of the freelancer

Technologies also pave the way to new ways of working. In today's labour market, more people are choosing to work online either as part of a team or as individuals. The emergence of online workers or freelancers has been instrumental in the growth of the "gig" economy in which "organisations contract independent workers for short-term engagements" (World Bank 2019b, 23). This trend towards remote working involves not only self-employed workers but also regular workers needing to earn additional income. According to a recent report by the Oxford International Institute (2017), the largest supplier of online workers is India (24 percent of the workers observed), followed by Bangladesh (16 percent) and the United States (12 percent). Furthermore, those workers work predominantly in the fields of software development and technology, creative and multimedia, and sales and marketing support.

The foregoing discussion on the impact of Industry 4.0 on economies, jobs, and occupations, and the implications for the skills and competencies required in the labour market, suggests the need to take a fresh look at education and training systems if they are to remain relevant. Furthermore, AI-driven and other Industry 4.0 technologies are forcing substantial changes in how students are educated and workers trained. The remainder of this paper outlines what skills and competencies need to be cultivated and how in order to prepare for industry change, drawing on contemporary ideas and research into changing labour markets and teaching and learning.

8.4. Education 4.0

8.4.1. Redefining the end

It is not only the fourth industrial revolution that is reshaping education and training. At the dawn of the 21st century, at least two influential ideas led to educational reforms worldwide, especially in less developed countries; they are the "four pillars of education" and the "21st-century skills". In 1996, UNESCO issued the Delors Report setting out a vision for the future of education based on the four pillars of learning (UNESCO 2015, 39):

1. *To know* – a broad general knowledge with the opportunity to work in depth on a small number of subjects;
2. *To do* – to acquire not only occupational skills but also the competence to deal with many situations and to work in teams;
3. *To be* – to develop one's personality and to be able to act with growing autonomy, judgment and personal responsibility;
4. *To live together* – by developing an understanding of other people and an appreciation of interdependence.

This vision reaffirms the humanistic approach to education wherein education systems are believed to emphasise certain types of knowledge at the expense of others that would otherwise sustain the full development of humankind. This broad vision for education is very much in line with other theories that categorise human development as cognition (to know), psychomotor (to do), and self-awareness (to be) and adds the important idea of social cohesion and peace (to live together). Many countries including Cambodia translated this global vision into national educational goals/objectives, which are often expressed in three categories of educational outcomes, namely knowledge, skills, and attitudes.

Then emerged a great enthusiasm for the first century of the new millennium. Many believe that workplaces and societies of the 21st century need to equip their people and workforces with different types of skills and competencies. These include, among others, higher-order thinking, teamwork and communication, and adaptability to new settings and information. These constitute a framework of competencies collectively

called the 21st Century Skills. According to this framework, to succeed in the fast-changing environment, students should possess the following key skills in addition to the 3Rs (writing, reading, and arithmetic) (Trilling and Fadel 2009, 176):

1. Critical thinking and problem solving
2. Creativity and innovation
3. Collaboration, teamwork, and leadership
4. Cross-cultural understanding
5. Communication, information, and media literacy
6. Computing and ICT literacy
7. Career and learning self-reliance.

Finally, in the last few years, the theme "skills for the future", often in the context of automation and Industry 4.0, has topped conference agendas and featured in reports on education and training. Because it is not certain what kinds of jobs are going to be created, there are still heated debates about what skills will become obsolete and what new skills will be needed. One notable proposal is the idea of new literacies and so-called "robot-proof" skills put forward by Aoun (2017). These literacies and skills refer to content knowledge and broader cognitive capacities that enable "learners to understand the highly technological world around them and simultaneously to transcend it by nurturing the mental and intellectual qualities that are unique to humans – namely, their capacity for creativity and mental flexibility" (Aoun 2017, 53). The new set of literacies to be cultivated, according to this model of education, includes technological literacy, data literacy, and human literacy, while robot-proof skills include critical thinking, systems thinking, entrepreneurship, and cultural agility.

Drawing on these diverse visions for education and considering advances in technology and the anticipated changes in skills demand in the labour market, the rest of the paper provides a framework for considering what it means to cultivate talent for Industry 4.0 and how to leverage the opportunities presented by advanced technology to that end.

The discussion centres on four sets of literacies and skills – fundamentals, thinking and metacognition, technological and data literacy, and human literacy – which, it has been argued, will become increasingly important in a technology-driven knowledge economy. First is a strong foundation in the 3Rs (reading, 'riting, and 'rithmetic) – the basics or fundamentals. We are moving towards an economy that depends not only on knowledge but also on data, or big digital data to be precise. At the fundamental level, literacy and numeracy are the prerequisite skills upon which higher knowledge is built along with the increasing creation and use of information and data; it goes without saying that the ability to read and write code (the lingua franca of the digital world) is one of the basic literacies to be mastered.

Second, thinking and metacognition abilities will remain unique to humans. Although machine learning has made some advances on the logical reasoning front, the ability to plan ahead, create new things, and understand one's own thinking will remain unique to humans and gain importance in the world of automation. While human thinking will be augmented by machines in significant ways, it is this ability to think and envision that will keep humans in command. Imagine what would happen if this human capability were to be bypassed by machines – life planning and self-reliance would be impossible.

Third, technological and data literacies are becoming increasingly essential for both life and work. Today's younger generation grew up with digital devices. They have developed an aptitude for using their devices to serve their needs. They know which apps to use or which websites to visit for their purposes. But they lack knowledge of the mathematics, coding, and software engineering that exist behind the screens. This has curtailed their ability to create digital content and exploit the full utility of digital devices and software. Another emerging competency is data literacy. The key to unlocking the potential of Industry 4.0 is fully harnessing information from connected assets to drive decision-making, a process known as the physical-digital-physical loop (Deloitte 2018). However, while a large majority of organisations in manufacturing, power, and mining industries gather data from the physical world, far fewer reported the ability to analyse this information and only about half said that they can act on data in real time.

Fourth, human literacy is crucial for relationship management and personal wellbeing improvement; future workplaces will require workers to collaborate more and sometimes with machines. This collaboration will happen at a greater scale and breadth in a digital world that knows no borders. Life will be less restricted by geographical location. The ability to interact and live together in an increasingly diverse and connected world will depend on two types of human sensitivities: emotional intelligence and cultural agility. Emotional intelligence is the ability to understand and manage one's own emotions and the ability to sympathise with other people's feelings. Cultural agility refers to the ability to understand and perform well in cross-cultural situations (Aoun 2017, 70). It is crucial that we have the skills to understand, respect, and work with others of different gender, race, culture, language, and religious beliefs. In addition to technical expertise, future professionals will need a strong foundation knowledge in the liberal arts and humanities in order to understand themselves, to interact with others, and to live meaningful lives.

It should by now be clear that in order to thrive – today and tomorrow – in a society shaped by ubiquitous ICT and autonomous machinery, knowledge workers need an array of higher-order skills to create and innovate and social skills to communicate and work in a team with people from diverse cultural backgrounds. They also need the ability to look within and examine their relationships with and appreciate the views of others in order to define their place in a complex and interconnected world. This requires not only discipline-specific knowledge but also an understanding of technology, data, and humanities.

8.4.2. Shifting the means

The traditional approach to teaching and learning, in which students are taught in a classroom with rows of tables all facing to the front where the teacher is most of the time, has long been criticised as a one-size-fits-all approach. This approach treats all students in the same way regardless of their learning styles and needs. The main underlying principle is standardisation – aiming to produce the same outputs with the same inputs and processes – analogous to the method of mass production invented during the industrial revolution. Thus, this traditional approach is also referred to as the factory model.

Innovations in teaching and learning have been envisioned through group work and individualised instruction to both promote student participation in the learning process and bring out the best in each student based on their individual needs. However, these ideals remain challenging in practice as they are bounded by the constraints of time, space, and resources for teachers to understand the needs or peculiarities of every single student no matter how hard they try. With the increasing use of ICT in education, the task of tailoring instruction to students' distinct learning needs (i.e. personalised learning) has become more feasible. Education technology ventures such as Coursera, edX, Udacity, and Khan Academy are able to provide personalised learning to millions of learners worldwide. Khan Academy, for example, reaches more than 10 million students per month, has over 350,000 registered teachers, and offers more than 6,000 instructional videos and 100,000 practice questions in the fields of mathematics, biology, physics, chemistry, economics, and finance.

Although the use of computers and online learning is not new, the recent blossoming of educational technologies, powered by the web and associated data-crunching systems, has revolutionised the ways in which education is personalised to the needs of each individual learner. While the idea of personalised (individualised) learning has long been advocated by educators, advanced AI and data analytics of recent years have made this personalisation a reality. With advanced online learning tools, learners around the world can study at any time, at any place, on any path, and at any pace. Perhaps the most important contributions of online learning platforms to the betterment of the education sector are the widened access and hyper-personalisation.

Online learning platforms have replaced standardised instruction with personalised learning. However, the question of promoting cooperative inquiry, which is important for cultivating higher-order thinking skills as well as the social and emotional competencies most needed by the new technology-driven knowledge industry and society, remains to be fully addressed. As argued earlier, the fact that learning has to be personalised and cooperative means online learning and school-based instruction can complement one another in what is now called "blended learning". Online learning platforms would be most helpful teaching the content that used to be delivered through lecture-style instruction and consumed much of class time. They

would free up teachers' time for engaging students in hands-on practice, discussion, and project work. Classroom time becomes a time for more interactive and creative activities. Online learning helps students to know while schools help students to do, to be, and to live together (Horn and Staker 2015). Put another way, using Bloom's taxonomy, online learning helps students to remember and understand while schools help promote higher-order thinking, that is, to apply, to analyse, to evaluate, and to create (Kim 2015).

8.5. Conclusion and policy recommendations

Digital transformation towards Industry 4.0 ushers in both opportunities and challenges for nations across the globe. Developing countries can accelerate their economic development thanks to the declining prices of new technologies and the potential for leapfrog manufacturing. Business organisations and factories and the economy at large can benefit from this paradigm shift through digital modernisation, data-driven development, and eco-friendly development. The shift will have significant implications for job markets and talent development; this is a major challenge to be addressed if Cambodia is to reap the full benefits of the opportunities and realise its development visions 2030 and 2050, as well as higher education vision 2030, to become a knowledge society by 2030. The key takeaways for policy reforms include rethinking education and training and its approaches, lifelong learning, and public-private partnership.

Rethinking education and training: The growth of AI, rise in freelancers, and shift in demand towards higher order skills suggest that educators and education institutions must reconsider the goals, models, and approaches to education and skilling. A resilient workforce capable of withstanding AI and robotics is one with higher-level thinking and soft skills, such as critical thinking, systems thinking, entrepreneurship, human literacy, and cultural agility, in addition to digital and data literacies. Social skills such as the ability to communicate effectively and live together are even more important given the growing independent workforce. Holistic talent development should consider training in ethics and morality, respect for and harmony with other beings, placing humans at the centre of education. Within this context, education systems should emphasise the development of AI-related knowledge and skills through the provision of STEM education, neuroscience, cognitive psychology, and social and emotional learning. In other words, educators must consider both breadth and depth of knowledge in their efforts to educate, train, and retrain talents. With the adoption of online learning, the education system can also diversify to meet the needs of different groups and offer higher education to a greater number of Cambodians (Chhem 1997).

In the pursuit towards the new normal of teaching and learning, in addition to training for Industry 4.0, there is a need to shift towards education 4.0. Given that AI and

machine learning are poised to disrupt industry, the pedagogical approaches for adult education and associated assessments must shift from teaching to learning, from one-size-fits-all instruction to personalised instruction, and coaching that places learners at the centre of the education ecosystem (Ernst & Young 2018). Excellence in learning involves learning by thinking (heads-on), by doing (hands-on), and by interacting (hearts-on). Learning experience is enhanced through digital platforms, which remove the barriers of time and space. Blended learning will facilitate online and offline learning while expanding access to quality education resources. This shift of educational approach requires the corresponding changes in teachers training and re-training of those already in the service.

Incentivising lifelong learning: Given the fast pace of technological change, knowledge and skills can become irrelevant or obsolete very quickly. One-shot (pre-service) education before entering the job market is no longer sufficient for building a flexible workforce that can respond quickly and effectively to a changing employment environment. Governments and businesses must ensure that individuals have the time and means to focus on continuous self-development. It would be wise to prepare those whose jobs are likely to be replaced by automation for future employment mobility. Education and training providers must shift their focus from preparatory job-specific skills training to lifelong learning.

Fostering cross-industry collaboration and public-private partnerships: To ensure that training is effective and relevant, it is essential to have a complete view of future skills requirements and labour demands. This is where businesses from different industries can be most helpful by working together to map out future employment needs and skills demands. Stakeholders, especially the government, businesses, education and training institutions, should then pool training resources for priority industries. Experiences from countries such as Germany and Switzerland show that training in the workplace is most effective in keeping up with numerous technological changes in industry. Again, this requires strong involvement from business and well-functioning public-private partnerships (Chhem et al. 2018).

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Chapter 9

An Observation of Characteristics and Development of Apprenticeship: International and Cambodian Perspectives

Keo Borin and Eam Phyrom

Abstract

The current study examines (1) characteristics of apprenticeship and approaches to measuring costs and benefits of apprenticeship training program, using international literature, and (2) characteristics and current status of Cambodian apprenticeship, using a small set of documentary data available. In principle, an apprenticeship training program, especially those under the formal scheme, is characterised by multi-stakeholder governance and coordination, combined on-and-off-the-job training, mastery-oriented and industry-recognised goals, clear contractual arrangements, expert/master guidance, work-based productive training structure, standardised competency assessment, and positive socio-cultural function. Currently, the international discourse of apprenticeship has moved into a new phase of developing "quality apprenticeship". In Cambodia, however, apprenticeship has not been prepared to adapt to the international discourse yet because the current apprenticeship system and programs still require more conceptual, strategic, technical, training, and regulatory support from different stakeholders.

Keywords: Enterprise-based training, vocational training, apprenticeship, internship, dual VET system

9.1. Introduction to apprenticeship

In a fully-functioning industrial economy, the human factors of production (such as working attitudes, knowledge, skills, and competencies) are indispensable. In the discourse of the 21st-century labour economies, advanced nations, regional alliances, and business conglomerates do not merely talk about having human resources to serve local needs, but they focus on developing high-quality and top-notch human assets to compete regionally and globally. They understand that human capital investments via high-quality education and training are requisite for strategic competition in all sectors.

While demanding education and training institutions to produce those high-quality and top-notch human resources, work organisations (particularly, those with resources available, creative leadership, and committed teams) have also attempted to perform the educating and training roles themselves. Such functions as training, development, research, supervising, and learning (which have been exclusive roles of education and training institutions) are now becoming important functions for business enterprises or industrial firms. Thus, models and approaches of training at workplaces are no longer a peripheral but strategic issue.

Apprenticeship training has attracted serious global attention when it comes to training in the work setting. In early industrial societies, training that happens at a work setting (i.e. factory, community work setting, or family workshop) is generally conducted in the form of apprenticeship. Apprentices learn their craft or trade by engaging in actual works under supervision or guidance of senior apprentices or masters and progressively develop the competencies and expertise themselves (i.e. moving from being a trained apprentice to becoming a learning journeyman and to further becoming a master). Most countries from the far Western to the far Eastern part of the world traditionally have these workplace-based, community-based, or family-based kinds of training although how the training operates may vary. In the 12th-century Europe, the Guilds – the associations of people with the same trade or craft working together in a city or town (Wollschlager and Guggenheim 2004, 7) – were in charge of training the apprentices in a specific profession, trade, or craft. In many other countries of Asia, Africa, and Latin America, traditional apprenticeships have been found to exist and have been transformed to be an important part of national skills system, especially in the informal economic sector (see McGrath et al. 1995, 68; Steedman 2012, 4; VSDP 2019, 29).

Modern apprenticeship training models have been developed in a complicated way in different regions around the world. A noticeable difference between the modern idea of apprenticeship and the traditional one is the official connection (or integration) between the modern apprenticeship system and the formal education and training system or the national skills system in many countries. With such connection, modern apprenticeship programs have been acknowledged as an enabler of a smooth school-to-work transition, a solution for youth unemployment, and a value-added mechanism for the growth of companies and the wider national economy (Steedman 2012, 1-2).

European countries (such as Germany, Switzerland, Denmark, and Austria) have had a long tradition of integrating their modern apprenticeship practices into their formal vocational training system, which develops into a vocational education and training (VET) model commonly called the dual training system. Positive benefits generated from the dual training of apprentices at firms in Germany, Switzerland, Denmark, Austria, and other non-European countries (adopting the dual models with support from international development partners) have been evident in the literature (see, for example, Mapa, Almeda and Albis 2016 for the case of the Philippines). The success of the dual model in ensuring employment-ready skills and competencies of the apprentices has urged Technical and Vocational Education and Training (TVET) policy makers around the world to renovate and innovate their traditional apprenticeship practices as well as to use apprenticeship as a means to connect its TVET system to the company-based training. Different countries approach such renovation and innovation differently (McGrath et al. 1995).

Built on such successful lessons in those countries and shaped by the Sustainable Development Goals (SDGs), major international organisations – such as International Labour Organisation (ILO), UNESCO International Centre for Technical and Vocational Education and Training (UNESCO-UNEVOC), Organisation for Economic Cooperation and Development (OECD), and European Centre for the Development of Vocational Training (CEDEFOP) – have recently moved the international discourses of dual training and apprenticeship into such ideation as "quality TVET for all" and "quality apprenticeship" (see, for example, UNESCO and ILO 2002; ILO 2021). The quality TVET for all and the quality apprenticeship concepts have seemingly been viewed as a value-added principle for both the quality education and training and the productive work, and thus they fit well into the global agenda to reduce unemployment and poverty, the changing world of work, the move towards decent job, the capability approach as an extension from the human capital approach, and the holistic movement to bridge between education and work and between academic education and vocational training.

9.2. The need to revisit Cambodian apprenticeship

As Cambodia has been determined in moving towards a fully-functioning industrial economy, a digitally-transformed economy, and Industry 4.0, this developing country, like other countries, expects its business enterprises and industrial firms to play more active roles in training and developing the nation's workforce, alongside and in collaboration with its TVET sub-sector. With such expectations, Public-Private Partnership (PPP) has been promoted as a new medium for Cambodian TVET providers and work organisations to network and collaborate in a way that adds values to both sides in terms of creating Cambodian productive, professional, and ethical workforce and talents. In the context of TVET, PPP is generally understood as a mechanism through which the government and the development partners encourage the private sector and related stakeholders to contribute more to improving

vocational and occupational skills (soft and hard), professional attitude, and real-work experience among the student population. PPP has been widely acknowledged as a vital mechanism in upskilling the workforce, closing the skills gap, and creating more and better jobs (Smith-Comyn 2011; UNESCO 2013; Lonn and Khieng 2015).

Enterprise-based training (or workplace-based training) options – such as internship, apprenticeship, and on-the-job staff training – are among the top priorities in PPP programs to produce high-quality workforce and talents in Cambodia, as set out in certain policy documents:

- In Strategy 3 of the National Technical Vocational Education and Training Policy 2017–2025, "to promote public-private partnerships and aggregate resources from stakeholders to support sustainable development of TVET", the Ministry of Labour and Vocational Training (MLVT) and related ministries and institutions are tasked with ensuring "coordination and collaboration between training institutions and industries to strengthen the quality and implementation of apprenticeships, field visits, internships, and on-the-job training" (RGC 2017,10–11).
- Under objective 2.3 of the National Employment Policy 2015–2025, "to improve relevance of education and TVET to labour market needs", one of the key policy measures is "to encourage work-based learning, promote internship, and apprenticeship" (RGC 2015b, 9).
- In Cambodia Industrial Development Policy 2015–2025, one of the supporting policies for skills and human resource development to contribute to industrial sector development is to "promote and implement incentive-based apprenticeship schemes in order to encourage firms to join the apprenticeship program" (RGC 2015a, 27).

These major national policies and strategies similarly suggest that enterprise-based (or workplace-based) training program is an important driver for the future of skill and competency developments of the new-generation Cambodian workforce and that, to systemise and mechanise the enterprise-based training, the participation of the private sector is a must. Cambodia can no longer afford to make do with a one-way supply of skills from educational/training institutions to firms, but the country needs mutual collaboration between educational/training institutions and firms (and other potential stakeholders) in building a critical mass of highly skilled and professional workers who can function well in their industries regardless of workspaces they are going to participate (viz. local or international work setting as well as physical or digital working platform).

This movement requires TVET policy decision makers to jointly examine Cambodian skills system and mechanism at both the national level and the firm/company/enterprise level. Likewise, this movement situates the enterprise-based training and (quality) apprenticeship training in an important position as they may provide

satisfactory answers to relevant Cambodian stakeholders – the youth, the firms/enterprises/companies, the higher education (HE) or TVET providers, and the government – who have long concerned with the chronic issues of skill gaps, skill mismatch, and skill outdating and have been sceptical about fads surrounding the future replacement of human intelligence and capability with the artificial intelligence and technicality.

9.3. The current study

9.3.1. Purposes

The main purpose of this study is to examine the developments and characteristics of apprenticeship from an international perspective and within Cambodian context. This exploratory study is an initial part of a larger project on Cambodian apprenticeship. A number of questions guide the study:

1. What are the core characteristics of apprenticeship?
2. How are the costs and benefits of apprenticeship measured?
3. What is the current status of apprenticeship training in Cambodia at the system level and firm level?
4. What are the challenges and opportunities from implementing apprenticeship training programs at Cambodian firms, given the current legal, policy, and practical conditions?

9.3.2. Methodological considerations

The current study reviewed literature on apprenticeship published by academic journals or by international organisations (such as ILO, UNESCO-UNEVOC, OECD, CEDEFOP) as well as official documents (i.e. laws, policies, strategic plans, and declarations) related to Cambodian TVET and apprenticeship. The literature was classified into two segments: (1) those discussing apprenticeship in general and (2) those discussing apprenticeship in Cambodia.

The whole review procedure was performed in two main stages. The first stage was an exploratory review, which aimed to conceptualise the notions and practices of apprenticeship and to identify key overarching discourses and themes surrounding research and policies on apprenticeship, both internationally and in Cambodia. This first stage led to the development of a conceptual framework that guided the writing of this paper.

The second stage was a critical review, which aimed to identify factual and empirical information in the selected articles. This stage provided detailed contents that explained each key theme generated from the first-stage exploratory review. The reviewing, synthesizing, and writing process of this chapter was iterative.

9.4. Apprenticeship in the international TVET discourses

9.4.1. Definitions and types of apprenticeship

Conceptually, apprenticeship can be understood as part of the larger framework of work-based learning and/or workplace-based training. Work-based learning refers to "learning that occurs in a working environment through participation in work practice and process…" (Atkinson 2016, 2). In this sense, work-based learning generally may take place right at workplace, but it can also take place in other settings. It can, for example, take place in a simulated work environment at TVET institutions. Workplace-based training, on the other hand, refers specifically to "learning or training undertaken in the workplace, usually on the job or on-site" (ILO 2012, x). Workplace-based training, in this sense, does not take place at an educational or training institution, and it can be equated with enterprise-based or company-based training. Based on this brief explanation, apprenticeship training can be considered either as work-based or workplace-based as it focuses on performing real works and can take place exclusively at the enterprise or combine training sessions at the enterprise and at training institution together.

According to Steedman (2012, 3), apprenticeship can be differentiated from other types of workplace-based training such as traineeship, internship, and workplace learning (see Table 9.1). Based on the table, apprenticeship (particularly, formal apprenticeship) offers wage to the trained apprentices, has a legislative framework, entails a program of learning, includes both off-the-job and on-the-job training, conducts formal assessment (generally through examination), offers certification (recognised by the industry), and has a fixed duration. Some of these characteristics, on the other hand, are not applicable in other forms of workplace-based training such as traineeship and internship.

Table 9.1: Different types of workplace-based training

	Wage	Legislative framework	Workplace-based	Program of learning	On-the-job training	Off-the-job training	Formal assessment	Recognised certification	Duration
Traineeship	Maybe	No	Yes	No	Maybe	No	No	No	Variable
Internship	No	No	Yes	No	Maybe	No	No	No	Variable
Informal apprenticeship	Pocket money or in-kind	No	Yes	No	Maybe	No	No	No	Variable
Workplace learning	Yes	No	Yes	No	Maybe	No	No	No	Variable
Apprenticeship	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Fixed

Source: Steedman (2012, 3)
Note: Apprenticeship here refer to formal apprenticeship training program.

Etymologically, there is no universal, one-size-fits-all definition of apprenticeship because apprenticeship practices vary a lot from nation to nation as well as from enterprise to

enterprise and from time to time. Apprenticeship, according to Lerman (2014, 2), refers to "a program of courses, work-based learning and productive employment in which workers achieve occupational mastery and industry-recognised credentials". In a less formal and more traditional sense, Lancy (2012, 113) defines apprenticeship as a "… contractual relationship between a master and a novice, of a specific duration, which is designed to serve two ends: to provide cheap labour (by the apprentice) … and/or fees to support the master's enterprise". Temporally speaking, apprenticeship has evolved from an early model (which is operated exclusively by professional communities, based at family or community working places and unattached from formal education or national training system) to a modern form (which is generally co-operated by firms, training providers, and/or professional communities and implemented as a pre-employment training that takes place both at workplace and at training venues outside of the workplace). The modern form of apprenticeship is not only enterprise-based technical training but also part of the national skills system.

The inherent nature of work-based, production-oriented goals, and expert guidance (i.e. a master or a supervisor) characterises apprenticeship training, and these characteristics enable apprentices to become experts in their craft or trade, embrace appropriate work attitudes and values, and socialise into their occupational and industrial environment. Wolter and Ryan (2011) and Steedman (2012) further implied in their studies that the recent conceptualisation of apprenticeship training from an international perspective generally comprise both the element of enterprise-based training and that of training outside of the workplace (which is believed to be influenced by the dual vocational and professional education and training models of German-speaking countries). These characteristics do not only equip well-trained apprentices with knowledge, skills, working attitudes, and competencies necessary to serve as an employee but also to start their own business as an entrepreneur.

International Labour Organisation (ILO) (2012, 7-8) further defines five generic principles in an attempt to characterise apprenticeship training that is sharable and applicable for international discourses:

- Master craftsperson/employer and apprentice conclude an agreement (i.e. training contract);
- The apprentice achieves occupational competence for a trade (i.e. training content);
- Training is workplace-based and integrated into the production process (i.e. training process and procedure);
- The apprentice is a young person (i.e. trainee's characteristics);
- The costs of apprenticeship are shared between master craftsperson/employer and apprentice (i.e. training costs).

Built on ILO's discourses, later studies add other, more formal, characteristics into the definitional scope of apprenticeship (Steedman 2012, 2-3), such as:

- Apprenticeship training is long-term training;
- Off-the-job education and training can be added to the enterprise-based training;
- Apprenticeship training is applicable only for recognised occupations; and
- Apprenticeship training requires external regulation of training standards both inside and outside of the workplace.

ILO (2011; 2012) also classified apprenticeship into three broad types – formal, informal, and traditional apprenticeship.

Formal apprenticeship: According to ILO (2012, x), formal apprenticeship refers to (a) a system through which the apprentice acquires the skills for a trade or craft in an enterprise by learning and working alongside an experienced craftsperson, usually complemented by classroom-based instruction; (b) the apprentice, master craftsperson/employer and training provider conclude a training agreement that is regulated by formal laws and acts; and (c) training costs are shared between the apprentice, master craftsperson/employer, and the government. The design and implementation of a formal apprenticeship system at the national level and a formal apprenticeship training program at the firm level involve at least the following core characteristics:

- a proper multi-stakeholder governance and coordination, with clear roles and responsibilities;
- a formal contract between employing firms (or masters) and apprentices (and sometimes apprentices' parents);
- a combination of real, productive work experience (on-the-job) in the workplace and off-the-job training at vocational training institutions or other training venues;
- shared costs of apprenticeship training programs between apprentices and employing firms and other stakeholders;
- available occupational standards (which define skills and competencies as well knowledge and work performances required to be employed in a particular occupation);
- examinations to measure competence for a specific occupation (i.e. to examine if an apprentice has mastered his/her craft) at the end of the apprenticeship term (with evaluation done by experts and professional bodies);
- graduation and certification to prove the scope and level of apprenticeship training achievement (which is useful for the apprentices in starting their own business, working for different firms in the same industry, or pursuing further education and training).

From contract formulation to training content development to certificate conferral, the implementation of a formal apprenticeship training program is engaged and governed by multiple stakeholders, among which are (a) employing firms, (b) TVET providers, (c) governmental bodies at various levels, (d) masters or supervisors, (e) trainees, (f) social partners (chambers of commerce, trade unions, or employer associations), and (g) sometimes trainees' families. Such an integrated system of co-governance and co-operation needs a robust legal framework, well-developed occupational standards, well-connected guiding policies and strategies, and clear contractual system to assign and support different stakeholders in performing their roles and responsibilities throughout the whole procedure of apprenticeship training. ILO (2012, 12) noted that, in a simple scenario of implementing the formal apprenticeship system, employers invest time and resources, apprentices provide labour, and the government provides financial support. Generally, employers take the lead, but all stakeholders need to share costs (and benefits) to ensure sustainability. Also, from this financial perspective, because much of the training time is spent doing productive work, apprentices in the formal apprenticeship training program are generally paid; in other words, the apprentices earn while they learn and work. Such a formal co-governance and co-operation mechanism at both the national and the enterprise-based level has to stand on the principle of trust, integrity, and mutual benefit.

Apprenticeship in Switzerland, Germany, Denmark, and Austria are clear examples of formal apprenticeship. While in other countries, the TVET sector and the apprenticeship sector can be viewed as separate entities (despite sometimes linked together), the apprenticeship sector and the VET sector in those German-speaking countries cannot be viewed as two separate entities. They are one system, defined by an inherent duality that comprises the workplace-based training and the training at vocational or professional schools. To explicate, this dual VET system is organised in a way that allows their apprentices to be formally trained at firms (generally, about 60 to 80 percent) and at VET institutions or other training venues (generally 20 to 40 percent). Firms take the lead in training, and they need to meet certain standards in order to be able to offer such apprenticeship training programs.

Because firms from the private sector generally contribute more in terms of implementing and delivering the formal apprenticeship training, the firms need a well-planned training curriculum, a balance between theoretical and practical knowledge and skills, an efficient interaction/coordination between the firms and the vocational schools, and, at a macro-level, an appropriate system of permeability between the vocational training track and the academic education track in order to facilitate transition to a higher level or transfer to a different type of education and training of the apprentices. The contents of training at both venues should be synchronised, and the balance between the training time and the expected learning outcomes is needed. This integrative duality provides more practice time, more pre-employment authentic work experience, and so a higher level of occupational mastery to the

apprentices after the training is completed. The training contents are also guided by a set of qualifications defined in occupational standards, which are driven by real market needs and continuously updated. A formal apprenticeship training program is long-term, practice-intensive, and production-oriented and generally takes three to four years to complete. The duration of apprenticeship training for a certain occupation can be shorter or much longer than another occupation, depending on the occupation itself and the implementing context (i.e. national context or firm context). For instance, apprentices in Switzerland spend 468 days in the workplace and 83 percent of that time doing productive tasks, while apprentices in Germany spend 415 days in the workplace and 57 percent of that time doing productive tasks (Dionisius et al. 2008).

The dual VET programs of Switzerland and Germany are highly praised for they guarantee that the skills delivered match the demands by firms and the labour market and that the young people who have gone through the programs have good prospects in terms of skills recognition and occupational mastery. The training experiences and earned certificate are therefore great assets for apprentices over their career life. Part of the success of the dual VET is due to the fact that the system has the component of apprenticeship formally embedded in the VET system, not as an add-on or a peripheral part. With apprenticeship as the backbone of the national VET system, the formal dual models of Switzerland and Germany are different from the systems of many other countries where the TVET sector is generally school-based and content-based and generally not responsive to the labour market needs and where apprenticeship is under-developed, not formalised, and not well-coordinated. However, it has recently been noticed that the dual training practices have been appreciated all over Asia, generally in a format whereby the on-the-job training mode focuses on hard skills whereas the off-the-job training mode focuses on soft skills (VSDP 2019, 14).

Informal apprenticeship: The formal (dual) apprenticeship model of Germany, Switzerland, Austria, and Denmark is just a type of apprenticeship. Not all countries formalise their apprenticeship as a national training system, and not all countries embed apprenticeship into the formal education and training system by using the dual approach. In Asia, the trend of formalising the national apprenticeship system and apprenticeship training program at firm has just started around the 1970s, reportedly influenced by international development partners (VSDP 2019, 13).

Before the formalisation, apprenticeship training in many parts of the world remains informal and may take place at random in some firms. Generally, the concept of informal apprenticeship is attached to the informal economy sector. The informal apprenticeship is generally considered very important for the functioning of informal businesses and informal economies in developing countries (ILO 2011; 2012; Steedman 2012). Beyond economy, the informal apprenticeship in developing Asian and African countries is considered central to the social and cultural practices of transmitting skills to the next generation. Moreover, the informal apprenticeship also contributes significantly to vocational development in countries whereby the performance of formal TVET is limited or dysfunctional.

According to ILO (2012, x), the informal apprenticeship refers to (a) the system by which a young learner (the apprentice) acquires the skills for a trade or craft in a micro- or small enterprise by learning from and working alongside an experienced craftsperson; (b) the apprentice and master craftsperson conclude a training agreement that is embedded in local norms and societal traditions; and (c) training costs are shared between the apprentice and master craftsperson. There is generally no national regulatory framework for the informal apprenticeship although some countries have already tried to upgrade their informal apprenticeship status (see, for example, ILO 2012; Steedman 2012).

Smith (2010, 312) and Steedman (2012, 4) similarly believed that the mechanism of informal apprenticeship, like that of the formal apprenticeship, is primarily and purely workplace-based and related to the practice of productive training engaged by the master and the apprentice. However, unlike the formal apprenticeship, ILO (2012, 12) pointed out that in an informal apprenticeship arrangement, the contract can be oral (or written), the training is entirely workplace-based (not at school or training centre), and the apprentice sometimes pays fees to the master craftsman to receive training. Although the informal apprenticeship still entails the workplace-based training, it may lack the formal school-based vocational education and training component and the industry-recognised qualifications or credentials.

Traditional apprenticeship: The informal apprenticeship is generally discussed with traditional apprenticeship. Sometimes they are not differentiated. The traditional apprenticeship is understood as (a) the system by which skills are transmitted from a father or a mother to one of their children or between close family or clan members; and (b) the traditional apprenticeship systems in many regions evolve into informal apprenticeship systems which are open to apprentices from outside the family or kin group (ILO 2011, 1). In this sense, the traditional apprenticeship is more narrowly defined within the scope of family-based intergenerational transmission of skills and can be seen as growing into the informal apprenticeship system. Unlike the informal and formal apprenticeship, the traditional apprenticeship is not institutionalised, let alone nationally embedded as part of the national skills system or officially attached to the formal education and training system of a nation.

Sonnenberg (2012, 95) claimed that "the main strengths of traditional apprenticeship are its practical orientation, its self-regulation, and self-financing. Its flexible and non-formal nature accommodates individuals who lack the educational requirements for formal training." Like the informal apprenticeship, these kinds of traditional skills training practices have been prevalent in some African, South Asian, and Latin American developing countries where the informal economy prevails (McGrath et al. 1995; ILO 2012; Steedman 2012; VSDP 2019). Informal and traditional apprenticeships are a better exposed form of skills training for youths in those countries, sometimes far better than the formal training system (see, for example, McGrath et al. 1995; Sonneberg 2012).

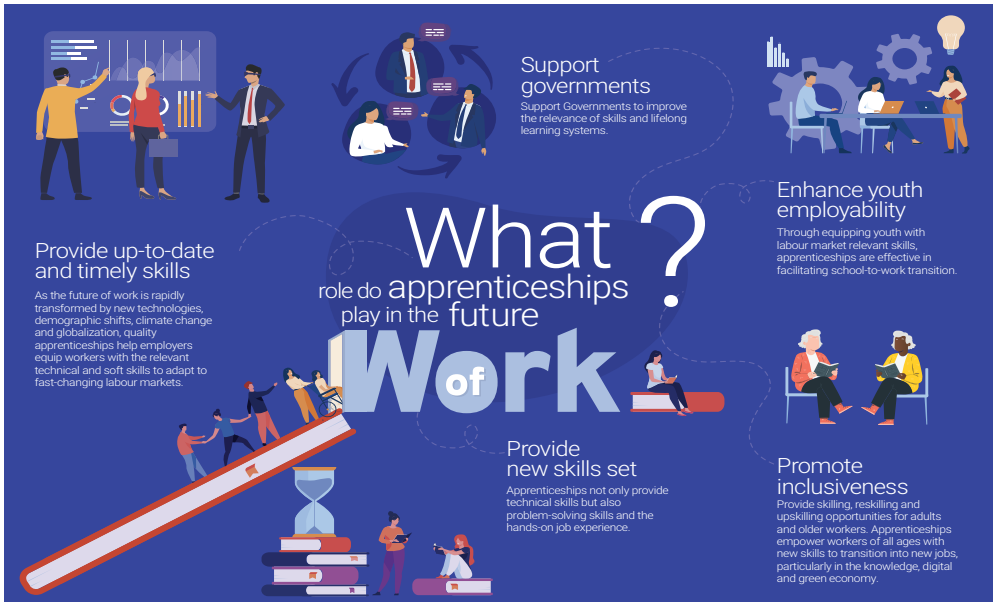
9.4.2. Emerging discourse and development of quality apprenticeship

Even though there has been such a typification of apprenticeship, the formal and informal/traditional apprenticeships are actually two extremes on the same line. As ILO (2009, 2) put it:

> In reality, the formal-informal division is really more of a continuum, where various degrees of program structure can be seen all along the axis, with the Formal Apprenticeship on one end with regulated programs and the Informal Apprenticeship which tends to lack any rigid or formalised organisational structure at the other.

As apprenticeship has become an important international agenda of TVET and labour economy, the international and supranational organisations (such as ILO, UNESCO-UNEVOC, OECD, and CEDEFOP) have occasioned a new movement towards the so-called quality apprenticeship. The idea of quality apprenticeship introduces a new discourse of apprenticeship which is no longer community-based or merely national but are more holistically connected into the discourse of "quality TVET for all", lifelong learning, and the more international and global educational and vocational ecosystem. In this way, the roles of quality apprenticeship in the future of work become highly relevant and of strategic important for different stakeholders, spanning from its ability to enhance the employability of youths (challenged by low skills and the risk of unemployment) to providing enterprises with productive and innovative workforces to supporting the governments in improving the relevance of skills and lifelong learning system (See Figure 9.1).

Figure 9.1: Infographic denoting roles of apprenticeship in the future of work



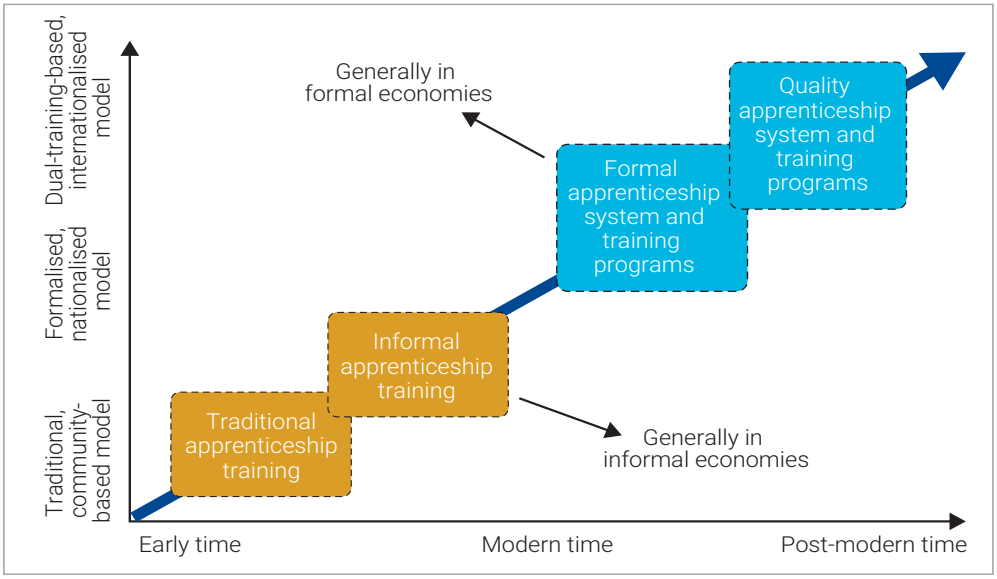
Source: ILO (issued on 19 April 2021), retrieved from https://www.ilo.org/skills/areas/work-based-learning/WCMS_781488/lang--en/index.htm

Built on its existing works and practical lessons in promoting the formal and informal/traditional apprenticeship in different countries, ILO (2017, 3-7; 2021, 7-8) suggested a number of key attributes for the quality apprenticeship: a tripartite system of governance, remuneration, a written agreement, social security coverage, a legal framework, a program of learning, both on-the-job and off-the-job learning components, a formal assessment process, and a recognised qualification. ILO (2021, 8) also recommended six building blocks to implement the quality apprenticeship program:

- Robust regulatory framework;
- Meaningful social dialogues;
- Clear roles and responsibilities;
- Equitable funding arrangement;
- Strong labour market relevance; and
- Inclusiveness.

With the idea of quality apprenticeship emerging as an extended conceptualisation of apprenticeship systems and training programs, we can better understand the different types of apprenticeship via a rather stylised figure that represents such developments. Figure 9.2 below locates the different types of apprenticeship in different phases of development, which is a function between the magnitude of time span (from early time to post-modern time) and the degree of formalisation and generalisation of apprenticeship (from community-based traditional training to a more dualised training system) (see Figure 9.2).

Figure 9.2: Stylised developments of different types of apprenticeship



Source: Authors

According to the above figure, the future of work rests in part on the quality apprenticeship system and programs. In other words, the quality apprenticeship may lead to a change in perspective of many countries and firms towards training and learning at workplace and so towards vocational performance and professional cultures.

Quality apprenticeship system and programs may remedy the skill gaps and skill mismatch as well as the lack of connection between VET institutions and firms/companies/enterprises and the lack of an appropriate career and workforce development system and culture in many countries. It should be noted that the idea of work and vocation are socio-cultural and have deep historical roots in religion and go beyond mere monetary and security reasons. In Protestant culture, for example, vocation is life, and it is closely related to the idea of "a calling" (Weber, Owen and Strong 2004, xii) or "a task given by God". People culturally rooted in this kind of religion take their vocation very seriously because they believe it is their destiny or the one thing they are meant to do in their life. With such perceptions, they constantly seek clear meaning, purpose, and perfection in what they do for a living, and so having work or vocation gives them a sense of dignity and virtue. The success in implementing quality apprenticeship can further promotes inclusiveness and social dialogues, which may have a long-term impact on the working cultures of people in different societies (from the appreciation of quality work to improving collectivism). That in turn may offer the apprentices values and benefits they need to be emotionally satisfied with their work/career life in the long run. In this sense, the quality apprenticeship can be viewed as a pre-requisite to the culture of high-quality, productive, professional, and decent works.

At the international and global level, the notion of quality apprenticeship fits well into both the lifelong learning and the education-and-skills-for-all agenda as well as the decent employment agenda and the changing perspective on how we should work (as exemplified by the Great Resignation phenomenon).

9.4.3. Costs and benefits of apprenticeship

Understanding the concepts, types, and guiding principles of apprenticeship is not enough to put apprenticeship to work. It is important to also understand how to measure the costs incurred and the possible benefits from implementing apprenticeship training programs. Comprehending the costs and benefits of apprenticeship programs (in both monetary and non-monetary terms) and factors influencing firms' decision to train apprentices is critical in many aspects. As Lerman (2014, 1) put it, policymakers can promote effective career training and increased earnings for workers with modest public expenditure if they can provide firms with information on economic returns, help them set up apprenticeship schemes, and fund off-site training. Lancy (2012, 113) argued, from another perspective, that apprenticeship is distinctive from other forms of informal skill transmission because it both trains and socialises apprentices. So, "…

apprenticeship (or any form of worker training and skills development) should be seen as a direct investment on the part of the parties involved (employees, governmental bodies, and employers in industry), and should not merely be seen as a stop-gap measure in satisfying a need for a supply of cheap labour" (ILO 2009, 43). Axmann and Hofmann (n.d. 3) further explained the benefits of apprenticeship, focusing on the firm's concern on poaching:

> Employers have their staff trained according to practical requirements, and apprentices contribute to production while constituting a unique source of recruitment. Apprentices constitute a 'pool' of competent labour for companies and for a sector as a whole due to the transferable nature of the skills acquired. This reduces the risk involved in poaching since other companies train to the same skill level and skilled workers are available on the market, in other words, the more companies are involved in apprenticeship training, the lower the risk of poaching. In addition, apprenticeship increases the awareness of the importance of learning within a company.

9.4.3.1. Measures of costs and benefits of apprenticeship

According to previous studies, the costs and benefits of apprenticeship can be measured only for apprenticeship training programs that are implemented formally and systematically. The costs and benefits of apprenticeship are generally measured in an economic framework, using monetary values within a particular timeframe and treating individual apprentices or firms as the unit of measurement. Previous studies generally performed cost-benefit analyses immediately after the apprenticeship training had been completed in order to capture short-term monetary results.

The cost-benefit studies of apprenticeships are conducted, led, and continuously innovated by such leading institutions as the German Federal Institute for Vocational Education and Training (BiBB) and the Swiss Federal Institute for Vocational Education and Training. In Germany, cost-benefit surveys of apprenticeship training, known as the BiBB cost-benefit model, can be traced back to 1974 (Dionisius et al. 2008). After years of experience, this evaluative cost-benefit-analysis model is one of the best frameworks generally adopted and adjusted by other countries' researchers when they want to understand outcomes from apprenticeship training.

The direct costs of apprenticeships consist of the following elements: wages or stipends for apprentices, wages for training specialists who oversee apprentices, and others (e.g. administration and recruitment, registration and continuing education, training materials and supplies, training infrastructure, company insurance, wastage and opportunity costs) (Lerman 2014, 3; CAF-FCA 2006, 5). The direct benefits, on the other hand, are the measure of productive work of apprentices, which is measured in wages (of both skilled and unskilled workers), apprentices' relative productivity and, sometimes, tax credits (CAF-FCA 2006, 5). The benefits of apprenticeship can be extended to include long-term and intangible gains which are generally not measurable in monetary terms, such as the firm's fulfilment of social responsibility and

the firm's reputation. Following such conceptual operations, Wolter and Ryan (2011, 542) developed a general equation to measure the costs (Equation 1) and benefits (Equation 2) of training an apprentice *i* at site *j* in apprenticeship year *t*:

$$C_{ij} = \sum_{t=1}^{n} aw_{ijt} + bw_{ijt} + X_{ijt} \quad (1)$$

$$B_{ij} = \sum_{t=1}^{n} a_{ijt} + uw_{j} + (1 - a)_{ijt} * Y_{ijt} \quad (2)$$

The net cost (*NC*) can then be calculated using the following formula:

$$NC_{ij} = C_{ij} - B_{ij} \quad (3)$$

The notations of Equations (1), (2) and (3) are explained in Table 9.2 below.

Table 9.2: Notations of the equations to measure costs and benefits of apprenticeship programs

Notations	Representing
i, j, t, n	*i* = individual apprentice, *j* = training site, *t* = apprenticeship year, *n* = number of training years
C_{ij}	Costs for an apprentice at a training site for an average year of the training period
aw	Wages for apprentices
bw	Wages for training personnel
X	Materials and other expenses
B_{ij}	Benefits for an apprentice at a training site for an average year of the training period
uw	Wage of unskilled workers
pw	Wage of fully trained skilled workers
a	Relative productivity measure for productivity of unskilled workers
y	Relative productivity measure for productivity of skilled workers
NC_{ij}	Net costs of an apprenticeship at a training site for an average year of the training period

It should be noted, however, that the costs and benefits of apprenticeship can take different forms in different contexts and for different occupational fields. The above equations are just a general tool for estimating and understanding the cost and benefit mechanism of a firm's apprenticeship training. Actual measures are and should be based on actual training contexts. That said, most studies build on these equations and adjust them to fit the practices in the country of interest or the particular occupations they are observing (see, for example, Dionisius et al. 2008 on apprenticeship in Germany and Switzerland; Viet, Nguyen and Dang 2015 for Vietnam; and Mapa, Almeda and Albis 2016 for the Philippines).

9.4.3.2. Some evidence of costs and benefits of apprenticeship in different countries

In a previous report in 2014, the cost-benefit studies of apprenticeship in Switzerland and Germany show evidence of net benefits immediately after the end of training. Namely, the productivity of apprentices in Switzerland rises from 37 percent in the first year to 75 percent in the third year of training, and Germany follows suit with an increase in productivity from 30 percent to 68 percent (Lerman 2014, 4). In exact monetary terms, Swiss firms gain more than EUR19,000 (around USD22,105) per annum from apprentices, and German firms gain EUR8,000 (around USD9,307).[1] Cost-benefit studies of the Swiss apprenticeship nearly always show evidence of net benefits (in financial terms) immediately on completion of training.

Some countries without the dual VET system also demonstrate positive returns to apprenticeship training. In a survey of 15 occupations in Canada, one Canadian dollar (around USD0.77) spent on apprenticeship training generates an average return to the firm of CAD1.38 (around USD1.06) (CAF-FCA 2006, 23, 36). In the Philippines, a cost-benefit study on the country's dual training scheme indicates that the benefits generated are at least 30 percent higher than the overall costs (Mapa, Almeda and Albis 2016, 47, 79).

To theorise the costs and benefits tendency of apprenticeship training, researchers generally refer to a stylised model as shown in Figure 9.3. Employers, according to the figure, are likely to incur costs in the initial training period and start to accrue short-term benefits towards the half-way stage. After the training is completed, employers continue to accrue various benefits (such as the productive contribution of apprentices as they are more skilled and reduced hiring costs for skilled workers).

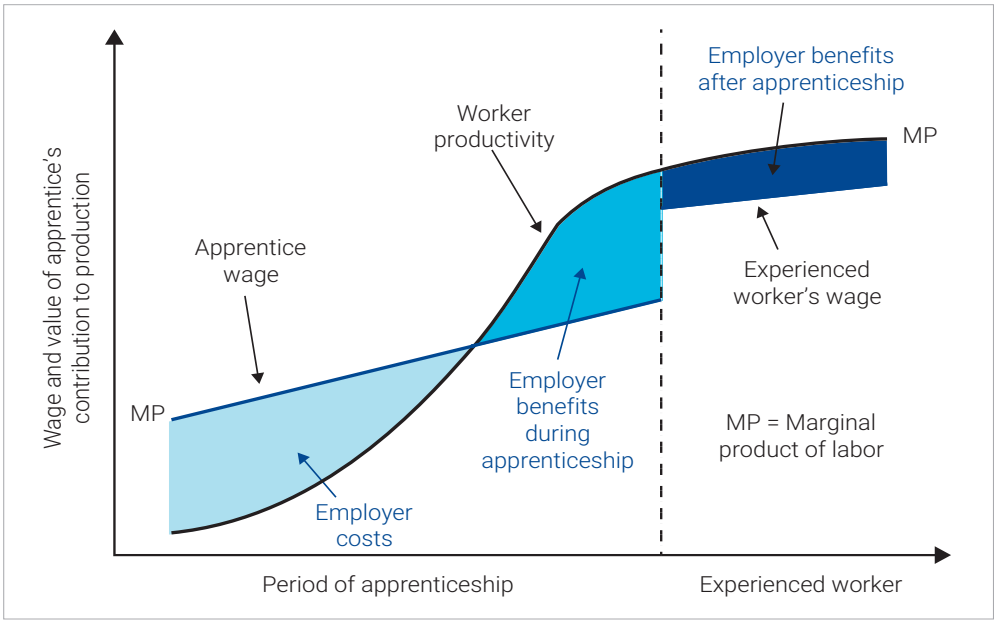
From an Asian perspective, a current comprehensive report of Swisscontact on apprenticeship training presented the following lists of benefits for different stakeholders (see VSDP 2019, 15):

- *Benefits for employers:*
  - Apprentices repay some or all training costs through productive work,
  - Future employees can be shaped according to company requirements,
  - Saving recruitment costs,
  - Reputation gains, productivity gains.
- *Benefits for apprentices:*
  - Better employment chance and often better wages,
  - Work experience,
  - Development of soft and employability skills,
  - Accessible training system specially for the poor.

1 The difference is partly because Swiss apprentices spend more days at the workplace and more time doing productive work rather than practicing tasks or doing work of no direct value to the firm (Lerman 2014, 4).

- *Benefits for governments:*
  - Cost-effective way of providing skills development,
  - Employers take over parts of training cost and responsibility,
  - Promote relevance of training.

Figure 9.3: Stylised graph of the dynamics of apprenticeship costs and benefits



Source: Adopted from Lerman 2019, 1 (Modified based on Gambin, Hasluck and Horgarth 2010, 133)

However, it should be highlighted that the predictive model as shown in Figure 9.3 is shaped by the human capital and economic rational choice theory and rather measures the immediate monetary costs and benefits associated with apprenticeship training. Not all countries have a dual apprenticeship system (with adequate systemic and firm-based supports) of Switzerland and Germany or the economic and educational conditions of Canada. Most studies in other countries do not confirm such instant monetary gains but may acknowledge positive and long-term benefits to firms and society which can be difficult to measure numerically (Beicht, Herget and Walden 2005; CAF-FCA 2006). Long-term gains for firms include, for example, retention of high-performing and competent employees and enhanced reputation for corporate social responsibility. Other more specific benefits include good job fit because apprentices are steeped in company values, increase their productivity and skills overtime, and bring new ideas and innovation to their firm (Gambin, Hasluck and Hogarth 2010). In that sense, apprenticeship programs are a long-term investment, not a mere cost, and can deliver more than monetary value to firms, stakeholders and society.

It should also be noted that understanding the determinants of apprenticeship costs and benefits – by looking at other variables – is also vital to explain why firms should

decide to offer apprenticeship. Previous studies explored such factors as industrial sector, firm size, availability of qualified workers (Muehlemann et al. 2007), business expectations (Dietrich and Gerner 2007), mix of classroom and work-based training, occupation, skill, wage progression, productivity of apprentices (Lerman 2014, 3), training regulations, labour and product market competition, pay structure, and productive contribution of apprentices (Muehlemann and Wolter 2013, 16). These factors can influence the costs and benefits and so the firms' decision to offer apprenticeship training. To set up a successful apprenticeship training program, firms should also consider these variables.

9.5. Exploring Cambodian apprenticeship

9.5.1. Basic information of Cambodian apprenticeship

To understand apprenticeship of a particular country, it is best to examine the definition and implementation of apprenticeship through legal, regulatory, or agreement documents or observe real practices (ILO 2017, 6). Legal, statistical, anecdotal, and partial documentary evidence offer some indications that apprenticeship in Cambodia exist both at the national system level and as firm-based training programs.

Based on the 1997 Cambodian Labour Law, apprenticeship is regulated. Besides the Labour Law, apprenticeship has been modified at different times in the form of subsequent notifications, declarations, and instructions in order to adjust the law to practical reality (i.e. Notification 06/97; Declaration 004/00; Instruction 003/01; and Notification 042/15 of MLVT). Chapter 3 of the Labour Law sets out in 14 articles the form, terms, and termination of the apprenticeship contract; the duties of instructors and apprentices; and the monitoring of apprenticeships.

Article 8 defines apprentices in the Cambodia context as "those who have entered into an apprenticeship contract with an employer or artisan who has contracted to teach them his/her occupation; and in return, the apprentice has to work for the employer according to the conditions and term of the contract" (see, also, UNESCO 2013, 61). Article 57 specifies that "any enterprise employing more than 60 workers must have the number of apprentices equal to 1/10 of the number of the workers in service of that enterprise" (UNESCO 2013, 68). The same UNESCO report points out that firms that meet these conditions but do not conform to apprenticeship requirements are obliged to pay an annual tax (equal to 1 percent of the firm's annual payroll), but it is not clear how this 1 percent tax is levied and reported. Some documents claimed that firms do not pay that 1 percent levy (e.g. ADB 2015, 2). Apprentices need to be at least 18 years old, while master craftsmen/tradesmen or supervisors need to be at least 20 years old. Article 59 of the law states that "masters need to offer facilitation to apprentices if they desire to study at vocational schools". The law also stipulates that the apprenticeship contract has to be in a written form, and Article 53 of the 1997 Labour Law specifies that, without any decision between the labour secretariat and the representative of the

training firm, the apprenticeship contract has to follow the tradition of that occupation. Also, examination, monitoring, and certification of apprenticeship are stated in the 1997 Labour Law.

With regards to the training duration, according to the 1997 Labour Law, apprenticeship training is to last no longer than two years. Some other documents, however, suggest that such duration has been adjusted several times in further instructions or notices to fit the work environment at Cambodian firms or enterprises. ILO and BFC (Better Factories Cambodia) (2019, 13) wrote:

> In general, an apprenticeship may not be longer than two years. However, Notice 06/97 states that in the garment industry in Phnom Penh, the period of apprenticeship should not be longer than two months.

If this is the case, questions arise because a two-month training scheme may not be considered an apprenticeship in a common sense and definitely not a form of formal apprenticeship. In general, apprenticeship training programs last between two and four years though the timeframe may vary according to different occupations. ILO has already added some principles – such as that apprenticeship is a long-term training – to define apprenticeship (see Steedman 2012, 2-3).

Such an adjusted time frame is perhaps one of the reasons that causes confusion and overlap among apprenticeship, internship, and other short-term training programs (such as training during probation period) in real workplace-based training practices in Cambodia. In fact the apprenticeship training is not equated with the training of probationary employee. Namely, the apprenticeship training happens before the probationary employment period. ILO and BFC (2019, 13) noted:

> Under an apprenticeship, an employer gives professional training to apprentices who are newly recruited and unskilled. Through the apprenticeship, an unskilled employee gets their initial training and after successful completion of this training they can expect to become a probationary employee and then become a regular employee.

It should be noted that such conceptual overlap has also been observed in previous studies in other contexts, such as in sub-Saharan African countries (Steward et al. 2018, 15).

Furthermore, statistical information shows evidence of apprenticeship in Cambodia. UNESCO (2013, 61), based on a report by MLVT in 2010, identified 92 enterprises with apprenticeship programs. In later years, Nen (2015, 5), in a minute of an ILO workshop, was quoted as claiming that there are between 100 to 120 enterprises in Cambodia that provide training to around 5,500 to 6,000 apprentices every year in areas such as agriculture, industry, trade, communication, construction, and services, with garment and footwear the most prominent sectors. However, the TVET Strategic Plan 2014–2018 (see MLVT 2013, 13) differently reported that MLVT has promoted

apprenticeship programs in 448 enterprises (without consideration of branches)[2], with 27,630[3] apprentices reported, in 17 provinces and one city throughout the country[4]. Little, however, has been done to explore more deeply the apprenticeship training programs at these reported enterprises with a clearer focus on their structures, training materials, training environment, and costs and benefits.

9.5.2. Challenges of the different forms of Cambodian apprenticeship

9.5.2.1. Apprenticeship regulated by the government

Because it is regulated legally in the Labour Law and adjusted in subsequent legal documents, apprenticeship in Cambodia was intended to be formal when it was formulated. However, UNESCO (2013, 92) observed that Cambodian apprenticeship is far more informal in practice, stating "… in construction, engineering and other craft sectors, basic competencies are learned on the job through informal apprenticeship, but without any contractual arrangement. In the formal sector, apprentices are seldom recruited."

Apprenticeship training via the government scheme is generally operated on a short-term basis and without a clear written contract, assigned productive workloads, attained occupational skills and competencies, and proper examination and certification. In formal apprenticeship programs in countries such as Germany and Switzerland, occupational standards are generally in place, but, in Cambodia, the responsible ministry and relevant stakeholders have still been working on the development of occupations. There are other general characteristics of formal apprenticeship training program that may have not been implemented fully in real training practices in Cambodia (for example, multi-stakeholder governance and coordination, shared costs, combination of on-the-job and off-the-job training, formal written contract, long-term duration between 1 to 4 years, and formal examination). Nen (2015, 6) further claimed that, in Cambodia, lack of labour inspectors, lack of incentives for labour inspectors, limited cooperation between stakeholders, firms hiding data on workers, and ineffective labour law enforcement are the major challenges facing the implementation of apprenticeship schemes.

Thus, the apprenticeship regulated by the government in Cambodia needs to ensure its formalisation and mitigate the fragmentation in policies and practices. The possibility of upgrading this form of apprenticeship to quality apprenticeship should also be considered by relevant stakeholders in Cambodia, especially, the government.

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[2] In examining the raw data from MLVT, we found that two firms were redundantly recorded. So, the total number of enterprises should be 446.

[3] In the raw data, there are 25,420 apprentices only.

[4] The 17 provinces and one city include Phnom Penh, Stung Treng, Rattanakiri, Battambang, Kampong Chhnang, Kampong Thom, Mondulkiri, Siem Reap, Banteay Meanchey, Thbong Khmom, Kratie, Kampot, Kampong Cham, Kampong Spue, Takeo, Preah Sihanouk, Kandal, and Svay Rieng

9.5.2.2. Apprenticeship not regulated by the government

Traditional apprenticeship: As earlier mentioned, Cambodia has also had its traditional form of skill training, which is the practice of young people working for a master, an experienced person, or a business owner for a period of time, with or without pay. In some cases, the purpose of training is more about employment; in others, it is more about learning a trade or a skill, in which case the trainee may pay the master to learn. Those traditional skills training activities are apparently common in such fields as goldsmithing, silversmithing, hairdressing, art, and/or mechanics of the Cambodian informal economy. This kind of practice is close to what the ILO refers to as traditional apprenticeship, which is understood as a system by which skills are transmitted from parents to their children, or between close family or clan members (ILO 2011, 1).

However, there have been limited official records of such traditional apprenticeships which are generally small-scale and family-based or community-based. That further makes it hard to understand Cambodian traditional apprenticeship and to support it. Such challenges bring the question of how to upgrade the traditional apprenticeship in Cambodia.

Apprenticeship training programs supported by non-governmental organisations (NGOs): Apprenticeship training programs supported by international development partners have been reported. An example of such interventions is the Swisscontact's apprenticeship program that focuses on careers in hospitality (a component of its Skills Development Program) in the three rural provinces of Preah Vihear, Stung Treng, and Kratie (see CDRI and BfD 2015). A baseline study on this project, supported by the Swiss Agency for Development and Cooperation (SDC), described these apprenticeship training programs as follows:

> There are apprentices paid by their employers and those paying their employers and there are apprenticeships without any financial arrangement… The three most required capacity development are technical skills, entrepreneurship training and access to finance and scholarship for poor apprentices … and other supports including equipment and material related to their work and the recognition of skills via formal assessment/certification… (CDRI and BfD 2015, 10).

The challenges of this type of apprenticeship is its sustainability. The coverage remains sporadic for just particular informal occupations, and the post-apprenticeship support is needed. In Cambodia the classification of informal and traditional apprenticeship and apprenticeship training programs offered by NGOs remain vague. More investigation is needed.

9.6. Final thoughts and suggestions

The current review aims to explain the characteristics and developments of apprenticeship in the international context and explore the current system and training programs of Cambodian apprenticeship. In real practices, Cambodian apprenticeship

remains informal and unregulated in many aspects, and the classification of the different types of apprenticeship are not yet clear. For the government-regulated apprenticeship, the legal requirements, executive processes, and real firm-based training are not yet in sync. Collaboration and partnerships to support apprenticeship training are acknowledged as important strategies by stakeholders, but all sides are still challenged in doing that and call for more mutual support and understanding. Apprenticeship concepts and mechanisms are also neither well understood nor shared among different stakeholders. In such a situation, the unguided apprenticeship practitioners at firms cannot find workable and efficient solutions to improve and upgrade existing firm-based training practices, thus keeping the apprenticeship scheme at both the firm and the national system level superficial and underdeveloped. The current apprenticeship training in Cambodia has little chance of achieving the promise that it can promote professional competences and vocational values in the Cambodian workforce. Consequently, the whole image of apprenticeship is unattractive. The private sector considers building a platform for apprenticeship training costly and unprofitable, and firms find it hard to get support for apprenticeship training.

There are various starting points to enhance and upgrade the different forms of apprenticeship at different levels. At a systemic level, van der Loop (2015) identified four key building blocks: (a) social dialogue (to build social foundation for apprenticeship); (b) definitions, roles, and responsibilities; (c) legal framework; and (d) (shared) financing arrangements. At a more pragmatic level, ILO (2009, 29), looking at the case of Bangladesh, also pointed to four strategies for formal apprenticeship: (a) develop skills recognition through competency standards, (b) establish an apprenticeship learning organisation, (c) focus on curricula, and (d) offer incentives to firms. The same document also highlighted four strategies for informal apprenticeship: (a) create recognition of prior learning, (b) develop assessment tools, (c) raise awareness, and (d) establish informal social networks (ILO 2009, 31).

All these recommendations from previous policy-driven and practical international studies can be used as a conceptual guidance to start thinking about the design of a national apprenticeship system and the firm-based apprenticeship training schemes in Cambodia. Cambodian apprenticeship still requires a lot more legal, conceptual, technical, training, and logistical support. A functional Cambodian apprenticeship system has to also be ecologically framed at governmental, firm-based, and social levels and participated by able stakeholders through sincere, genuine, and sustainable collaboration. Finally, research and investigation into the actual training programs of apprenticeship at Cambodian firms are still in dire needs.

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Chapter 10

From Workplace Training to Organisational Learning? Revisiting the Training Function at Cambodian Work Organisations

Eam Phyrom and Keo Borin

Abstract

The main purpose of writing this chapter is to offer a quick overview of how human resource or training department of Cambodian work organisations responds to the need to develop a learning function. Through the review of literature, we come to suggest that embedding a learning function into the current practice of training and development at Cambodian work organisations present more opportunities for them to thrive in the global knowledge economies and societies. Learning is becoming an important strategic component at the workplace as the organisational learning structure is interconnected with and supportive of other strategic aspects such as talent development and management, research and development, knowledge management, and digital transformation. The study suggests further research to measure learning capacities and cultures at Cambodian work organisations in order to map the current scope of learning practices and develop a practical framework for learning promotion that fits into their working conditions.

Keywords: Learning organisation, organisational learning, workplace-based training, staff development, talent development

10.1. Introduction

The future model of work organisation in the global knowledge economies and societies is the learning organisation or, put simply, the organisation that continuously learns. To be sustainable and stay competitive in their industry, organisations need to learn and to learn fast and strategically. How an organisation and its people learn, how these learning people (and their talents) are managed, and how organisational knowledge (associated with those learning activities) is created and used have been, and will be, increasingly relevant in the employment sector and labour economies. The three most undeniable explanations for this organisational learning and learning organisation phenomenon are the burst of knowledge in multiple forms and modes, the rapid advancement of digital technologies, and the tremendous effects of globalisation on all spheres of human societies, especially on cross-border labour migration.

An implication of this phenomenon is that work organisations need to upgrade their organisational strategies, infrastructures, and activities surrounding training, development, and learning in order to ensure that employees, new recruits, potential recruits, and/or outsourced service providers all meet the knowledge, skills, and competencies expected by the employers and that they [the employees] can perform their works in a highly productive, timely, ethical, and positive-value-laden manner. Equally, employees can find a compromise between their personal (especially, affective-emotional) or professional values and the organisational requirements and conditions. As a consequence, the human resource and training department at many work organisations in developed countries have revisited their functions, roles, and reaches. This tendency is especially true for multinational corporations and companies that compete not only in the local market but also in the global market because global talent management is of strategic importance to the survival and success of those companies.

Are Cambodian work organisations ready to compete in the global learning economies? More specifically, are Cambodian firms or companies, especially the local small and medium business enterprises (SMEs), ready to learn and go regional and global? Do the firms' training or human resource departments have in place their knowledge management and talent development systems, strategies, and tools? Have the Cambodian local firms already embraced the global mindset (as once embraced by local Japanese firms such as Honda and Toyota before they dominate the international markets)?

As Cambodia has sought to participate more actively in the regional and global employment and economic ecosystem, these questions matter significantly. Little is still known about how such developments surrounding the organisational learning and learnability have fared so far in Cambodia or how the firm-based training and development environment has adapted to the inevitable changes.

The main purpose of writing this chapter is to offer a quick overview of how Cambodian work organisations' human resource management or training departments respond to

the need to develop a learning culture at their organisations. The study is nascent. It is not a full-fledged empirical study; neither is it a complete argumentative essay. The justification for writing this chapter is to introduce an important practical research area in the field of management science which is not widely and deeply examined in Cambodian context so far whilst the country has already committed to industrial development and digital transformation in all social dimensions and attempted to transition further into the path of global knowledge economies and societies.

10.2. A movement towards learning at work organisation

10.2.1. Workplace training and development, plus learning

Learning at work organisation is referred to in various terms – e.g. workplace learning or organisational learning. The terms are used differently by different groups of researchers based on different perspectives. Fenwick (2008) noted two main groups: the adult educators (from the educational perspective) and the human resource developers (from the workplace perspective). Workplace learning, as observed through the adult education lens, involves two major issues: how people solve workplace problems through learning and how particular groups of workers learn (Fenwick 2008, 17). Illeris (2003, 174-176) explained that three major groups of adults need to learn at the workplace: those who need further qualifications, those who need re-qualification, and young adults who need basic qualifications.

In the field of organisational studies, before the concept of learning is introduced, training and development are important activities. Training and development refer to systematic processes initiated by (or at the direction of) the organisation resulting in the relatively permanent changes in the knowledge, skills, or attitudes of organisational members (Kraiger 2003, 171). Work organisations, particularly the human resource components, depend on training and development to support and grow their staff as well as to reward them. Work organisations also need training and development to orient new staff into their organisational working cultures, to fulfil knowledge or skill gaps of their staff due to their impractical or irrelevant education at universities, and sometimes to upskill and reskill their long-term staff.

As the business world has envisioned the coming of global knowledge economies and societies, work organisations have paid more attention on learning, so expanding the traditional roles of training and development. Emergent ideas such as workplace learning and organisational learning have been attracting serious attention from employers. Matthews (1999, 19-20) defined workplace learning as follows:

> Workplace learning involves the process of reasoned learning towards desirable outcomes for the individual and the organisation. These outcomes should foster the sustained development of both the individual and the organisation, within the present and future context of organisational goals and individual career development.

Work organisations, perhaps influenced by schools and universities, now turn to believe that learning should be learner-centred and active, and so rather than depending too much on passive training activities whereby the trainees participate as a passive recipient of structured knowledge prepared by the training team, workers need to develop the learning habits within a working culture that promotes learning, and so both the work organisation and the staff continuously and strategically learn. Learning in this sense generates innovation and creativity and so opportunities and growth. Workplace learning is vital for business employers and industrial enterprises to manage existing and state-of-the-art knowledge and to keep innovating themselves in order to stay sustainably functional in the more competitive world.

10.2.2. Organisational learning and learning organisation

Workplace learning has been viewed as a prerequisite to help an organisation become a learning organisation (Matthews 1999, 26), and organisational learning is found to be the mediator between training and performance (Aragón, Jiménez and Valle 2014). In other words, after an organisation designs its learning system and develops its learning culture, it figuratively becomes an organisation that learns. Terms such as organisational learning and learning organisation have already become buzzwords shared by human resource developers and workplace training teams internationally.

Since 1990, Peter Senge's famous book "The Fifth Discipline '' has paved the way for this whole new learning culture in business organisation. The book introduces the term learning organisation and theorises that, for an organisation to learn, the people at the organisation need to learn (individually and collectively) and to develop the habit of learning. For people to learn at the work organisation, Senge offers his well-cited five disciplines – (1) shared vision, (2) mental model, (3) team learning, (4) personal mastery, and (5) system thinking.

- *Shared vision:* In addressing the firm's issues or achieving the firm's goals, individual staff need to have a clear idea of the learning direction of the firm and the core values that the firm is trying to develop in pushing the staff to continue learning. Despite diversities of the individuals in their specialisation, attitude, and personal background, they should share the vision of the pursuit of learning as a team and share this vision in a deep and authentic manner. Integrity between the hidden shared vision and the overt behaviours is a necessary measure for the success of the learning organisation.
- *Mental model:* The individual staff need to be able to clearly visualise and conceptualise the object of learning in their mind as they try to learn, to understand, or to master it. The staff need to learn how to think and embrace the attitude of clarity in their thinking.
- *Team learning:* Individual learning is not enough for an organisation to be a learning organisation, the staff as well as the management need to learn as a team. Major targets and achievements of their business or industry, as Senge

views it, could only be accomplished through collaborative and tolerant team works. Team learning fills the gap of and adds values to the individual pursuit of learning.

- *Personal mastery:* The individual staff need to engage in the learning process strategically and adequately through different phases in order to master what they learn. This requires the staff's self-directed approaches as well as the continuous support from the team and the organisation.

- *System thinking:* This principle suggests that the individual staff of the firms in the age of information, data, and knowledge need to view business or industrial challenges they are facing or goals they are trying to achieve in a systemic and systematic way. The firms need to see the whole picture of the system, the sub-system, and elements that make up the system and the sub-system. The firms need to also see the relationship among these systems and sub-systems.

Though Senge (1990) used the term the fifth discipline as the title of the book, we think it is better to understand it as five areas or principles for an organisation to consider in order to develop a learning culture and become a learning organisation.

How exactly firms in developed countries initiate and implement the learning organisation concepts vary because the areas of organisational learning and learning organisation are still evolving (in terms of theoretical research, professional framework, and field-based practices). Popper and Lipshitz (1998) suggested practitioners to first look into two aspects of the organisation (the structural aspect and the cultural aspect) in order to build organisational learning, resulting in the so-called Organisational Learning Mechanism (OLM). According to Amstrong and Foley (2003), the structural aspects of the OLM may constitute the following dimensions:

- *Learning environment:*
  - Mission linked learning
  - Facilitative learning environment
  - Mission support
- *Identifying learning and development needs:*
  - Learning identification satisfaction – section/work unit
  - Learning identification satisfaction – immediate supervisor
- *Meeting learning and development needs:*
  - Organisation support
  - Low personal impact
  - Mentoring and coaching
  - Training satisfaction

- *Applying learning in the workplace:*
  - Learning applicability – suitability
  - Learning applicability – effectiveness
  - Learning applicability – immediate supervisor support and feedback.

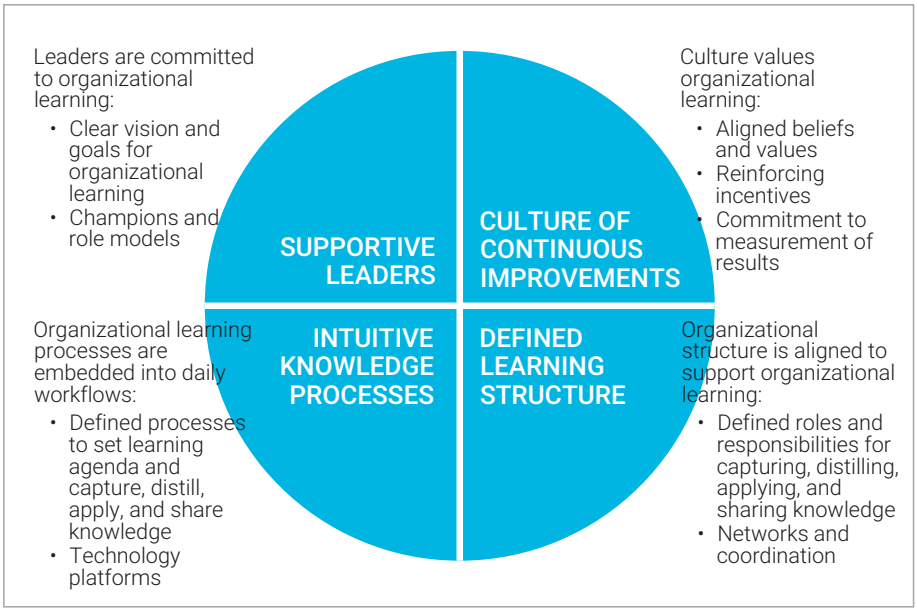
The cultural or normative aspect of the OLM, according to Popper and Lipshitz (1998), includes five hierarchically arranged values: continuous learning, valid information, transparency, issue orientation, and accountability.

In later stages of their studies, the psychological facet, policy facet, and contextual facet of organisational learning are added (Lipshitz, Popper and Friedman 2002). The psychological facet constitutes psychological safety and organisational commitment; the policy facet constitutes tolerance for errors, commitment to learning, and commitment to the workforce; and the contextual facet comprises error criticality, environmental uncertainty, task structure, proximity to core mission, and committed leadership (see Lipshitz, Popper and Friedman 2002, 81). In the contextual facet, Popper and Lipshitz (2000, 189) hypothesised that some of the four conditions should be met to institutionalise organisational learning: a high level of environmental uncertainty, costly potential errors, a high level of professionalism, and strong leadership commitment to learning.

Similarly, Milway and Saxton (2011) also acknowledged the dimension of culture and structure, further emphasising the dimension of process (of learning) and leadership. The prospects of learning organisation depend largely on how its working culture empowers and habituates learning and embraces this learning mechanism as the backbone of its working process. Support from leaders and relevant stakeholders are indispensable to kickstart as well as to sustain the learning. Thus, Milway and Saxton (2011, 47) suggested that there are four elements of organisational learning (see Figure 10.1).

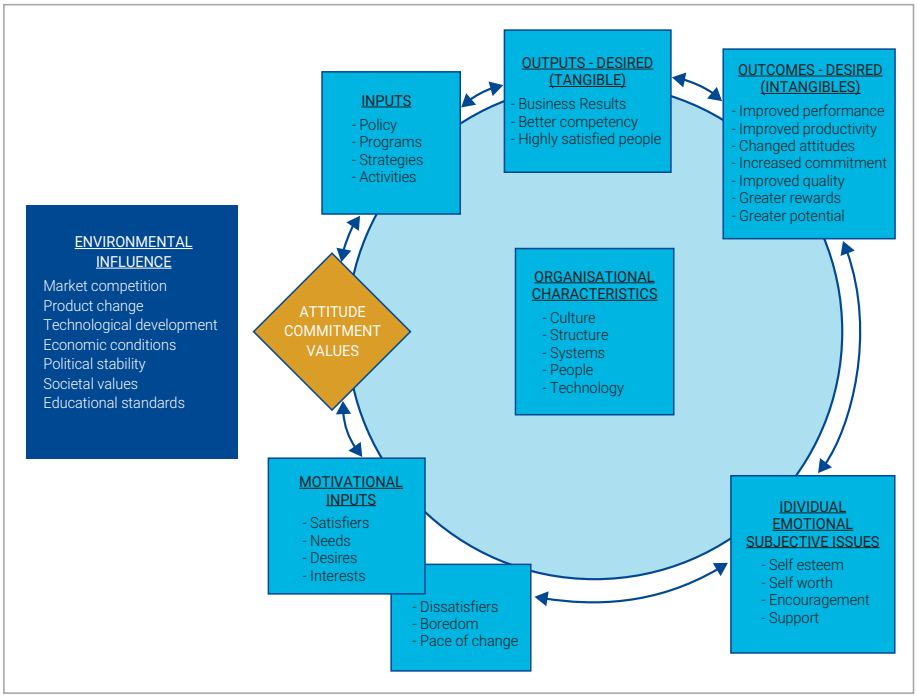
Another model of organisational learning that is more holistic and systematic is provided by Matthews (1999, 26) (see Figure 10.2). The interesting part of this holistic model is its practicality in the semi-production-function view of inputs-throughputs-outputs-outcomes system of workplace learning. Matthews (1999) – extending Rylatt (1994) – suggested that (a) the workplace learning inputs include policies, programs, strategies, and activities; (b) the workplace learning outputs may include business results, better competency, and highly satisfied people; and (c) the workplace learning outcomes may include improved performance, improved productivity, changed attitudes, increased commitment, improved quality, greater rewards, and greater potentials. The rest of the models explain the multiple factors (generally identified in the organisational development, organisational psychology, and management research areas) involved in the process part of workplace learning. Among these are the interplay among individual, organisational, and environmental aspects.

Figure 10.1: Four elements of organisational learning



Source: Reproduced from Milway and Saxton (2011, 47)

Figure 10.2: A holistic view of workplace learning



Source: Matthews 1999, 26

After all, it is clear from the brief literature discussion above that embedding workplace learning and/or organisational learning into the existing training and development practices and then transforming the whole organisation into a learning organisation involves multiple dimensions and aspects of a work organisation. How a work organisation will establish the learning structure and culture and engage their staff or workers in continuous learning activities will become a new big agenda for business enterprises and industrial firms globally in the 21st century. For those work organisations that have not considered the learning function, Rothwell (2014, 7) suggested a number of questions for them to start thinking about long-term strategies to transform their organisations to be a learning organisation (see Table 10.1):

Table 10.1: Questions to consider to understand an organisation's learning practices

How does your organisation:	How does your organisation:	How does your organisation:
• Align learning with strategic objectives? • Differentiate training from management needs? • Assess and analyse training needs? • Establish and measure instructional and performance objectives? • Design training? • Select, use, and blend technology to deliver training? • Deliver training? • Measure and evaluate reaction, learning, behavioural change, and transfer of learning to the job, results, return-on-investment, and business impact of training? • Decide on ways to manage and budget for training? • Manage training strategically?	• Identify organisational values? • Train workers and managers on organisational values? • Identify organisational ethical dilemmas? • Train workers and managers on how to address ethical dilemmas?	• Identify individual learning competence? • Encourage individuals to improve their learning competence? • Identify and measure the organisation's learning climate? • Improve the organisation's learning climate?

Source: Adapted from Rothwell (2014, 7)

10.3. Emerging areas closely linked to learning organisation

10.3.1. Talent Development and Talent Management

In a learning organisation of the developed world, the tasks of Talent Development (TD) and Talent Management (TM) (ranging from attracting and recruiting to retaining and developing the talent pools) have become an important mission. TD is a field of study as well as a professional field of practice. TD professionals play many roles, ranging from being a specialist (such as trainer, instructional designer,

coach, consultant, or organisation development professional) to being a generalist who uses a broad spectrum of practices to achieve organisational goals (ATD 2021). The Association for Talent Development (ATD) has developed the so-called capability model which includes three dimensions of TD capabilities for the TD professionals to master: Personal capability, Professional capability, and Organisational capability (see Figure 10.3). As shown in the figure, the capability of talent developers is a composite of different knowledge, skills, competencies, and experiences, ranging from the professional domain of project management to instructional design to data and analytics.

Related to TD, TM is also important for a learning organisation. TM involves (1) recruitment, planning, and succession planning; (2) training and development; and (3) retention management (Stahl, Bjorkman, Farndale, Morris, Paauwe and Stiles 2012, 8). We should highlight that TM is not a mere local practice; TM is currently a global business. At the global scale, the missions of TM may incorporate (a) strategic alignment between company's strategy and talent management practices; (b) how the talent management practices can ensure internal consistency, rather than ad-hoc, piecemeal intervention; (c) how the talent management strategies are embedded into the culture of the organisation; (d) how the management at all levels involve in the talent management activities; (e) how the companies balance between the global and local needs; and (f) how the company attracts talents in a very innovative and creative ways (Ribeiro and Machado 2017, 119-120, citing Stahl et al. 2012).

In the area of higher education (HE) research, TM is in line with such concepts as "brain gain" and "brain drain" strategies. Many developed countries have benefited significantly from brain gains – i.e. the benefits generated by having foreign scholars, scientists, researchers, or high-quality students working at their higher education institutions (HEIs). In the same manner, therefore, the future of firms and non-academic work organisations will also benefit in that way if they can manage the local and foreign talent pools properly. Firms have to be capable of managing foreign talents because, for their business and economic activities to be sustainable and growing, firms have to reach customers beyond the local sphere and the geographical space.

Figure 10.3: Talent development capability model by ATD

Source: https://capability.td.org/#/professional/learning-sciences

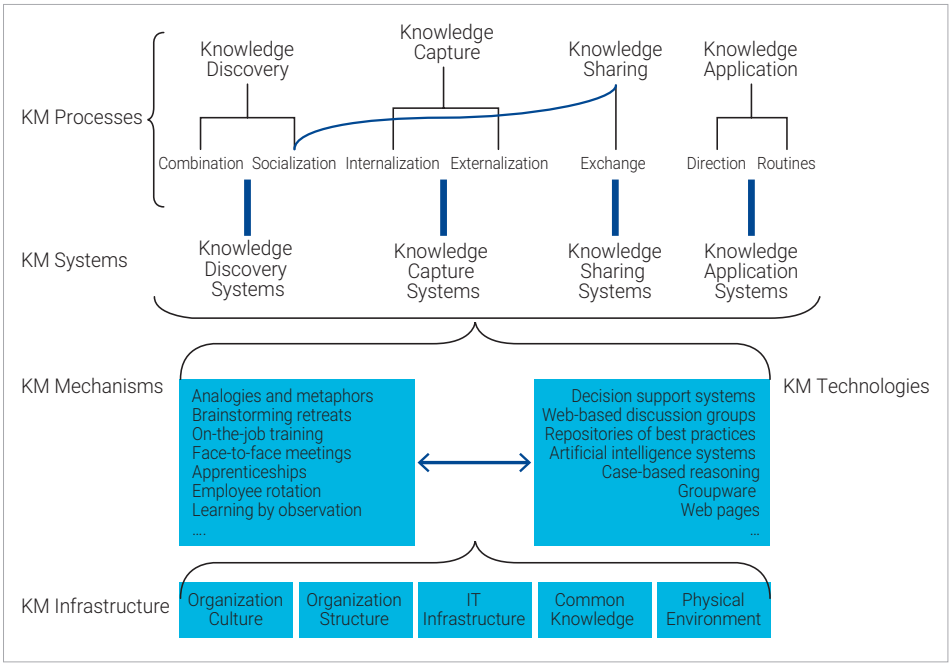
TD and TM are somehow a reflection of the faculty development model of HEIs. Wilkerson and Irby (1998, 394), for example, suggested that faculty development incorporates professional development, instructional development, educational scholarship and leadership, and organisational development. This is a clear trend that non-educational work organisations have now embraced, leading to more emphases on the learning function at workplace, and such embracement is also supportive of the move towards the idea of learning organisation, learning economy, and learning society.

10.3.2. Knowledge Management and Research and Development

In the knowledge-driven economies and societies, institutions regardless of whether they are educational institutions or business and industrial organisations are more or less influenced by knowledge, information, data, technologies (especially information and communication technologies), and new innovations in business strategies. Work organisations need to engage in a more complex networking environment in order to stay updated with the current knowledge, information, data, and innovation. These work organisations therefore need to manage knowledge properly. Well-managed knowledge resources and capitals are an important part of learning organisations in order for them to stay competitive and continue leading locally, regionally, or globally. Figure 10.4 offers one of the most research-based comprehensive models of Knowledge Management (KM) solutions. It is obvious that KM intersects many components of the work organisation, from IT infrastructure to organisational learning cultures and structures. Different firms have different capacities, conditions, and challenges in instituting the KM solutions in their current context, so how they should start solving the KM issues requires appropriate strategies and need to start at the right place.

KM is closely intertwined with Research and Development (R&D), the same way that TM is highly related to Training and Development (T&D). KM in fact expands R&D in that its mechanism covers not only the knowledge discovery and the knowledge application process but also the knowledge capture and knowledge sharing practices, which allows KM to link R&D to training and learning activities and strategies of a work organisation. As seen in Figure 10.4, the KM mechanism partially involves apprenticeship training and learning observations. It should be noted that research in the non-academic context is always an applied or actionable kind of research, and that is why it is always used with the term development (i.e. Research and Development). Before that, the translation of research into application follows a two-stage path, with the fundamental research conducted at universities first and then the application or development activities conducted at firms. Likewise, because KM involves knowledge sharing, the areas of communication strategies and strategic communications become relevant and indispensable in the KM and learning system of a work organisation. Thus, to promote learning organisation, R&D and strategic communication functions need to be considered.

Figure 10.4: A detailed view of knowledge management solutions



Source: From Becerra-Fernandez and Sabherwal (2014, 71)

10.3.3. Digitalisation and Digital Transformation

The use of advanced technologies to promote efficiency, reliability, and productivity of the working and production process has become an important strategic direction of business enterprises and industrial firms. Without technology upgrades, firms will lose their business competitive edge and risk being left behind in the new business spaces (i.e. the digital space).

Technology upgrades and digital transformation are foundational in transforming a workplace to be a learning organisation. The use of digital platforms (both internally built or externally linked) is a cost-efficient way to engage staff in continuous learning and sharing. In fact, the magnitude and efficiency of implementing organisational learning, TD, TM, KM, R&D, and/or strategic communication are reliant heavily on the ability of firms to transform digitally.

By reviewing 282 works and using a systematic process to develop a conceptual definition, Vial (2019) defined Digital Transformation (DT) as "a process that aims to improve an entity by triggering significant changes to its properties through combinations of information, computing, communication, and connectivity technologies". In practices at work organisation, the scope of digital transformation strategies may range from the strategic and infrastructural dimensions to the technical and leadership capacity dimensions of the work organisation. At the technical level, digital platforms which

apply different advanced digital technologies (such as business intelligence, artificial intelligence, machine learning, and digital security) need to be developed to facilitate learning and relevant factions.

10.4. Towards organisational learning at Cambodian workplace?

10.4.1. Workplace training in Cambodia in brief

Overall, opportunities to engage in real workplace training remain very limited for Cambodian youth. Based on the data from the school-to-work transition survey conducted by the International Labour Organisation (ILO) in 2014 (cited in OECD Development Centre 2017, 77), it seems that most Cambodian working youth do not receive adequate workplace training, and those who do are mostly tertiary graduates (21.4 percent) (see Table 10.2). As indicated in the table, 78.6 percent of the tertiary graduates claimed they did not receive any training (internship, apprenticeship, or other forms of training) as part of their job, compared to 93.2 percent of the secondary school graduates and 96.4 percent of the primary school graduates.

Table 10.2: Share of Cambodian youth receiving training as part of their job in the last 12 months, 2014

	Primary		Secondary		Tertiary	
	Graduates	Dropouts	Graduates	Dropouts	Graduates	Dropouts
Yes, currently in apprenticeship/ internship	3.6	1.7	4.3	3.4	10.0	0.0
Yes (not apprenticeship/ internship)	0.0	0.4	2.6	0.0	11.4	0.0
Not receiving any training	96.4	97.9	93.2	96.6	78.6	100.0
Total	100	100	100	100	100	100

Source: Adopted from OECD Development Centre (2017)

Cambodian firms need a productive workforce to grow their capitals and profits, and they recognise that it takes some time for employees to be productive after they freshly graduate from a university or a TVET institution. So, some firms are in fact willing to train the fresh graduates and employees. There are synergy success stories of private firms willing to train staff on the job or accept interns (see, for example, UNESCO 2013; Markova and Wray 2016; Eam, Heng, Ravy, Tim and Song 2020). The National Employment Agency (NEA) (2018b, 8) claimed that during the 12 months preceding its 2017 survey, 15.9 percent of the 605 surveyed establishments had funds or had arranged some forms of training, but 22.0 percent claimed to have had difficulty either organising training or finding trainers.

Training is important because employers in general remain concerned about the quality of graduates from educational and training institutions. NEA (2018a, 17) claimed that "47.9% employers stated they experienced recruitment difficulties, of which around

53.1% caused by low number of applicants with required skills, lack of work experience or qualification establishment demands [sic]". Along the same line, in a study on IT industry skills and labour in Cambodia conducted in 2016 by Digital Rain, a leading IT company, stated:

> There is a lot to choose from, but they have nothing on their CV, no internship, no skills and no experience. It is easy to hire people but more complicated, you have to train your own staff… As it is very difficult to hire qualified staff, we prefer to train our own [sic]. (Markova and Wray 2016, 29)

Although these exemplary cases of firms willing to train do not offer statistical generalisability of Cambodian firms' training intention, it is logical to accept that the need for workplace training in Cambodia is very high because the skills gap and mismatch issues have remained to be a serious concern for business enterprises and industrial firms.

In Cambodia, there are a variety of workplace-based training practices (such as induction/orientation program, internship program, apprenticeship program, volunteering program, in-house on-the-job staff training, off-the-job staff training, training that combine on-and-off-the-job training, and further education support program) (see CAMFEBA 2018; Eam et al. 2020). These different practices need further exploration and documentation in order for policy makers, researchers, and practitioners to gain a full picture of workplace-based training in Cambodia.

Internships may be the most common form of workplace-based, school-to-work transition program in Cambodia because some universities and TVET providers require students to engage in an internship program as part of their academic or vocational degrees. Internship takes place either due to the pull factors (firms' needs for human resources) and the push factors (needs of external stakeholders which can be schools, universities, TVET providers, students, or others) (Eam et al. 2020).

Many firms offer internship programs, and a few of them spend a considerable amount of money on such programs for students as well as on in-service training programs for their staff. Two exemplary cases are ACLEDA Bank Plc and Mega Asset Management Co., Ltd. The internship program of the ACLEDA Bank Plc is open to local and international applicants, and its in-service training for its own staff is vigorous. In 2010, according to its annual report, ACLEDA spent USD464,305 on in-service training (see Table 10.3). For the period between 2012 and 2016, the bank offered internship opportunities to 1,229 local students per year on average (see Table 10.4). Likewise, the Mega Assets Co., Ltd, according to the data obtained from its training office, provides a significant number of internship opportunities (of different types) to students, generally over more than 100 per year (see Table 10.5).

Table 10.3: In-service training at ACLEDA Bank Plc, 2007–10

	2007	2008	2009	2010
Total number of employees who received training	4,401	6,128	7,013	6,999
Average days of training received per trainee	43	36	27	27
Average training hours per trainee	5	5	5	6
Training cost per trainee (USD)	118	110	80	66
Total training cost (USD)	518,350	679,926	564,305	464,305

Source: Adopted from ACLEDA (2016, 40)

Table 10.4: Internships and in-service training at ACLEDA Bank Plc, 2010–16

	2012	2013	2014	2015	2016
Number of employees	7,721	9,451	11,182	11,926	12,325
Training for new recruits	1,375	2,711	2,368	1,717	1,374
Internships for local students	1,280	1,220	969	1,241	1,433
Internships for international students	2	3	2	5	1

Source: Adopted from ACLEDA (2016, 38)

Table 10.5: Internships at Mega Asset Management Co., Ltd., 2010–October 2017

Type	2010	2011	2012	2013	2014	2015	2016	October - 2017
Normal interns	88	125	164	195	129	134	148	94
Special interns	No record of special interns from 2010 to 2014					25	44	39
Total	88	125	164	195	129	159	192	133

Source: Statistics offered by Mega Asset Management Co., Ltd after interviewing its senior training and development officer

Besides internship programs implemented at different types of Cambodian work organisations, some workplace training or skill-upgrading programs have been supported by key development partners generally as an intervention to develop skills among Cambodian workers. The Voucher Skills Training Program (2005–2010), funded by the Asian Development Bank (ADB) and implemented by Ministry of Labour and Vocational Training (MLVT), was an example of that. It was an initiative to equip disadvantaged groups in seven provinces with job skills. Similarly, the Skills Development Fund, "a dedicated stock or flow of financing outside normal government budgetary channels for developing productive skills for work" (ADB 2015, 2), involved multiple stakeholders, especially private firms, in an initiative to upskill Cambodia's existing workforce. There are multiple of such programs, which have been implemented in Cambodia since the provision of development aides to Cambodia around 1990s; however, these programs are generally short-term and not sustainable. As the Cambodian economy has grown to the point that the country was labelled as a lower-middle-income country, such international development aides may shrink and therefore a more sustainable skill development mechanisms are needed.

In fact, many other Cambodian work organisations, business firms, non-governmental organisations (NGOs), and some public institutions offer internship programs as well as other types of training programs to students, but the data on those programs is generally not collected or not available to the public. So more large-scale research to gather and compile such datasets is needed.

10.4.2. Further opportunities to promote organisational learning in Cambodia

We shall first ask Cambodian work organisations if they think their current approaches to workplace training are enough or whether they think they need to transform their training practices and create a space to incubate learning structure and culture at their organisation. Empirical data through a large scale survey is needed to answer such a question.

As we can see from earlier discussions, workplace training alone (as it currently is) may not contribute significantly to the expected outputs and outcomes of the firm. The global momentum to promote learning at work organisations in developed countries has also become very active. We therefore postulate that Cambodian work organisations should extend their workplace training and development and formulate their own learning organisation model. To do that they have to independently develop an organisational learning system and build their learning capacities and cultures.

However, the theoretical, conceptual, and operational frameworks of organisational learning and related areas (such as TD, TM, KM, or DT) are still under development, and therefore to practically set up a system of learning organisation that guarantees a hundred percent of success at Cambodian workplaces can be an unrealistic and daunting endeavour. But in Cambodia, recent developments in TVET and economic and employment sectors imply more opportunities to develop learning culture at its workplaces.

First, educational and training institutions as well as the government have sought participation from the private sector to improve workplace training (e.g. internship, apprenticeship, joint training program) through PPP. The government and its multilateral and bilateral development partners hold the view that PPP between TVET providers and private firms can generate mutual benefits and opportunities for both sides in various dimensions, especially in offering trainees and workers a functional and interdependent space (between school and workplace) to engage in practical and productive learning environment. PPP may also offer new opportunities for digital transformation and knowledge management at Cambodian work organisations, which in turn supports the learning infrastructure at the work organisations.

Secondly, we have noticed numerous changes in the employment environment of Cambodia recently. Emerging learning-related job positions signify the increasing awareness of the important role of learning at work organisations in Cambodia. Among these new learning-related positions are the learning officer position,

generally combined with research and monitoring and evaluation (M&E) works; the talent developer position (generally linked to training head or trainer position); the research officer or research manager position; the communication officer position; or the knowledge manager position. These positions are noticeably available through leading local job recruitment platforms (such as BangThom) and other international recruitment platforms that have recently established their business operation in Cambodia. Increases in business enterprises working on technology are also noticeable in Cambodia, and these enterprises more or less have promoted the data-related positions at their workplaces. The number of Cambodian firms starting to operate internationally also had increased before the Covid-19 spread in late 2019. The ACLEDA Bank Plc, for example, has reportedly expanded its operation in Laos and Myanmar. This bank has also established its own university, with one of the purposes to train their own future staff. All these developments in the employment sector show positive signs for an attempt to embody learning into the work organisations in Cambodia.

Figure 10.5: A comprehensive framework of Cambodian digital transformation policy

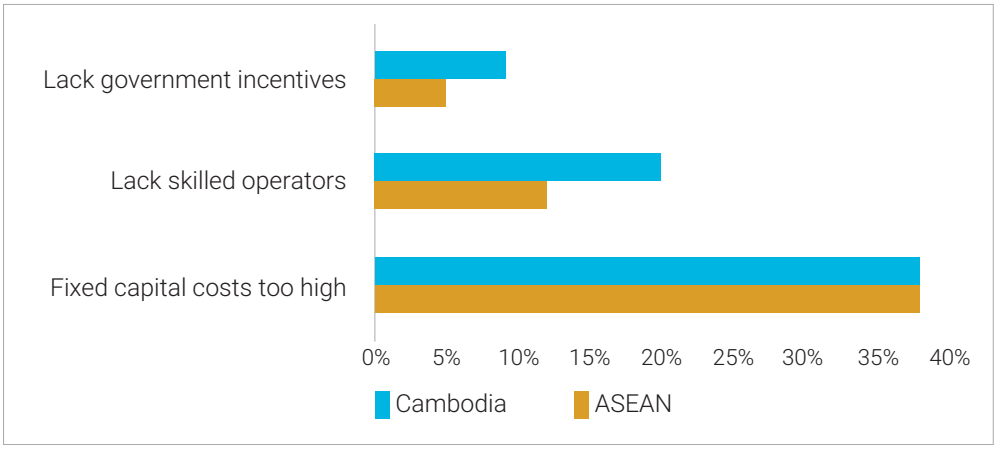
Source: Working Group of the Supreme National Economic Council (RGC 2021, 4)

More to the point, at the macro-level, Cambodia has already had policies that open the way for further discourses on organisational learning and learning organisation. One of these policies is the currently issued Cambodia Digital Economy and Society Policy Framework 2021-2035 (RGC 2021). If we take a quick look at this comprehensive framework (see Figure 10.5) (RGC 2021, 4), it is hard to imagine the future survival of

firms or work organisations that do not embrace the transformational approaches and the learning cultures in Cambodia. To illustrate, Cambodian business environment in the future, under the digital transformation framework, will be far more competitive, especially on the digital space and the regional and global spheres than it is now. Thus, as punned by researchers, either the (Cambodian) firms learn, adapt, and transform or they die.

However, technology upgrade and digital transformation can be a bit idealistic for especially small enterprises. Like other ASEAN countries, 35 to 40 percent of firms in a survey by ILO consider the fixed capital costs of technology upgrade too high for them. Also, compared to their ASEAN counterparts, more Cambodian firms are concerned with the lack of government incentives and lack of skill operators in upgrading technologies (see Figure 10.6 below). It should also be noted that the Cambodian economy is still dominated by the informal sector (such as in agricultural and retails).

Figure 10.6: Barriers to upgrading technology



Source: CAMFEBA (2018) in a slide presentation at Workplace-based learning workshop on 21 February 2018, Phnom Penh

If we take another perspective on firm-based R&D and KM in Cambodia, we understand that these domains are also important systems to develop at Cambodian firms if the firms need to transform their training and development functions and promote learning capacities and cultures. R&D at Cambodian firms remains very limited, however. In the 2016 survey of Cambodian R&D (with the report published in 2018), there were 441 R&D personnel at 29 (out of 808) Cambodian business enterprises reported to have been involved in some kinds of R&D (MoP 2018, 19). Only 43 out of those 441 R&D personnel are officially researchers (MoP 2018, 19). The poor performance of R&D at firms has many implications on firms' capability to KM. For instance, technology transfer capacity, innovative product development capability, or global outreach of local products face significant drawbacks when the R&D does not function. Without the R&D and KM in place, building the learning infrastructure can be hard.

10.4.3. Some suggestions on future promotion of organisational learning

Based on this brief perspective on current developments surrounding workplace training and employment environments in Cambodia, building a space for learning at Cambodian work organisations may begin with an upgrade of the human resources and the training and development components of those work organisations. The human resource and training components have explicit and tacit knowledge and data of the existing talent of each work organisation, and the kind of talent the organisation needs. Work organisations therefore need to first explore and observe their own current workplace training and development practices and identify the potential gaps, challenges, or opportunities for them to embed an appropriate organisational learning system into their workplace and in the long run to become a learning organisation.

A number of challenges may emerge from such exploration: (a) whether firms have clear strategic directions and resources to implement appropriate learning, TM, DT, and KM activities; (b) whether they acknowledge the values of new approaches and are willing to try; and (c) whether the human resource and training unit at firms are efficient and capable in mobilising resources for capacity building, training, re-skilling, up-skilling, and learning activities. Though it may seem too early, this study suggests that Cambodian firms need to start thinking and learning about best practices from other organisations that have already implemented strategies to become a learning organisation.

This review study is too nascent to offer any concrete and empirical suggestions on actions to take. This chapter is written more as an introductory text to the research area that is promising in terms of its actionability and applicability in business and industrial sectors and so for the development of the whole nation's economies and societies. However, to offer any suggestions at all for Cambodian firms, if we may, the following should be considered:

1. Expand organisational visions by embedding learning as part of the organisational strategies and ensure that the visions are understood and shared by everyone in the organisation,
2. Enhance the existing training and development practices by including more learning-centric activities,
3. Start considering and formalising a long-term apprenticeship training program as well as the short-term internship training,
4. Invest in the development of internal knowledge management system,
5. Upgrade relevant technologies and conform to the national digital transform movements, and
6. Develop a knowledge-sharing platform for team learning at the organisation.

Leap-frogging into a new kind of training, development, and learning practices may create burdens for work organisations for a short term, but that will positively influence the working culture at Cambodian work organisations in the long run as they are moving into the coming global knowledge economies and societies. Organisational structure, culture, and infrastructure need to be changed or upgraded, with the support of digital technologies, at Cambodian work organisations for them to embrace new organisational learning principles.

The current study is an introductory and a rather broad piece of writing. To extend and deepen this study, further works may examine whether Cambodian firms have the intention to introduce the new learning function and perceive it as a working strategy for them to grow. Likewise, future studies need to measure the learning capacities and cultures at firms and systemically observe the different dimensions (e.g. digital technology, knowledge creation and acquisition approaches, and training culture) in order to understand how to model a learning organisation in Cambodia.

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Section III

Perspectives on Cambodian STEM Pipeline and Education in the Discourse of 21st-Century Competencies

Chapter 11

STEM Major Choice of Cambodian Senior-Year University Students: Further Indication of Secondary School and Future Career Influences

Eam Phyrom and Keo Borin

Abstract

This study aims to identify factors associated with STEM major choice of Cambodian university students. The sample size was 1,600 senior students from 15 selected Cambodian universities in the academic year 2016-2017. Binary logistic regression was used to explain associations between 15 predictor variables (specified based on previous international and local studies) and a dichotomised outcome variable (STEM major vs. non-STEM major). The analyses show that six attributes of Cambodian senior-year university students significantly explain why they choose a STEM major: being male, studying at a Phnom Penh-based university, preparing for a priority university major since their secondary school years, selecting science stream at secondary school, desiring to pursue a STEM-related career, and acknowledging the importance of science and technology to society.

Keywords: STEM education, STEM pipeline, science education, university major choice, STEAM

11.1. Background

The future of Cambodian educational, economic, and cultural performances is intrinsically linked to her strategic design of STEM (science, technology, engineering and mathematics) pipeline and STEM education. Cambodia needs the majority of her citizens to be literate in STEM (i.e. STEM literacy for all), a large proportion of them to be educated/trained in STEM majors, and a significant number of them to be leading and serving in STEM careers. The importance of STEM, along with research and innovation, has come to the fore as Cambodia grapples with rapid economic development and growing complexities of industrial production systems and globalised cultures. STEM literacy, approaches, and expertise will contribute largely to the productive capabilities and the cultural development of Cambodia in the future.

Discourses and actions in the field of STEM education have become more dynamic in Cambodia at the turn of the 21st century. Within the past five years, the Cambodian government has approved several major policies, plans, and/or institutional establishments to subsequently promote STEM in school, industry, and society, notably:

- Cambodia's National Science and Technology Master Plan (2014–2020) for Growth and Quality of Life, launched in 2013 and supported by the Korea International Cooperation Agency (KOICA) and the Korea Institute of Science and Technology Evaluation and Planning;
- Cambodian Information and Communication Technology (ICT) Master Plan 2020, launched in 2014 and also supported by KOICA;
- National Science and Technology Council and its general secretariat established in 2014 and 2015;
- STEM Education Policy issued in 2016 by the Ministry of Education, Youth and Sport (MoEYS);
- The 2021-published Cambodia Digital Economy and Society Policy Framework 2021-2035 by the Royal Government of Cambodia (RGC); and
- The 2021-published Cambodia's Science, Technology and Innovation Roadmap 2030 by Ministry of Industry, Science, Technology and Innovation (MISTI).

These plans and policies are generally designed in alignment with the long-term, macro-level Rectangular Strategy III 2013–18, National Strategic Development Plan 2014–18, and Industrial Development Policy 2015–25 and in response to the future need for experts and workforce in STEM.

An unpublished report by the Japan International Cooperation Agency (JICA) (2012 cited in Madhur 2014, 1) estimated that Cambodia would need around 35,000 engineers and 46,000 technicians by 2018 to attract higher foreign direct investment inflows and build a strong human resource foundation for powering its economic engine. MoEYS (2019, 40) aimed to increase the percentage of students enrolled in STEM programs at higher education institutions (HEIs) from 27.1 percent in 2018 to 32.0 percent in 2023.

More to the point, Cambodian schools and HEIs have engaged in a number of ways to promote STEM curricula, infrastructure, and teaching and learning. A MoEYS report "STEM Education Achievements" noted that at least ten STEM development programs have been launched as of 2018 – from online learning platforms (supported by the Korea Education and Research Information Service) to online resource platforms operated by MoEYS (e.g. Open Education Resources and the *Krou/Teacher* website) (MoEYS 2018). STEM infrastructure and learning centres have also been established, including resource secondary schools, new-generation schools, STEM buildings and facilities at the Royal University of Phnom Penh (RUPP), and research programs at the Institute of Technology of Cambodia (ICT). Other initiatives to encourage more take-up of STEM majors, according to the report, include loans for outstanding students, teacher training on approaches to STEM education, and a published information booklet about Cambodian STEM institutions. Furthermore, secondary schools across Cambodia, since 2010, have introduced students to the streaming system (i.e. science vs social stream) with the hope to see more students participating in STEM majors and careers (Kao 2013, 14). Eng and Szmodis (2015, 282) similarly noted the existing access to science laboratories and computer training at Cambodian secondary schools and the preparation for TIMSS (Trends in International Mathematics and Science Study) and PISA (Programme for International Assessment) tests. These educational institutions are expected to play an important role in guiding their students in studying science and mathematics; helping them meet the requirements for studying STEM majors at university; equipping them with STEM-related skills needed for employment; and inspiring them to pursue careers in STEM-related sectors and industries.

However, despite these positive developments, it is critical to stress that the STEM pipeline[1] in Cambodia has neither been fully understood nor well established. From the supply-side perspective, questions have still been raised on whether Cambodian universities and other types of post-secondary education and training institutions have adequate STEM programs of sufficient quality to accommodate students who want to study such majors as data science, neuroscience, theoretical physics, biotechnology, artificial intelligence, or other interdisciplinary specialisations. Postgraduate programs (or advanced studies) in STEM-related fields are small in number as most existing programs offer only advanced degrees in language, business, or social studies. It should be noted that all eleven doctoral graduates at Cambodian HEIs (in the academic year 2014-2015) had pursued social science programs, and only seven percent of 3,013 master's degree students graduated with a degree in natural science and agricultural science combined (MoEYS 2016).

From the job market and career perspective, the real demand for STEM workforce and experts has yet to be officially investigated. Policymakers, employers, and students still need clearer information and more directional plans on the size of STEM-related job markets and

1 STEM pipeline in this study refers generally to the whole educational and vocational (career) pathway related to STEM fields, from lower-level education to post-secondary education and to future career.

industries. Likewise, the number of scientists, engineers, technicians, mathematicians, and/or researchers that will be required over the next 10 to 20 years need to be made explicit to all stakeholders.

It seems that Cambodian students are still not attracted to STEM majors despite all the efforts at different levels of education. In the academic year 2016-2017, according to MoEYS (2018), only 23.86 percent of the total number of Cambodian students enrolled in associate and bachelor's degree programs were studying a STEM-related major. Namely, out of 165,359 bachelor's degree students and 20,570 associate degree students, only 44,366 were studying a STEM major. UNESCO's data for academic year 2019-2020 shows a similar percentage (23.2 for STEM-related and 76.8 for non-STEM related majors), with most of the STEM majored students studying ICT (9.74 percent) and engineering (8.96 percent) programs. The latest report from MoEYS in 2021, which analysed only students currently in bachelor's degree programs of the academic year 2019-2020, continued to show that the trend of major choice has not changed much: business-related majors (42 percent), foreign languages (10 percent), information technology (9 percent), social science and arts (9 percent), engineering (8 percent), law (7 percent), basic science (5 percent), health (5 percent), agriculture (3 percent), and tourism (2 percent) (MoEYS 2021, 104).

A small pool of previous studies (e.g. CAMFEBA and ILO 2008; Kao 2013; Eng and Szmodis 2015; Peou 2017; Eam, Keo, Leng, Khieng and Song 2019) has provided some accounts on factors influencing major choice of Cambodian university students, but most do not focus particularly on the senior-year university students. In light of the above-discussed issues, senior-year university students' STEM major choice deserves a critical observation because this group of students is able to stay in their STEM program at HEI until the last academic year without quitting.

Therefore, exploring and explaining what shapes students' choice of university major remains important in order to contribute to further understanding on the aforementioned problems of low STEM enrolment, limited support of quality STEM majors, and/or the need for a map of STEM careers. Understanding patterns of major choice can offer further insights for the problem of skills mismatch and gaps (Peou 2017), which has been an ever-present concern in Cambodia (e.g. World Bank 2012; Bruni, Luch and Kouch 2013) while the government wishes to see more students get into the STEM pipeline.

11.2. The current study

11.2.1. Objective

This study aims to identify factors associated with Cambodian senior-year university students' choice of STEM major. This study is an extension from a previous study that focused on factors explaining major choice of Cambodian university freshmen (see Eam et al. 2019) in the same project.

11.2.2. Concept and measure of STEM major choice

In this study, STEM major choice simply refers to majors in or related to science (e.g. physics, chemistry, biology), mathematics (and related formal science majors), technology (e.g. information technology, geo-technology), and engineering (e.g. electrical engineering, mechanical engineering). The STEM concept is in fact complicated and confusing for two reasons. First, STEM is often discussed without specifying the conceptual lens through which it is viewed. In the literature, STEM discourses revolve around either STEM education or STEM pipeline. STEM education can be conceptualised through the lenses of discipline, approaches, and/or outcomes. STEM pipeline is related more to the pathway of STEM and so covers different phases of STEM participation, from secondary school stream to university major and further to career track. Second, rather than defining and specifying STEM, the discussion in the literature tries to generalise the idea of STEM and so broaden its scope and relate it to just about everything. Such discussion of the philosophical and practical concept of STEM, however, is beyond the scope of this study.

Our focus is on the concept of STEM major, not STEM education, STEM pipeline, or STEM per se. That said, we do not focus on the interdisciplinary nature of STEM; the integrative, applicative, or productive approaches to STEM; or the STEM competencies and literacies as the outcomes from participating in STEM-related programs. Our conceptualisation of the STEM major is simple and has been used in most previous literature as we place different, separate majors in a boundary scope between STEM majors and non-STEM majors (see Table 11.1).

Table 11.1: Classification of major choice

STEM major choice (coded 1)	Non-STEM major choice (coded 0)
Agricultural engineering	Accounting, banking, and finance
Agronomy	Agricultural economics
Animal science	Architecture
Bio-engineering	Business administration
Biology	Economics
Chemical engineering	English language
Chemistry	Fashion design
Civil engineering	International relations and political science
Computer science	Korean studies
Health science	Land management
Electrical engineering	Law
Environmental science	Media
Fishery and forestry science	History
Geo-resources and geo-technology	Khmer studies
Mechanical engineering	Sociology
Mathematics	Psychology
Physics	Geography
Electronic engineering	

11.2.3. Literature on factors influencing STEM major choice in brief

Previous studies on factors influencing major choice have discussed attitudes towards science, psychological constructs (e.g. identity and interest) related to science, and behavioural engagement in science – mostly at the individual level (Regan and DeWitt 2015). They generally adopted motivational psychology models such as the Theory of Reasoned Action, the Theory of Planned Behaviour, and the Social Cognitive Career Theory (Regan and DeWitt 2015). Those studies also derived perspectives through the theoretical lenses of expectancy-value, narrative analysis, or feminism (Henriksen, Dillon and Ryder 2015). Regan and DeWitt's seminal review (2015), and other studies including Woolnough (1994) and Tripney et al. (2010), pointed to a multidimensional array of factors and variables influencing STEM enrolment behaviour, specifically personal factors (gender, race, age, conception of science, career values, interest, performance expectation and attainment), school-related factors (school type, teachers' qualifications, curriculum, pedagogy, pre-university experience and preparedness for higher education), and family-related and external factors (parental support and resources). These conceptual lenses, theories, specific factors, and variables (and their relationships) have together formed an important body of knowledge and continued to shape research into major choice in general and STEM major choice in particular.

Literature on how Cambodian students perceive and cope with the intended strategic shift away from trendy majors and careers in business, language, and social studies to majors and careers related to STEM has remained limited, and the findings are sometimes contradictory. In answering the question of why Cambodian students choose their major the way they do, previous local studies pointed to career- and family-related factors (Peou 2017), parents' and teachers' support (Eng and Szmodis 2015; Peou 2017), peer influences, and other personal and school factors (CAMFEBA and ILO 2008; Kao 2013; Eng and Szmodis 2015). More recently, Eam et al. (2019) emphasised the role of career guidance and secondary school science and maths competencies as important determinants of STEM major choice of Cambodian first-year university students. Similar studies (e.g. Blotnicky et al. 2018; Goff et al. 2019) in other national contexts corroborated the Cambodian studies' findings, concluding that STEM career knowledge (together with career activities and interests) and science and maths self-efficacy influence STEM career choice and what they called STEM identity.

The variables identified by the local studies to explain STEM major choice are not necessarily beyond the sphere of the theoretical and international literature and so can be framed around personal, career, school, family, and external factors. There is a need to look at the issue of major choice from such a multidimensional perspective because no single theory or specific dimension alone can fully explain this complex notion of choice. In theoretical terms, major choice is not a fixed one-time decision but a dynamic, continuous process (Ryder, Ulriksen and Boe 2015, 354), so studying factors influencing choice across (or at) different time periods is a necessary approach. For that reason, research studies should focus on university students in different

academic years. The main approach of the current study, therefore, is not to test any theory of major choice, but rather to extend the existing local literature by exploring and explaining different variables of different dimensions associated with Cambodian university students' choice of major, this time with a special focus on the senior-year cohort.

11.2.4. Analytical framework for the current study

The current study was designed on the basis of positivism, the foundational paradigm of quantitative research methodology. With the deterministic analytic framework (guided by the literature and clearly specified variables), the associational hypotheses were set up and tested. Fifteen predictor variables were used to predict the dichotomised major choice (1=STEM major choice and 0=non-STEM major choice) of 1,600 senior-year students in the academic year 2016-2017[2] from 15 universities based in different cities and provinces of Cambodia. The predictor variables (measured quantitatively and selected based on local empirical literature and including personal, career, high school, university, family, and external variables) together formed the conceptual framework for the study. The logistic regression analytic model (employed due to the dichotomous dependent variable) can be expressed by the following equation[3]:

$$logit(Y_1) = b_0 + b_1GN + b_2PM + b_3CP + b_4UL + b_5HSS + b_6HSSQ + b_7HSLQ$$
$$+ b_8WS + b_9FI + b_{10}PI + b_{11}SI + b_{12}MC + b_{13}FC + b_{14}MHE + b_{15}FHE + e \qquad (1)$$

Where Y_1 = STEM major choice; logit(Y_1) = the natural logarithm of the odds of STEM major choice; e = random error term; b (0, 1… 15) are regression coefficients; GN=gender; PM=personal priority major; CP = personal career prospects; UL=university location; HSS=secondary school stream; HSSQ=perceived secondary school service quality; HSLQ=perceived secondary school laboratory quality; WS=working status; FI=perceived friends' influence; PI=perceived importance of science and technology to society; SI=perceived science outreach activities' influence; MC=mother's career; FC=father's career; MHE=mother's education; and FHE=father's education.

2 For the academic year 2015-2016, the total population of senior-year students of the 15 universities amounted to 15,406 out of the total population of 44,767 students of all universities in Cambodia.

3 It should be noted that logit(Y_1) = ln(π/1-π) = ln(odds of Y_1). Unlike the linear regression model that directly predicts the value of the outcome variable, the logistic regression model predicts the natural logarithm (*ln*) of the odds of the outcome variable (which are the ratios of the probability of the outcome variable happening (π) to the probability of the outcome variable not happening [1-π]) (Peng, Lee and Ingersoll 2002, 4). So, the reported parameters of the associations between predictors and the outcome variable are generally not the regression coefficient (b) but the odds ratio (Exp(b)) or the calculated marginal effects. The current study reported the odds ratio values.

Table 11.2: Demographic variables and descriptive statistics

Variables	Description and measurement	M	SD	F	%
STEM major choice	0=Non-STEM major			512	32.00
	1=STEM major			1088	68.00
Personal and career factors					
Gender (GN)	0=Female			756	47.25
	1=Male			844	52.75
Personal priority major (PM)	0=No, changed major			476	29.75
	1=Yes, prioritised major			1124	70.25
Personal career prospects (CP)	0=Non-STEM-related job			888	55.50
	1=STEM-related job			346	21.63
	.= Missing			366	22.88
Secondary school and university factors					
University location (UL)	0=Province			427	26.69
	1=Phnom Penh			1173	73.31
Secondary school stream (HSS)	0=Social stream			173	10.81
	1=Science stream			1390	86.88
	.= Missing			37	2.31
Perceived secondary school service quality (HSSQ)	1=Very poor to 5 = Outstanding	3.23	1.02		
Perceived secondary school laboratory quality (HSLQ)	1=Very poor to 5 = Outstanding	3.12	1.01		
External and family factors					
Working status (WS)	0=No			1098	68.63
	1=Yes			502	31.38
Father's career (FC)	0=Others			1178	73.63
	1=Working in public, private and NGO sector			411	25.69
	.=Missing			11	0.69
Mother's career (MC)	0=Others			1457	91.06
	1=Working in public, private and NGO sector			138	8.63
	.=Missing			5	0.31
Father's education (FHE)	0=Lower than Grade 12			1209	75.56
	1=Vocational and higher education			171	10.69
	.=Missing			220	13.75
Mother's education (MHE)	0=Lower than Grade 12			1178	73.63
	1=Vocational and higher education			196	12.25
	. =Missing			226	14.13
Perceived friend influence (FI)	1=Not important to 5=Very important	2.65	1.22		
Perceived importance of science and technology to society (PI)	1=Not important to 5=Very important	3.74	1.12		
Perceived science outreach activities influence (SI)	1=Not important to 5=Very important	3.21	1.23		

Note: M=mean; SD=standard deviation; F=frequency.

11.2.5. Data used and participants

The participants in this study were senior-year university students from different regions in the country. The majority of them were based in Phnom Penh (73.31 percent). Of all the participants, 86.88 percent chose the science stream at secondary school. There were 844 males and 756 females (52.75 vs. 47.25 percent, respectively). About 27.00 percent of the participants were based at provincial universities, and 31.38 percent worked while doing their undergraduate degree. Table 11.2 offers the detailed statistics of these and other variables used for the analyses.

Of the sample of 1,600 students, 68 percent were studying a STEM major and 32 percent non-STEM-major. This result is perhaps disproportionate with the population parameters in the sampling years. However, rather than applying the sampling weight to account for this intentional oversampling, we kept the samples as they were for this preliminary analysis because (1) the specific purpose of this study was to understand the relationship among variables, not to present descriptive statistics to estimate the characteristics of the population; (2) the survey intentionally oversampled the programs related to science, technology, mathematics, and engineering at the selected universities in order to avoid the domination of samples from the business, social science, and humanity groups; (3) the dichotomised STEM major choice variable is a recoded variable from the original one that specifically asked students to state their exact major; (4) weighting may result in unnecessary increase in standard errors of the analyses; and (5) we did not conduct adequate follow-up investigation on the nature of the survey nonresponses due to time limitation. In fact, weighting is more supported for descriptive analyses not for regression analyses (Gelman 2007, 163), and, in statistical science, the discussion and guidance on weighting in logistic regression analysis remain very limited. We should also highlight here briefly that because the study did not weight the respondents' data and answers, generalising the results has to be done with care and may only be done in comparison to other future studies.

11.3. Findings

The analyses of the 15 predictor variables were performed in three stages, thus generating three models (see Table 11.3). The results indicate that gender, personal priority major choice since secondary school, and personal career prospects (of the Personal and career factors of the first model) were statistically significantly associated with STEM major choice. These three variables remained significant throughout the analyses of the other two models. University location and secondary school stream choice (of the secondary school and university factors of the second model) were also statistically significant (predicting the major choice in both model 2 and model 3). Furthermore, the variable perceived importance of science and technology to society (of External and family factors of the third model) was also statistically significantly associated with the STEM major choice of Cambodian senior-year university students. In short, the final model 3 with all the 15 variables included indicates that *gender*, *personal priority*

major since secondary school, *personal career prospects*, *university location*, *secondary school stream*, and *perceived importance of science and technology to society* were associated with Cambodian senior-year university students' STEM major choice. These six statistically significant variables together (in the final model) comprise the highest explanatory power of STEM major choice with a Pseudo R^2 value of 0.264.

In odds ratio (Exp(b)) terms, male students were about 2.5 times more likely than female students to enrol in a STEM major. Those with a clearly prioritised university major since their secondary school years were about 2.0 times more likely to choose a STEM major than those without a clearly intended choice of major. The odds ratio of 5.2 for STEM career prospects means that students intending to work in STEM-related fields were about 5.0 times more likely than those who do not want to pursue STEM-related careers to be enrolled in a STEM major. Students at Phnom Penh-based universities were around 4.0 times more likely to be enrolled in a STEM major than those at provincial universities. Students selecting the science stream at secondary school were also more likely than those who chose the social stream to pursue a STEM major (odds ratio=5.1). And students who perceived the importance of science and technology to society were more likely to fall into the STEM major group (with an odds ratio of 1.5) than those who did not see them (science and technology) as important.

Table 11.3: Binary logistic regression results of Cambodian senior-year university students' choice of STEM major

Variables	Model (1)	Model (2)	Model (3)
Personal and career factors			
Gender (GN)	1.026***	1.221***	0.876***
	(7.72)	(6.93)	(3.58)
Personal priority major (PM)	0.276*	0.467**	0.628*
	(1.98)	(2.62)	(2.44)
Personal career prospects (CP)	1.790***	1.405***	1.651***
	(8.78)	(5.89)	(4.72)
Secondary school and university factors			
University location (UL)		1.374***	1.444***
		(7.96)	(5.89)
Secondary school stream (HSS)		1.336***	1.629***
		(5.04)	(4.04)
Perceived secondary school service quality (HSSQ)		0.088	0.108
		(0.97)	(0.81)
Perceived secondary school laboratory quality (HSLQ)		0.176	0.076
		(1.86)	(0.56)

Variables	Model (1)	Model (2)	Model (3)
External and family factors			
Working status (WS)			- 0.392
			(-1.56)
Perceived friend influence (FI)			-0.114
			(-1.07)
Perceived importance of science and technology (PI)			0.396**
			(3.14)
Perceived science outreach activities influence (SI)			0.155
			(1.27)
Mother's career (MC)			-0.576
			(-1.20)
Father's career (FC)			-0.472
			(-1.66)
Mother's education (MHE)			0.541
			(1.36)
Father's education (FHE)			0.671
			(1.66)
Constant	-0.33*	-3.019***	-4.54***
	(-2.56)	(-6.8)	(-5.95)
N	1,234	992	562
Chi-square test	208.05***	230***	167.91***
Pseudo R^2	0.133	0.205	0.264

Note: *p<0.05, ** P<0.01, *** P<0.001; values in brackets are Z-test values.

In further bivariate analyses of the statistically significant variables (as indicated in Table 11.4), 79.50 percent of male students chose a STEM major, compared to 55.16 percent of female students in the samples (Chi-square test = 108.60, p<0.001). Senior-year university students in the STEM programs who had a priority university major since their secondary school years accounted for 69.84 percent, compared to 63.66 percent of those who did not have a priority major (Chi-square test = 5.87, p<0.05). The majority of students intending to pursue a STEM-related career (91.04 percent) were studying a STEM major; and only 58.11 percent of those who did not want to work in STEM-related areas decided to study a STEM major (Chi-square test = 122.78, p<0.001). For university location, 74.17 percent of students studying in Phnom Penh chose a STEM major, compared to 51.05 percent of those studying at provincial universities (Chi-square test = 76.87, p<0.001). A high percentage (i.e. 72.09 percent) of students who took the science stream at upper secondary school pursued a STEM major at university, compared to only 35.84 percent of those who took the social

science stream (Chi-square test = 93.01, p<0.001). Finally, the percentage of students who highly acknowledged the importance of science and technology to society and enrolled in a STEM major was 78.31 percent, while there was only 57.41 percent of students who rated low in the perceived importance of science and technology to society and enrolled in a STEM major (Chi-square test = 69.09, p<0.001). These differences between percentages, from a bivariate perspective, offered additional confirmation of the association between the significant predictor variables and the outcome variable (i.e. STEM major choice).

Table 11.4: Bivariate chi-square test results between the significant predictors and the STEM major choice

Variables	Categories	Non-STEM major choice (%)	STEM major choice (%)	Chi-square test and significance
Gender (GN)	Male	20.50	79.50	108.60***
	Female	44.84	55.16	
Personal priority major (PM)	Yes	30.16	69.84	5.87*
	No	36.34	63.66	
Personal career prospects (CP)	Non-STEM	41.89	58.11	122.78***
	STEM	8.96	91.04	
University location (UL)	Phnom Penh	25.83	74.17	76.87***
	Province	48.95	51.05	
Secondary school stream (HSS)	Social science stream	64.16	35.84	93.01***
	Science stream	27.91	72.09	
Perceived importance of science and technology (PI)	Low	42.59	57.41	69.09***
	High	21.69	78.31	

Note: *p<0.05, ** P<0.01, *** P<0.001.

11.4. Discussions and implications

The current study employed a quantitative approach to identify correlates of STEM major choice of Cambodian senior-year university students. This study extended a previous publication that focused on factors influencing major choice of first-year university students in Cambodia (see Eam et al. 2019). The findings of the current study suggest that being male, desiring to pursue a STEM-related career, studying at a Phnom Penh-based university, preparing for a priority university major since secondary school years, selecting the science stream at secondary school, and acknowledging the importance of science and technology to society are key attributes of Cambodian senior-year university students enrolled in a STEM major. These findings, corroborating to a large extent with some of the previous studies, indicate that certain variables of personal, career, school, university, and external factors explain the STEM major choice of Cambodian university students. It should be highlighted that the identified associations in this study do not infer causality but correlation because the design of this study is not experimental.

The most important insight from this study is the need to focus on students' learning engagement in and their learning environment of STEM-related subjects at secondary school as well as on students' understanding of STEM career paths. Such claim can be justified by the detected statistical significance of a number of important variables in this study: personal career prospects, personal priority university major since secondary school years, and science stream choice at secondary school. These significant associational patterns between what happen at secondary school and the university major choice are supported by various international studies that look at the issue of choice from multidimensional perspectives and at multiple levels (e.g. Woolnough 1995; 2000; Regan and DeWitt 2015). In local studies, Kao (2013) also argued that high school achievement in mathematics and science of Cambodian students is a factor influencing science and engineering major choice. Both Kao (2013) and Peou (2017) further pointed critically to the students' choice of major based on career prospects and opportunities. These findings imply that building a strong foundation of STEM (competences, attitudes, and habits) since the students' secondary school years is of critical importance. The secondary-school- and career-related dimensions can offer many possibilities to policymakers and relevant stakeholders in their future interventions to increase Cambodian students' interest and participation in later stages of the STEM pipeline (i.e. at the post-secondary stage and the career stage).

This study also rehighlights the need to consider gender equity in STEM. The gender-related factors associated with the university major choice have been detected in various past studies, both local and international (e.g. Goldman and Hewitt 1976; Maokler and Kim 2004; Tripney et al. 2010; Kao 2013; Eam et al. 2019). These studies generally explained their findings by claiming that male students perform better in mathematics and science or that they have more positive attitudes towards these subjects. Other explanations were related to the gender stereotyping that remains entrenched in human society, especially in developing countries. The fact that male students dominate STEM-related majors in Cambodia highlights the importance of promoting gender balance in future efforts to design and develop STEM education and pipeline. There is a clear consensus in the literature that empowering girls and women to take up STEM-related subjects and careers will broaden their career opportunities and help fulfil the national demand for skills (Wang and Degol 2013).

The relationship between university location and STEM major choice indicates that STEM programs (especially, the good quality ones) are generally available only at universities in Phnom Penh. According to the Cambodian Higher Education Roadmap: 2030 and Beyond, about 36 percent of the 121 higher education institutions (as of 2017) are located in the provinces (MOEYS 2017). Secondary school graduates expecting better quality courses and more opportunities tend to move from their province to the city if they want to pursue a higher education degree in general or a STEM-related degree in particular. Educational policies aiming to promote STEM majors and careers

may give more consideration on establishing good quality (and differentiated) STEM programs at provincial universities (which also constitute a significant share of all Cambodian HEIs).

Despite all these claims, certain aspects of this study's findings need to be confirmed in further studies to safeguard against any misleading interpretation. The finding that students who clearly prioritised their major since secondary school generally fall into the STEM major group has barely been investigated in the literature on major choice. Yet this variable indicates the importance of pre-university experience and preference or university preparedness (e.g. Rask 2010). What the finding implies is that Cambodian university students' choice of a STEM major may not be left to chance, but rather is part of a clear intention and preparation since secondary school. In this study, such a clear intention may also explain why the senior university students stay in the STEM program until their last undergraduate year. It also extends the claim that the government policy (starting in 2010) requiring high school students to choose between the science and social science stream is contributing to enrolments in STEM majors in certain ways. This finding, however, has to be further investigated before any serious conclusions can be made. We have little data to fully understand whether or not students who enrol in STEM majors at university drop out or switch to another discipline.

The study also detected that the senior-year university students' perception on the importance of science and technology to society is correlated with their choice of major. This may be explained in light of what Ryder, Ulriksen and Boe (2015, 358) defined as the "available discourses" that influence STEM major choice, such as "science is difficult and for the clever." Regan and DeWitt (2015, 75) similarly discussed the "conception of science and scientists" as factors influencing major choice. With such discourses and conceptions, for example, if students believe that science is just for the clever, those who are not confident in their STEM-related ability are unlikely to pursue a science or mathematics major and career. So, such discourses will more or less influence their decision-making process on major choice. In Cambodia, the discourse of "science is important for national development" may ring true in students' thinking though they might not understand it deeply, and such vague belief may still influence their major choice. However, there is little evidence to support this argument. More in-depth understanding on how Cambodian students internalise the important roles of science and technology is needed.

The insignificance of family factors is yet another finding that warrants caution in its interpretation. This study found no parental or other familial influences on STEM major choice, as detected partially in Kao (2013), Eng and Szmodis (2015), and Peou (2017). This may be due to the different measures or conceptualisations of familial influences between our study and theirs, which also needs to be investigated, compared, and confirmed in further studies.

As a final remark, in this study, the researchers focused on university-level data but did not explore deeply the decision-making mechanisms for choosing between the science and social science stream at Cambodian secondary school. Do secondary school students choose the science stream because they are successful achievers of science subjects, because they truly understand and are interested in science subjects, because of the positive and inspiring image of scientific achievements or works of scientists, or because their parents tell them to? And how strong is their knowledge of STEM-related subjects at secondary school? Actual students' engagement, experience, and performance in STEM subjects in the Cambodian secondary school environment are worth exploring in further studies. Similarly, how students actually define and comprehend the philosophical, technical, and vocational aspects of STEM careers has not yet been studied. In other words, we do not know how deeply and realistically students can understand and visualise their future careers. Therefore, to further understand students' major choice in Cambodia against the backdrop of the national STEM agenda, we need further discussions on the actual STEM-related learning experiences at Cambodian secondary schools and the depth of students' knowledge and understanding about STEM-related majors and careers. The whole STEM pipeline (from secondary school stream to university major choice and to future career) should be examined with a comprehensive and connected approach.

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Chapter 12

Are Students Financially Incentivised to Enrol in STEM Majors in Cambodian Higher Education?

Chea Phal, Tek Muy Tieng, and Nok Sorsesekha

Abstract

This chapter examined the financial sources that Cambodian university students relied on in pursuing their higher education and assessed the relationship between students' financial aid (tuition-waiver scholarship) and their enrolment in STEM majors. In doing so, the study employed descriptive statistics and ordinary least square regressions, using a cross-sectional dataset collected by CDRI in 2020 from 1,338 university students and another dataset of MoEYS's enrolment statistics. We found that Cambodian students predominantly depended on parental financial support to carry on their higher education. Scholarships are the third main financial source (after parental support and personal earnings) that students depend on during their studies. The regression analysis further indicated negative but statistically insignificant relationships between STEM majors and shares of tuition-waiver scholarship students.

Keywords: Student financing, scholarship, tuition fees, STEM major, higher education

12.1. Introduction

A bulk of literature on major choice in higher education suggests that many factors (from student characteristics, family backgrounds, academic performances, self-efficacy, to expected labour market after graduation) influence students' decisions on major choices (Moakler and Kim 2014; Arcidiacono, Hotz and Kang 2012; Baker et al. 2018; Eam et al. 2021). Students' decisions on what degree they should earn in their higher education will not only influence their future earnings but also have consequences for their societies. In its latest projection on future job demands, the World Economic Forum found that the Covid-19 pandemic has accelerated the speed of technology adoptions and forecasted that jobs that will be in the highest growth in the next five years are technologically related (e.g. data scientists, AI and machine learning specialists, and big data specialists), while jobs that can be automated (e.g. clerks, administrative secretaries, and accountants) will be getting obsolete (WEF 2020).

Understanding this global trend, the Royal Government of Cambodia (RGC) has made concerted efforts to strengthen human resources of the next generation by laying down several policies and strategic plans. For instance, the Industrial Development Policy 2015-2025 attempts to diversify and transform the country's industry structure based on sciences, technologies, and innovations by instilling better knowledge of mathematics, sciences, technology, and literature in general education and enhancing higher education curriculum in agricultural and other sciences and engineering (RGC 2015). A year later, in 2016, the Ministry of Education, Youth and Sport (MoEYS) released the STEM policy aiming at equipping students in general education and higher education with STEM competencies in response to the labour-market demands, and in its Education Strategic Plan (ESP) 2019-2023, the promotion of STEM enrolment in higher education was set as one of the core breaking indicators in the education sector (MoEYS 2016; 2019). This strategic plan aims to increase the percentage of enrolment in STEM disciplines from 27.1 percent in 2018 to 32 percent by 2023.

As the impact of creative destruction on future jobs is presumably substantial due to the rapid technological changes, and to fully reap the benefits from the demographic dividends and industrial revolution, there is an urgent need to better equip the next Cambodian generation with technological and digital knowledge and skills (SNEC 2021). The National Council of Science, Technology & Innovation (NCSTI), established in late 2020, recently released Cambodia's Science, Technology & Innovation Roadmap 2030 as a guide for the development of science, technology, and innovation (STI). One of its strategies is to promote STEM education and training in higher education by setting a bold target of having 50 percent of university students enrolling in STEM majors by 2030 (MISTI 2021). That being said, the percentage of STEM students in Cambodian tertiary education, especially in the fields of science and mathematics, is relatively low in comparison to the other countries in the region (UIS 2021).

As a result of the government's need-based priority scholarship schemes (tuition waivers) targeting females and students from poor households and students in rural areas, the overall female enrolment ratio in higher education now has surpassed their male counterparts, and that students from less affluent households have higher odds of pursuing higher education, provided they can complete upper secondary school (MoEYS 2020; Chea 2019). In the meantime, efforts have also been made to promote STEM enrolment in higher education, such as the establishment of the science track in high school to prepare and spur student interests in STEM (Kao and Shimizu 2020). In addition, there has been support from development partners to enhance institutional capacities and quality of teaching and learning in STEM (World Bank 2018). It is also evident that from policy makers' perspective, students with STEM degrees would provide higher social rates of returns after their graduations. However, students are still allured by business-related and foreign-language majors, even though graduates from ICT-related fields are found to earn about 10 percent more than their non-ICT peers (Rath, Song, Chea and Ven 2021). The challenges to attract Cambodian students to STEM majors pose the question of whether enough has been done to incentivise potential students into STEM fields.

Financial constraints are found to influence students' decisions to seek further higher education after high school and, to some extent, what bachelor's degree they should earn. Financial aids have been used by governments around the world, including in Cambodia, as a tool to ensure more equitable access to higher education (Mak, Sok, and Un 2019; Jackson 1978; Wang et al. 2013). Nevertheless, its role in promoting specific major choices is not yet well understood in the context of developing countries. Against this background, this paper intends to firstly identify the channels of financial sources Cambodian undergraduate students use to support their studies in higher education, and secondly, it examines the relationships between financial aid through tuition-waivers programmes and student's major choices (being STEM or non-STEM).

12.2. Literature review

The debates on higher education financing strategies have been around the issues of access, equity, and quality, as well as its private and social rates of return to education. Virtually in all countries around the world, albeit with different degrees, higher education is financed through a combination of public subsidies and investment from the private sector (Woodhall 2007). As a global common trend in many countries, higher education is becoming more and more expensive, and unit cost per student has been on the rise as the result of high expectations that has been placed on higher education to produce human resources to drive the knowledge-based economies (Johnstone 2009). Coupled with the expansion of private higher education with minimal funding support from the states, student's

households have been asked to shoulder a larger share of the financial burden (Duggan 1997; Welch 2011; Marcucci 2013). The cost-sharing paradigm through the collection of tuition fees from students and parents to overcome the limited public funding in the higher education sub-sector has been the most sustainable and lucrative form of funding alternative and has helped bring higher education to the masses in response to the increasing rise in demands (Johnstone 2009). Furthermore, in some cases like in China, it is the students from lower-income households who pay the higher prices as they cannot enter elite public schools where tuition fees are normally cheaper (Li 2007). Without doubt, there have been concerns that the transfer of financial burden from the public to student's households hampers equitable access to higher education, in particular, among those from less affluent families. The high-cost higher education could put talented students who cannot afford the investment in education under undue constraints.

To address this issue, several financial aid policies have been put into practice to ensure that students marginalised by socioeconomic backgrounds are not precluded from the opportunities to further their higher education just because of the financial pressure (Marcucci 2013). Student financing assistance can be in the form of non-repayable assistance (such as student grants, scholarships, vouchers, or tuition waivers) or deferred payment schemes (such as student loans and income-contingent loans). However, the effectiveness of policy tools varies depending on the country's contexts; a successful financing mechanism in one economy does not imply that it will be successful in another.

At the same time, to nurture the next generation of scientists and engineers in the fields of STEM, various initiatives, such as kindling student interests in STEM, enhancing their academic preparation at early stages, and provision of mentoring programmes or special opportunities for professional development, have been introduced (Wilson et al. 2012; Piper and Krehbiel 2015; Sellami et al. 2017; Halim, Soh and Arsad 2018). Another policy tool to attract talented students into STEM majors is through financial incentives. This extrinsic incentive policy has been used to address the underrepresentation of specific student groups, namely females, low-income families, and minority students, in STEM participation. For instance, Louisiana State University introduced the Computer Science, Engineering, and Mathematics Scholarships (CSEMS) to attract academically bright students from low-income households into STEM disciplines (Wilson et al. 2012), while the Federal Government of United States of America, through the National Science Foundation, initiated the Scholarship in Science, Technology, Engineering, and Mathematics Program (S-STEM) to support talented students from less affluent families who intend to further their higher learning in STEM majors (NSF 2021).

12.3. Overview of STEM and student finance in Cambodian higher education

12.3.1. STEM enrolment

Although the share of Cambodian students choosing the science track is much higher than the social track in upper secondary school (Kao and Shimizu 2020), STEM enrolment in post-secondary education is relatively low in comparison to other countries in the region. Even though this issue has been pinpointed in countless reports and studies, higher education enrolments remain concentrated in fields related to business, liberal arts, and foreign languages (MoEYS 2020; Srinivana and Chhem 2015). As shown in Table 12.1, 27.0 percent of students who graduated from STEM tertiary programmes in Cambodia is the second-lowest proportion in the region after Indonesia. Percentages of STEM tertiary education graduates in Malaysia and Brunei are over 40 percent. When STEM majors are decomposed by UNESCO classifications, Science accounted for 3.8 percent, Technology 9.7 percent, Engineering 9.0 percent, and Math 4.5 percent. These proportions are slightly different from MoEYS's higher education statistics (excluding the two-year tertiary programme), to be discussed in the following section. The percentage of students earning an engineering degree is particularly far behind many other countries in the region. The proportion of STEM enrolees in Vietnam is only slightly higher than in Cambodia, but its enrolment in the engineering field is more than twice of Cambodia's.

Table 12.1: Percentage of STEM graduates in tertiary education in Southeast Asia

Country	Year	Science	Technology	Engineering	Mathematics	Total
Malaysia	2019	1.6%	6.9%	28.6%	3.7%	40.8%
Brunei	2019	N/A	13.6%	18.1%	8.4%	40.1%
Myanmar	2018	0.6%	2.2%	8.0%	23.6%	34.3%
Singapore	2018	0.2%	8.6%	19.6%	5.3%	33.7%
Philippine	2017	3.3%	12.0%	15.3%	1.5%	32.0%
Thailand	2016	3.0%	4.5%	19.0%	4.3%	30.9%
Laos	2019	7.5%	8.5%	12.7%	2.0%	30.7%
Vietnam	2016	4.5%	2.1%	19.9%	0.7%	27.2%
Cambodia	2019	3.8%	9.7%	9.0%	4.5%	27.0%
Indonesia	2018	4.1%	8.3%	7.9%	3.3%	23.5%

Source: UNESCO Institute of Statistics (accessed on 5 June 2021)
Note: i) Science majors: agriculture, forestry, fisheries, ii) Technology majors: information and communication technologies, iii). Engineering majors: engineering, manufacturing, and construction; and iv). Mathematics majors: Mathematics, and statistics

According to the MoEYS's education congress report, STEM enrolment in bachelor's degree programme accounted for 29 percent (8 percent in information technology, 8 percent in engineering, 5 percent in basic science, 5 percent in health, and 3 percent in agriculture) of the total enrolment in the academic year 2018-2019 (MoEYS 2020). However, using supposedly the same data with the major coding as seen in Appendix 12.A, our estimations suggest only about one quarter of bachelor's degree enrolees choose STEM majors (6.8 percent in information technology, 6.5 percent in engineering, 5.5 percent in basic science, 4.1 percent in health, and 2.3 percent in agriculture). When the enrolment is disaggregated by student gender, type of higher education institutions (HEIs), and location of HEIs, it is clear that STEM enrolment is unevenly distributed. STEM enrolment is as low as 14.3 percent in provincial HEIs, and only 16 percent of females, less than half of their male counterparts, are in STEM majors. STEM enrolment is also relatively low in private schools, at 18.9 percent.

Figure 12.1: Enrolment in bachelor's degree programme by major

	All	Student Gender		HEI Type		HIE Location	
		Female	Male	Private	Public	Phnom Penh	Province
Non-STEM	74,9%	83,6%	65,8%	81,1%	66,0%	70,0%	85,7%
- Business	39,4%	48,8%	29,7%	47,7%	27,7%	34,8%	49,6%
- Social Science and Art	15,5%	15,7%	15,2%	12,4%	19,7%	14,6%	17,4%
- Foreign Language	10,9%	11,5%	10,2%	13,2%	7,6%	11,4%	9,8%
- Law	6,9%	4,9%	8,9%	5,5%	8,9%	7,0%	6,8%
- Tourism	2,2%	2,7%	1,7%	2,3%	2,2%	2,3%	2,1%
STEM	25,1%	16,4%	34,2%	18,9%	34,0%	30,0%	14,3%
- IT	6,8%	1,8%	11,9%	6,1%	7,8%	7,9%	4,3%
- Engineering	6,5%	2,1%	11,0%	5,1%	8,5%	9,0%	0,7%
- Basic Science	5,5%	6,0%	5,0%	3,7%	7,9%	4,9%	6,7%
- Health	4,1%	4,6%	3,6%	3,7%	4,7%	5,9%	0,1%
- Agriculture	2,3%	1,8%	2,7%	0,3%	5,1%	2,2%	2,5%

Source: Authors' estimation based on DGHE's statistics in the academic year 2018-2019

The uneven enrolment proportions are even more extreme in the cross-tabulations shown in Figure 12.1. For instance, the percentage of males majoring in information technology (11.9 percent) is more than six times higher than females (1.8 percent). Enrolment in engineering is also low among females, but their enrolments in basic science and health science (including nursing and midwifery) exceed their male peers. There are also regional disparities between HEIs in Phnom Penh and provincial HEIs located outside the capital. Enrolments in health and engineering are much concentrated in Phnom Penh capital, as less than 1 percent of health students and 3 percent of engineering students are enrolling in provincial HEIs. Only two provincial HEIs in Preah Sihanouk and Kampong Chhnang provinces offer degrees related to health science. Besides Phnom Penh, engineering-related majors are only available in Battambang, Siem Reap, Tbong Khmum, and Preah Sihanouk provinces. At provincial HEIs, basic science is the most widely available STEM field, as students in this field account for 46.8 percent of STEM students. There are also clear gaps, albeit

smaller, in STEM enrolment rates between private and public HEIs. The enrolment in information technology and health disciplines are slightly lower in private universities, but the differences in enrolment rates in the field of agriculture, basic science, and engineering are noticeable. It is worth noting that these estimations do not include students registered at technical training institutes under Ministry of Labour and Vocational Training (MLVT) due to data availability.

12.3.2. Student financing in higher education

Prior to higher education reforms in the late 1990s, the number of students in higher education was still small, so the state was able to finance the higher education sub-sector alone. Higher education at the time was only available at public universities in Phnom Penh, and tuition fees were fully subsidised by the government's budget. To make higher education more accessible to the masses in response to the growing demand for higher education, the government allowed for the establishment of the first private HEI, Norton University, in 1997, and a few years later, fee-paying tracks were introduced at public HEIs. As the government's priorities are mainly on basic education, financial commitment to the higher education sub-sector has been relatively low (Mak, Sok and Un 2019). Therefore, the cost-sharing approach is the only viable means for Cambodian higher education to transit from what Trow (2006) called "elite stage" to a "mass system".

The latest statistics from MoEYS put enrolment in bachelor's degrees at 179,258, about 15.0 percent of whom received tuition waivers (MoEYS 2020). Although student financing in Cambodian higher education has still been less explored, the main funding source for higher education both at public and private HEIs is believed to be from the private sector, in particular through tuition fees (Mak, Sok and Un 2019). With limited financial support from the government and development partners, Cambodian HEIs have heavily relied on tuition fees for their survival. Having said that, the government still continues to provide free higher education to specific groups of students in the form of merit-based and need-based scholarships (tuition waivers only). Although private HEIs are not subsidised by the government, most private universities take part in the national scholarship programmes, providing tuition-waiver scholarships every year through the MoEYS's scholarship scheme (CDRI 2020). MoEYS allocates scholarships to eligible students based on their performances at the national grade 12 examination and other prioritised criteria (Leth and Heang 2011). In addition to the national scholarships, HEIs also offer tuition-waiver scholarships to students through political figures.

The World Bank's Higher Education Quality and Capacity Improvement Project (HEQCIP) piloted a special priority scholarship scheme (tuition waivers plus monthly stipend scholarship) with 1,000 students enrolled in the academic year 2011-2012. The impact evaluation indicated a significant positive impact of the programme on retention and graduation as well as on their earnings after graduation (Chea 2018).

However, without strong political commitment, there has been no initiative to scale up this stipend scholarship scheme. MoEYS's Department of Higher Education had conducted a feasibility study on student loan schemes, but it failed to materialise due to the expected challenges in collecting repayment and high default rates learned from the experiences in other countries in the region (Mak, Sok and Un 2019).

Income-contingent loans are considered an innovative approach in student financing in higher education. Different from traditional student loans, the repayments are decided by the future earnings of the borrowers; the more you earn, the more you pay. It is used as a risk-sharing mechanism to reduce the default rate, and its practice is commonly found in developed countries where there are reliable systems to verify individual earnings (Chapman 2006; Woodhall 2007). Interestingly, the practice of income-contingent loans, albeit it is operated by an NGO on a small scale, was also found in Cambodia (Humphreys 2015).

12.4. Methodology

This chapter used two separate data sources, the student survey conducted by CDRI in 2020 and the enrolment statistics for the academic year 2018-2019 obtained from the MoEYS's Directorate General for Higher Education (DGHE), for the analysis. The student survey contained a wide range of information from student's characteristics, their family and educational backgrounds, information related to their higher education, to experiences during the Covid-19 pandemic. From this dataset, only a small fraction of the survey was used to examine the students' financial sources. A two-stage sampling method was employed in the selection of 1,338 students. The first stage was to randomly select HEIs, using systematic sampling with probability proportional to size, measured by the total student enrolment. There are 124 HEIs recorded in MoEYS's report, but not all of them are under the direct supervision of MoEYS (MoEYS 2020). Currently, 16 different ministers oversee HEIs in Cambodia, but a majority of them are under MoEYS (61.3 percent) and MLVT (20.2 percent). For logistics reasons, CDRI only sought permission to conduct the research under the two ministries. Lists of HEIs and enrolment statistics were obtained from MoEYS and MLVT on which the first-stage sampling frame was based and constructed. After small-size HEIs with the enrolment of 500 students or lower and provincial campuses were dropped from the sampling frame, 75 HEIs remained for the first-stage sampling. In total 21 HEIs, of which 13 are private and four are located outside the capital, were selected at this stage. Later, student lists at the selected HEIs were obtained for the second-stage simple random sampling. After the enumerator training and survey pre-test in early July 2020, 1,338 students were interviewed face-to-face in digital format using the KoboToolbox platform between July and September 2020.

The second data from MoEYS provided enrolment statistics by HEI, gender, academic cohort, major, and scholarship status. This dataset also contains enrolment statistics of HEIs supervised by the other seven ministries; however, not all HEIs report their enrolment to the DGHE. Enrolment statistics from 104 HEIs, amongst which 35 are

branch campuses, were recorded in the MoEYS's statistics in the academic year 2018-2019. The research team re-coded the majors and classified them into STEM and non-STEM before transforming them for data analysis.

In response to the research objective, this study first examined the distributions of students' financial sources Cambodian students primarily depend on in pursuing their higher education using the CDRI data set. Next, to assess the correlations between scholarships and STEM majors, we employed a set of ordinary least square (OLS) regressions using the MoEYS's enrolment statistics. Several controlling factors were incorporated in our regression model specification as follows:

$$Scholarship_{ijk} = \beta_0 + \beta_1 STEM_j + \beta_2 Female_{ijk} + \beta_3 Public_i + \beta_4 Phnom\ Penh_i + \beta_5 Branch_i + \beta_6 MoEYS_i + \beta_7 HEI\ Size_i + \beta_8 Cohort_k + \varepsilon_{ijk}$$

where $Scholarship_{ijk}$ is the share of scholarship students at HEI i enrolling in major j in cohort k by gender. $STEM_j$ is a dummy variable taking the value 1 if major is classified as STEM, otherwise, 0; $Female_{ijk}$ is a dummy variable taking the value 1 for female enrolment, otherwise, 0; $Public_i$ is a dummy variable taking the value 1 for public HEI *i*, otherwise, 0; $Phnom\ Penh_i$ is a dummy variable taking the value 1 if HEI *i* is located in Phnom Penh, otherwise, 0; $Branch_i$ is a dummy variable taking the value 1 if HEI *i* is a branch campus, otherwise, 0; $MoEYS_i$ is a dummy variable taking value 1 if the HEI *i* is under MoEYS, otherwise, 0; $HEI\ Size_i$ is the natural logarithms of total HEI enrolment of HEI *i*; $Cohort_k$ is the academic cohort of students from freshman to senior years; and ε_{ijk} is the error terms.

Table 12.2: Descriptive statistics

	Mean	SD	Min	Max
Scholarship	0.445	0.368	0	1
STEM	0.278	0.448	0	1
Female	0.494	0.500	0	1
Public	0.496	0.500	0	1
Phnom Penh	0.600	0.490	0	1
Branch	0.164	0.370	0	1
MoEYS	0.821	0.384	0	1
HEI Size	7.425	1.250	2.996	9.844
Cohort				
- Year 2	0.263	0.440	0	1
- Year 3	0.238	0.426	0	1
- Year 4 and Higher	0.226	0.419	0	1
Observations				3,263

Source: Prepared by the authors based on MoEYS's statistic academic year 2018-2019

12.5. Results

12.5.1. Sources of student financing

Table 12.3 provides information on the distributions of the surveyed undergraduate students by majors, gender, types of HEIs, and locations of HEIs. 206 STEM enrolees constituted 15.4% of the sampled respondents. Males and females were nearly equally distributed but only about 5 percent of females chose STEM majors, while 26 percent of males did so. Approximately one-third of our respondents were from private HEIs, and one in every five of them was enrolling in provincial HEIs. STEM students enrolled at private HEIs accounted for more than 20 percent; a similar trend was also found at provincial HEIs.

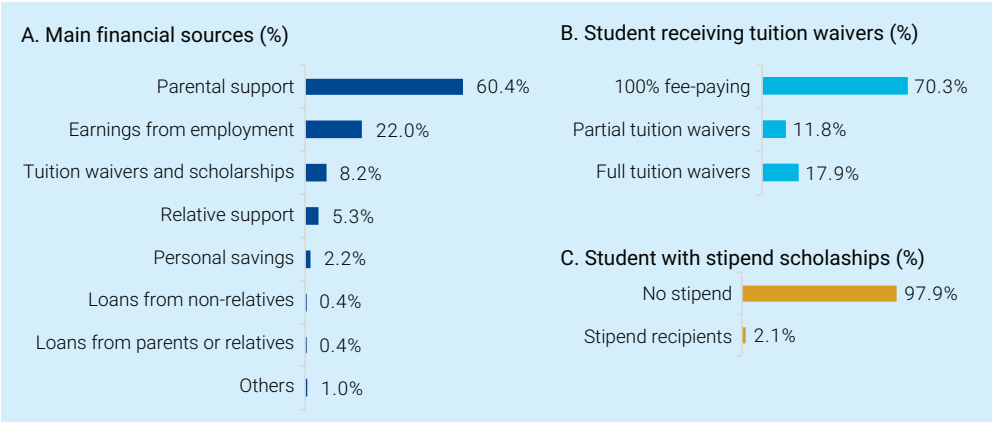
As illustrated in Figure 12.2's Panel A, a majority of students (60.4 percent) relied on financial support from their parents for their higher education studies, while more than 20 percent of students responded that their main financial sources were from their personal earnings. Approximately 60 percent of our sampled students reported having worked at least one hour during the past seven days of the interview. Access to student loans, whether it is from the family members, their schools, or financial institutions, seems to be very limited in Cambodia as less than one percent of the sampled students used it to finance their higher learning. About 8 percent of the students considered scholarships (in forms of tuition waivers or stipends) as their main financial sources in supporting their learning. Further questions revealed that only 2.1 percent of the students were stipend scholarship awardees, but nearly 30 percent of them were awarded either fully or partially through fees exemptions. In other words, only a small fraction of students was supported by stipend scholarships in Cambodia, yet many students regard tuition waivers as a key source of financial assistance. In total, the number of students awarded full tuition waivers (17.9 percent) is higher than those with partial exemption (11.8 percent).

Table 12.3: Descriptive statistics of respondents

	Non-STEM		STEM		All	
	Obs.	%	Obs.	%	Obs.	%
Gender						
- Female	639	95.1%	33	4.9%	672	50.2%
- Male	493	74.0%	173	26.0%	666	49.8%
Type of HEIs						
- Private HEIs	334	78.0%	94	22.0%	428	32.0%
- Public HEIs	798	87.7%	112	12.3%	910	68.0%
Location of HEIs						
- Provincial HEIs	206	79.5%	53	20.5%	259	19.4%
- Phnom Penh HEIs	926	85.8%	153	14.2%	1,079	80.6%
Total	1,132	84.6%	206	15.4%	1,338	100%

Source: Authors' calculation based on CDRI's student survey in 2020; Obs = Observations

Figure 12.2: Main Sources of Student Finance



Source: Authors' calculation based on CDRI's student survey in 2020

When the data were grouped by students' major choices (STEM or non-STEM), gender, type of HEIs, and HEI's location, we found that share of STEM students who regarded tuition waivers and scholarships as their main financial sources were slightly higher than their non-STEM counterparts (Figure 12.3). However, it seems that females and students enrolling in provincial HEIs relied on this type of financial assistance the most. The high ratios of females and students at provincial HEIs benefiting from scholarships and tuition waivers were partially attributed to government scholarship schemes (tuition-waiver programmes) targeting females, rural students, and students from poor households. The percentage of STEM students depending on personal earnings to finance their study (15 percent) was the lowest, and they were also the group that had the highest share of students depending on the support from their parents (65.5 percent).

Figure 12.3: Main sources of student finance by sub-group

	Major		Student Gender		HEI Type		HIE Location	
	Non-STEM	STEM	Female	Male	Private	Public	Phnom Penh	Province
Parental support	59.5%	65.5%	62.4%	58.4%	56.8%	62.1%	60.4%	60.2%
Earnings from employment	23.2%	15.0%	18.8%	25.2%	24.3%	20.9%	22.2%	20.8%
Tuition waivers and scholarships	8.0%	9.2%	10.1%	6.3%	6.1%	9.2%	7.4%	11.6%
Relative support	5.1%	6.3%	6.1%	4.5%	6.5%	4.7%	5.6%	4.2%
Personal savings	2.3%	1.5%	1.3%	3.0%	3.3%	1.6%	2.3%	1.5%
Loans from non-relatives	0.4%	0.5%	0.4%	0.5%	1.2%	0.1%	0.6%	0.0%
Loans from parents or relatives	0.5%	0.0%	0.3%	0.6%	0.7%	0.3%	0.5%	0.4%
Others	0.9%	1.9%	0.6%	1.5%	1.2%	1.0%	1.0%	1.2%
Observations	1,132	206	672	666	428	910	1,079	259

Source: Authors' calculation based on CDRI's student survey in 2020

Figure 12.4 presents the cross-tabulation results of the tuition fee payment, type of fee waivers, and tuition fee providers or supporters by the sub-groups of students. The ratios of full fee-paying STEM and non-STEM students were roughly the same, although

STEM students were more likely to receive the exemption in full (the second highest after students at provincial HEIs) and lower odds of getting partial tuition waivers (Figure 12.4's Panel A). Students at private HEIs had the highest share (21 percent) of partial-exemption awardees, but less than 10 percent received full tuition waivers.

Figure 12.4: Shares of students with tuition waivers

	Major		Student Gender		HEI Type		HIE Location	
	Non-STEM	STEM	Female	Male	Private	Public	Phnom Penh	Province
A. Tuition Fees								
- Full tuition waivers	17.0%	22.3%	20.2%	15.5%	9.8%	21.6%	14.6%	31.3%
- Partial tuition waivers	12.6%	7.3%	12.9%	10.7%	21.0%	7.5%	13.0%	6.9%
- 100% fee-paying	70.3%	70.4%	66.8%	73.9%	69.2%	70.9%	72.4%	61.8%
Observations	1.132	206	672	666	428	910	1079	259
B. Type of Tuition Waivers								
- Merit-based	39.6%	45.9%	41.7%	39.1%	36.4%	42.6%	40.9%	39.4%
- Need-based	31.5%	37.7%	32.3%	32.8%	22.0%	37.7%	30.5%	38.4%
- Others	28.9%	16.4%	26.0%	28.2%	41.7%	19.6%	28.5%	22.2%
Observations	223	174	223	174	132	265	298	99
C. Providers								
- From the government	35.4%	36.1%	33.6%	37.9%	19.7%	43.4%	29.5%	53.5%
- From school	48.5%	44.3%	48.0%	47.7%	67.4%	38.1%	52.7%	33.3%
- Others	16.1%	19.7%	18.4%	14.4%	12.9%	18.5%	17.8%	13.1%
Observations	223	174	223	174	132	265	298	99

Source: Authors' calculation based on CDRI's student survey in 2020

Panels B and C further examine the types and providers of tuition waivers among the recipients of partial and full waivers. Amongst the STEM students, 45.9 percent of the tuition waivers were merit-based offers, awarded based on their academic performance at high school. This proportion was much higher than that of students at private HEIs (36.4 percent) and higher than that of non-STEM students, males, and provincial students (slightly below 40 percent). There was no noticeable difference between STEM and non-STEM students in terms of where they obtained the tuition waivers.

The types of tuition waivers were somehow well distributed amongst different groups, although awardees at private HEIs had a smaller share of the need-based group. Nearly half (47.9 percent) of tuition waivers were offered by schools, and 35.5 percent were provided through government schemes. Students enrolled in public and provincial HEIs benefited the most from the government's schemes. At private schools, less than 20 percent of the tuition waivers were from the government, while the ratio of tuition fees exempted by schools was as high as 67.4 percent. There are obvious differences between students at private and public HEIs and between students at Phnom Penh-based and provincial HEIs. While more students at public HEIs and provincial HEIs benefit more from the government's scholarship schemes, the majority of tuition-waiver programmes at private HEIs are from the universities themselves.

The survey also asked students if they received any stipend scholarship. However, only around 2 percent of the sampled students disclosed they were awardees of this kind of scholarship. Unlike the case of tuition waivers, students at provincial HEIs had fewer opportunities to get stipend scholarships as only 1.2 percent of them reported to be scholarship grantees. While the majority of stipend scholarships (60.7 percent) were provided by NGOs, the government and private foundations also offered such stipend scholarships, accounted for 14.3 percent and 10.7 percent, respectively.

12.5.2. Tuition-waiver scholarships and STEM major choice

MoEYS's higher education statistics disaggregate student enrolment by the status of fee-payers and scholarship awardees. To our knowledge, scholarship students here refer to full tuition waivers. This allowed us to estimate the share of scholarship students as shown in Figure 12.5. About 15 percent of STEM students are tuition-waiver recipients, slightly lower than their non-STEM peers at 16 percent. This ratio is slightly lower than what was reported by the respondents in the CDRI's students survey at 22 percent and 17 percent respectively. In the STEM fields, tuition-waiver scholarships are in favour of females and those enrolled in public HEIs. We also found huge disparities in the shares of tuition-waiver scholarships between the STEM disciplines. While 36 percent of students in agriculture major were tuition-waiver grantees, only 6 percent and 11 percent of health and engineering students are exempted from tuition fees respectively.

Figure 12.5: Share of tuition-waiver scholarship students by major

	All	Student Gender		HEI Type		HIE Location	
		Females	Males	Public	Private	PNH	Provinces
Non STEM	16%	15%	16%	24%	11%	17%	17%
- Business	11%	11%	12%	16%	9%	12%	12%
- Foreign Language	23%	23%	23%	32%	19%	24%	24%
- Law	17%	20%	15%	19%	14%	18%	18%
- Social Science and Art	22%	23%	21%	34%	9%	23%	23%
- Tourism	13%	14%	11%	17%	11%	13%	13%
STEM	15%	17%	13%	20%	7%	13%	13%
- Agriculture	36%	43%	32%	37%	28%	29%	29%
- Basic Science	15%	15%	15%	23%	3%	20%	20%
- Engineering	11%	17%	9%	16%	5%	10%	10%
- Health	6%	6%	6%	11%	1%	6%	6%
- IT	16%	26%	14%	17%	14%	13%	13%
Grand Total	15%	16%	15%	22%	10%	15%	15%

Source: Authors' calculation based on MoEYS's enrolment statistics academic year 2018-2019

Table 12.4 reports the results from a series of regression on the determinants of share of tuition-waiver scholarship students in the academic year 2018-2019. In the

regression models, several factors — student gender, type of HEIs, location of HEIs, branch campus, supervising ministry, size of HEIs, and enrolment cohorts — were controlled for. Holding controlling factors constant, the study found that STEM majors are negatively associated with share of students awarded tuition waivers, but the association is not statistically significant. Being females or enrolling in public HEIs is associated with higher shares of scholarship students, while students enrolling in branch campuses or big HEIs in terms of enrolment size have smaller chances of receiving full tuition waivers. Scholarship opportunities seem to be not affected by location of HEIs, whether it is in Phnom Penh or provinces. We cannot detect any significant relationship between STEM majors and share of scholarship students even when the sample is disaggregated by gender.

Table 12.4: Regression results on share of scholarship students

	All	Female	Male	STEM	Non-STEM
STEM	-0.031	-0.010	-0.049		
	(0.041)	(0.048)	(0.037)		
Female	0.033***			0.077***	0.024***
	(0.009)			(0.018)	(0.009)
Public	0.171***	0.189***	0.150**	0.059	0.189***
	(0.065)	(0.064)	(0.067)	(0.082)	(0.066)
Phnom Penh	-0.032	-0.017	-0.048	-0.106	0.003
	(0.069)	(0.066)	(0.073)	(0.095)	(0.075)
Branch	-0.233***	-0.222***	-0.244***	-0.261***	-0.214***
	(0.067)	(0.064)	(0.072)	(0.073)	(0.070)
MoEYS	-0.128	-0.103	-0.153*	-0.048	-0.207**
	(0.089)	(0.088)	(0.091)	(0.121)	(0.100)
HEI Size	-0.159***	-0.160***	-0.157***	-0.143***	-0.159***
	(0.026)	(0.025)	(0.027)	(0.029)	(0.030)
Cohort					
- Year 2	-0.009	-0.003	-0.016	-0.020	-0.000
	(0.021)	(0.021)	(0.023)	(0.036)	(0.019)
- Year 3	0.002	0.004	0.002	-0.053	0.024
	(0.023)	(0.024)	(0.025)	(0.048)	(0.020)
- Year 4 and higher	0.015	0.024	0.008	-0.050	0.043
	(0.033)	(0.033)	(0.036)	(0.049)	(0.034)
Constant	1.693***	1.686***	1.731***	1.625***	1.723***
	(0.177)	(0.171)	(0.183)	(0.174)	(0.213)
Observations	3,263	1,611	1,652	908	2,355
R-squared	0.409	0.400	0.417	0.409	0.437

Robust clustered standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.10

We are also intriguing whether the factors examined in the chapter affect the share of scholarship differently between STEM and non-STEM students. From our findings, scholarships are in favour of females regardless they are enrolled in STEM or non-STEM majors, but females have even a much higher odds of getting tuition waivers if they choose STEM majors. The positive correlation between the share of scholarship and enrolment in public HEIs become weaker in STEM students in comparison to non-STEM students in terms of both statistical significance and coefficient magnitude. Although in general there are more scholarship opportunities at public HEIs, it is not the case for students choosing STEM majors. As shown in the analysis of STEM sub-sample, the correlation between public HEIs and share of scholarship students is positive but statistically insignificant. The negative effect of being a student at Phnom Penh-based HEIs is detected only in STEM sub-group, but not in non-STEM students.

12.6. Discussion and conclusion

Higher education enrolment in STEM majors in Cambodia is still relatively low in comparison to other countries in the region and attracting potential students into STEM pathways remains a challenge. The study set off to determine the funding sources students use to finance their higher learning and to investigate whether there are any significant relationships between financial aids and students' major choices. The two main financial sources that Cambodian undergraduate students counted on to support their study were from their parents and personal earnings. As the result of higher education privatisation, families and students in Cambodia are now shouldering a significant burden to support the expansion of higher education. This finding confirms that Cambodia is also following the global trend of shifting higher education's financing channel from the states to student households (Welch 2011; Marcucci 2013).

Nevertheless, while governments around the world and in the region have adopted student loan policies for students from less affluent families in response to this global trend (Tangkitvanich and Manasboonphempool 2011; Lochner and Monge-Naranjo 2016), Cambodia is still reluctant to introduce subsidised student loan programmes due to its challenges and complexities MoEYS learnt from other countries' experiences (Mak, Sok, and Un 2019). Indeed, introducing and implementing student loan schemes is not easy. It requires strong financial management, clear legal frameworks, as well as effective recruiting mechanism and repayment strategies (Woodhall 1992). However, student loans are known as one of the progressive strategies to ensure that students from lower-income households can have access to higher education to exert their potentials. There are also many success stories of student loans from both developed and developing countries where we can learn from (Shantakumar 1992; Nyahende 2013).

In addition to the lack of student loans, only a small fraction of Cambodian university students received stipend scholarships. The most common financial aid Cambodian

students had access to is tuition waivers. The fact that tuition-waiver scholarships are considered the third most important financial source among students hints that, without this financial support, students of low-income households would not be able to further their higher education. Together with short learning hours, the lack of financial aids may push many Cambodian university students to combine work and school to support their learning.

On the correlations between major choices and students' financial assistance, our findings suggest that, all else being equal, the correlation between STEM majors and share of scholarship is negative, albeit statistically insignificant. We also found that STEM students are more likely to depend on their family financial support. This implies that the current national scholarship schemes are not in the best interests of STEM students by design. While Cambodia clearly has a high-level vision and strategies to promote student participation in STEM, it lacks concrete action plans and detailed mechanism to realise it. For instance, neither the MoEYS's policy on STEM, nor the Education Strategic Plan (ESP) 2019-2023, illustrates any explicit implementation arrangement on how to encourage talented students to enrol in STEM majors in higher education. Currently, there is no scholarship scheme designed to promote enrolment in STEM majors in Cambodia. STEM graduates are found to earn more than their non-STEM peers (Roth et al. 2021), but students are not always aware of these higher wage premiums. To address this market failure caused by imperfect information, scholarship schemes have been used as an incentive-based strategy to encourage students to participate in STEM majors (Wilson et al. 2012). Cambodia can adopt this strategy to incentivise talented students to follow STEM majors and careers. To embrace the rapid technological changes and IR 4.0, Cambodia needs to foster more capable scientists, engineers, and technologists. The national scholarship interventions need to be revisited to attract more potentials students into STEM majors and careers.

The positive associations between females and share of scholarships reflect the effectiveness of the scholarship schemes in prioritising females. Nevertheless, the difference in shares of scholarship students between STEM females and non-STEM females is statistically insignificant. Female enrolment has surpassed their male peers, yet female STEM enrolment rate at 16.4 percent is still less than half of their male peers. In this situation, female priorities should be a focus in the promotion of STEM major enrolments which are still far from parity.

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Appendix 12.A. Classification of STEM major fields

Agriculture
Agriculture
Agriculture Machinery
Agro-industry
Agronomy
Animal Food
Animal Science
Aquaculture
Fishery
Forestry and Natural Resource
Genetics and Breeding
Horticulture
Plant Science
Rubber Plant
Soil Science
Veterinary

Basic Science
Biology
Chemistry
Environment
Food Chemistry
Food Processing
Food Science and Technology
Geology
Mathematics
Physics

Engineering
Air tools and cables
Artificial and satellite engineering
Bio-Engineering
Chemistry Engineering
Civil Engineering
Electricity
Electronics
Electronic Automation
Electronic Telecommunication
Engineering
Industrial Engineering
Mechanics
Nuclear Engineering
Rural Engineering and Construction
Water and Environment Engineering

Information Technology
Computer Science
E-Commerce
Information Technology
Software Engineering
Telecoms and Networking

Health
Dentistry
Laboratory
Medical Science
Nursing and Midwifery
Nutrition and Health
Ophthalmic nurse
Pharmacy

Chapter 13

Perceived Experiences, Self-Efficacy, and Interest in Learning Mathematics and Sciences of Cambodian Upper Secondary School Students

Keo Borin, Tara Patel, and Eam Phyrom

Abstract

This study aims to evaluate Cambodian upper secondary school students' perceived experiences, self-efficacy, and interest in learning mathematics and sciences. Descriptive statistics and classical tests of difference were employed to observe the magnitude and patterns of differences among the sub-constructs of these three variables, measured psychometrically, using a dataset of 2,891 grade 12 students in the academic year 2017/18 from 35 upper secondary schools in five regions across the country. The main result suggests that Cambodian upper secondary school students generally exhibit a moderate level in the sub-constructs of perceived experiences, self-efficacy, and interest in learning mathematics and sciences. The magnitude of these sub-constructs, however, varied significantly between different attributes of a number of variables – i.e. the students' grade 9 exam result, grade 12 stream choice (science or social stream), time spent on learning mathematics and science subjects, intended major at university, and future career prospects.

Keywords: Attitudes towards science, learning experience, interest in science, self-efficacy, STEM

13.1. Background

If Cambodia is to achieve its bold socio-economic goals of becoming an upper-middle-income country by 2030 and a high-income country by 2050, the country needs to intensify the momentum of its economic growth and mitigate negative impacts caused by the Covid-19. Though Cambodian economy continues to depend on garment, construction, and tourism industries, its government has set sights on promoting and innovating STEM (science, technology, engineering, and mathematics) education and workforce to further diversify and drive industrial and social development.

National policies, strategies, and action plans to promote STEM education at schools and universities across the country and STEM careers across sectors have been articulated in various government's official documents, including Rectangular Strategy Phase IV, National Employment Policy 2015–2025, Industrial Development Policy 2015–2025, STEM Education Policy 2016, and Cambodia's Science, Technology and Innovation Roadmap 2030. For two consecutive years, in his opening address at Cambodia Outlook Conference 2018 and 2019[1], Prime Minister Hun Sen emphasised the vital importance of science and technology development and industrial digitalisation to Cambodia's future economic growth, specifically in light of the shift towards Industry 4.0. With STEM at the forefront of Cambodia's economic and educational aims, its industrial production base is expected to be transformed from a low-skill-intensive base to a high-tech and knowledge-intensive base; its economic integration into regional and global value chains will be improved; and its social development dimension will become more advanced, adaptable, and progressive.

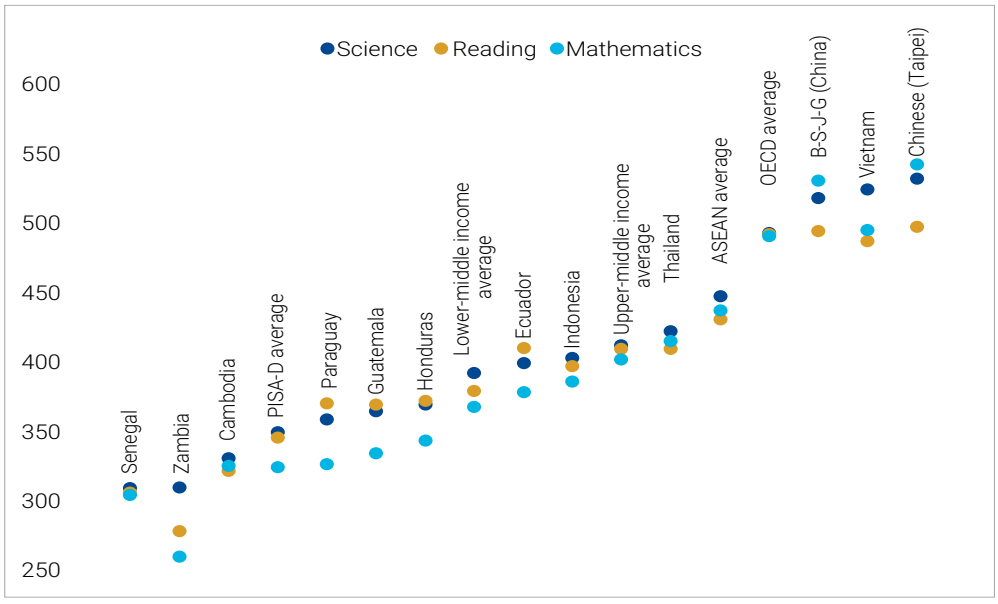
These industrial, economic, and social directions have in turn influenced STEM-related educational practices in many ways, albeit less favorable. So far, there has been an assumption that, as more students choose science stream at secondary school, they will further choose a science major at university and consequently pursue a science-related career after their university graduation. But this linear way of thinking is not the case in practice. According to data from the Examination Office of the Ministry of Education, Youth and Sport (MoEYS), in the academic year 2015/16, almost 70 percent of high school students completed grade 12 in the science stream. But this initial achievement has not translated into increased enrolments in STEM majors at university. Statistics from the STEM Achievement Report 2018 (MoEYS 2018a) indicated that in the academic year 2016/17 only 23.86 percent of the total population of university students were pursuing a STEM-related major (both in associate and bachelor's degree programs). The concern on STEM major enrolment at university is more serious from a gender equity point of view. In 2012, only 13.90 percent of female students in Cambodia were enrolled in science programs, and only 11.18 percent of women graduated in a STEM field (Korean Women's Development Institute 2015). In another survey conducted in 2016, female students accounted for only 7.5 percent of 2,000 Cambodian university students enrolled in ICT-related majors (ESCAP 2017).

1 The annual conference organised by the Cambodia Development Resource Institute (CDRI).

From the career perspective as well, the Cambodia Job Outlook Report 2018 continued to show concerns on the difficulty of Cambodian firms in recruiting and retaining qualified and trained workers because of the shortage of skilled labour (e.g. industrial, production, or chemical engineers) (NEA 2018). These patterns raise critical questions on the assumption underlying the linear thinking that streaming students into the science track at secondary school will attract more of them to pursue post-secondary education and career in STEM. And these questions, if not addressed in an appropriate way, will in turn negatively affect the expectation that STEM will contribute to Cambodian industrial, economic, and social development.

Furthermore, in terms of educational performance on mathematics and sciences of Cambodian students at secondary school, research findings continue to raise questions on whether their learning experiences and attained learning outcomes in these core subjects help them get ready for a STEM university major or career. Based on the PISA-D results, although Cambodian students' score of 325 points in mathematics is on a par with the PISA-D average of 324, compared to the ASEAN and OECD averages for the three tested subjects (mathematics, science, and reading), Cambodian students of the aged cohort scored significantly lower (see Figure 13.1). Similarly, in a comparative study on chemistry exam results, only 34.2 percent of Cambodian students were able to understand key concepts in chemistry, compared to 59.67 percent of Japanese students (Set, Ford, Sieng and Masakazu 2015).

Figure 13.1. Performance of Cambodian students (aged 15) in reading, mathematics, and science of PISA-D



Source: MoEYS 2018b, 27

While we have generalisable international test results of the educational performance on mathematics and sciences of Cambodian secondary school students, we still have little knowledge about their authentic experiences of learning and their perceptions or attitudes towards these important subjects which are foundational to STEM university majors or careers. This is a clear research gap that needs to be addressed. Arguably, the choice of STEM major at university and/or STEM career is determined to a large extent by students' educational experiences (e.g. how they learn or how their teachers teach them), their belief in their ability towards learning mathematics and sciences, or their developed interest or attitudes towards learning these subjects since their secondary school years (see, for example, Maltese and Tai 2010; Eng and Szmodis 2015; Eam, Keo, Leng, Song and Khieng 2019; Kao and Shimizu 2020).

Understanding students' experiences, self-efficacy, and interest in learning mathematics and sciences is significant not only for students but also for their families, teachers, and educational policymakers. In Cambodia, as highlighted by Eam et al. (2019), students' attitudes towards mathematics and sciences at high school need to be understood in order to enhance their readiness and so to promote student engagement in further stages of the STEM pipeline. Besides studies on choice of major at university (e.g. Kao 2013; Eam et al. 2019; Kao and Shimizu 2019; 2020), it seems that no large-scale quantitative study on students' perceptions of and experiences in STEM-related subjects has been conducted in Cambodian secondary school context, except for Eng and Szmodis (2015) and Kao (2020). Without an adequate understanding of such constructs as experiences, self-efficacy, and interest of the students in learning mathematics and sciences at the upper secondary school level, stakeholders of post-secondary education and training as well as employers will continue to face great challenges in coping with STEM-unready students from the lower level of education and training.

13.2. The current study

13.2.1. Objectives

To extend the line of previous STEM-related studies on Cambodian students at the upper secondary school level (see Eng and Szmodis 2015; Eam et al. 2019; Kao 2020; Kao and Shimizu 2020), the current study specifically focuses on three aspects of learning STEM-related subjects at the upper secondary school level: (1) how the learning of mathematics and science subjects is experienced by students, (2) how much confidence students believe they can learn these subjects, and (3) to what extent students are interested in learning these subjects. Namely, the three main observed variables of the current study were the perceived experiences, self-efficacy, and interest in learning mathematics and sciences of the students. These variables were measured and explained relative to a number of background variables, as guided by the literature (e.g. Lent et al. 2001, 2003; Kao 2013; 2020; Sadler et al. 2012; Eng and Szmodis 2015; Regan and DeWitt 2015; Eam et al. 2019; Kao and Shimizu 2020). It

should also be noted that the focus on mathematics and sciences was due to the fact that they are foundational subjects required for STEM majors and/or careers.

To specify, this research study aims to answer the following two questions:

1. What is the magnitude of perceived experiences, interest, and self-efficacy in learning mathematics and sciences of Cambodian upper secondary school students?
2. Do students' perceived experiences, interest, and self-efficacy in learning mathematics and sciences vary depending on their gender, age, grade 9 result, grade 12 stream choice, time spent learning mathematics and sciences, intended major choice at university, and future career prospects?

13.2.2. Literature review

Theories and policy-oriented conceptual frameworks guiding the identification of factors influencing attitudes and behaviours towards (learning) science, mathematics, or STEM-related subjects have developed in a complicated way. Guiding theories are generally rooted in psychological studies and include, among others, the Theory of Reasoned Action, the Planned Behaviour Theory, the Expectancy-Value Theory, and the Social Cognitive (Career) Theory. Conceptual frameworks from the policy and practice perspectives range from the ecological one (that includes from personal to national policy factors) to those that are rooted explicitly in educational practices of teaching and learning sciences and mathematics at schools. The discussion of this complicacy is beyond the scope of this chapter.

In Cambodian context, a recently published work by Kao (2020), using survey data of 455 students at grade 11, measured and derived six constructs of attitudes towards science. The study concluded, on the one hand, that Cambodian students have high positive attitudes towards the importance of science on society, practical work in science, and enjoyment of practical work in science. On the other hand, the study found that the students have a low self-concept in science and science learning and a low attitude towards future participation in science. The study further noted the patterns of differences of attitudes towards science between male and female students, science and social science streams, and urban and non-urban students. The study tended to suggest that one cannot say exactly that the attitude of Cambodian students towards science is positive or negative, unless one specifies clearly to which aspect of the attitudes towards science is referred.

This conclusion corroborates well with theories surrounding attitudes towards science. Theoretically speaking, attitude is a broad concept in psychological research and has been defined in different ways in different theories or contexts. Even after 30 years of investigation, attitudes towards science remain as a concept "bedevilled by lack of clarity" (Osborne, Simon and Collins 2003, 1053) because attitude towards science is not composed of a single construct but rather "consists of a number of subconstructs"

with varying degree of contribution to the conceptual definition (Osborne, Simon and Collins 2003, 1054). In their comprehensive review, Osborne, Simon and Collins (2003, 1055) noted that most students referred to "attitude towards science" as "a product of students' experience of school science". Unfried et al. (2015, 2) and Ching et al. (2019, 4), based on previous psychological theories, defined attitude as a composite of both self-efficacy and expectancy-value beliefs. Among the most used measures of this "attitude towards science" variable are subject preference studies, attitude scales, interest inventories, subject enrolment, and qualitative measures (Osborne, Simon and Collins (2003, 1055-1059).

In our study, rather than delving into theoretically defining the concept "attitudes towards science" or using a single index of attitudes towards science, we studied three constructs with separate measurement scales: (1) perceived experiences of learning sciences and mathematics, (2) self-efficacy in learning sciences and mathematics, and (3) interest in learning sciences and mathematics. As worded, we focused on the attitudes towards the learning of mathematics and science subjects, rather than the attitudes towards sciences and mathematics per se. Built on previous literature, we explained and justified as follows why these three constructs are conceptually and practically important at different phases within the STEM education and career (i.e. from secondary school science stream to STEM-related major and to STEM-related career).

13.2.2.1. Perceived experiences of learning mathematics and sciences

How students experience learning of mathematics and science subjects at secondary schools may determine their performance of STEM education and their likelihood of pursuing STEM careers in the long run. Cooper, Kortegast and Heavrlo (2009) developed a 47-item student questionnaire survey, of which 14 items were used to assess factors related to mathematics and science learning in high school (e.g. I enjoy learning the material in this class; my teacher encourages us to apply what we have learned to situations outside class; we use technologies in class that help me learn) and were measured on a five-point Likert scale (1=strongly disagree to 5=strongly agree). Heaverlo, Cooper and Lannan (2013) adopted the same questionnaire items to study 6th–12th grade female students' interest and confidence in sciences and mathematics and found that the role of mathematics and science teachers and extra-curricular STEM involvement have an impact on female students' interest and confidence in STEM subjects. Learning experience of mathematics and science subjects is generally enhanced when their teachers effectively use active-learning methods to engage the pupils, the pupils understand and enjoy their lessons, and technology is well integrated into the classroom to aid their understanding of the subject (see, for example, Woolnough 2000; Eam et al. 2019). Here the roles of teachers are highly crucial in developing positive experiences of and attitudes towards sciences and mathematics.

In Cambodia, unfortunately, there has been a severe shortage of qualified trained teachers – i.e. 61.58 percent of teachers do not hold an upper secondary school diploma, and some have not even undergone pedagogical training, meaning they may not necessarily possess the skills or knowledge to create a conducive learning environment (Phin 2014) that promote positive learning experiences and so attitudes of the students. A scenario in light of this issue in Cambodia is that if a certain subject teacher is not trained properly and could not make the students engage, understand, and enjoy the lessons, the quality of their teaching could be poor, and the students will continue to struggle with academically challenging subjects (such as mathematics and sciences) and often have difficulty grasping the basic concepts and approaches in these subjects. If that situation of unfavourable learning experiences is not improved, the expected participation in STEM university major or career will not be improved as well (see, for example, Eam et al. 2019). Thus, how Cambodian students at upper secondary school level perceive their learning experiences of STEM-related subjects can be a good indicator to understand students' attitudes towards STEM in general.

13.2.2.2. Self-efficacy in learning mathematics and sciences

Previous studies on Cambodian students indicate that students with excellent performances in mathematics and science subjects are more likely to choose a science-related major at university (Kao 2013; Eam et al. 2019). Excellence in performance of mathematics and sciences may be predicated by high self-efficacy in mathematics and sciences. In other words, developing a positive belief on the students' ability towards mathematics and sciences (i.e. high self-efficacy) at a young age may predict their long-term achievement and performance in sciences and mathematics. Self-efficacy is an important concept in Social Learning Theory (SLT), Social Cognitive Theory (SCT), and Social Cognitive Career Theory (SCCT). Bandura (1997, 3) defined self-efficacy as "beliefs in one's capacities to organise and execute the courses of action required to produce given attainments".

To measure self-efficacy in sciences and mathematics, some scholars have drawn on scales guided by the Bandura's concept of self-efficacy. For example, Lent et al. (2001) developed two mathematics/science efficacy subscales, namely "mathematics course self-efficacy" and "coping efficacy", on a 10-point Likert scale (0=no confidence at all to 9=complete confidence). Mathematics course self-efficacy was designed to measure students' confidence in their ability to complete 16 maths-related courses and achieve a B grade or higher. The coping self-efficacy subscale was developed with 18 items to measure students' confidence in their ability to manage an array of barriers or obstacles that they might experience (e.g. succeed in a mathematics or science courses despite having a poor instructor). Lent et al. (2003) further revised and adapted the scale to specifically measure engineering self-efficacy (and their coping self-efficacy)

among students enrolled in ten engineering-related majors with seven items (e.g. complete a degree in engineering despite financial pressure). Though self-efficacy is defined as a belief and cannot be used as an exact measure of performance or achievement of sciences and mathematics (compared to the use of tests), it offers an important insight on the attitudes of students towards sciences (or STEM), not only at the secondary school but also at higher level of education as well as during the career phase.

13.2.2.3. Interest in learning mathematics and sciences

Strongly related to self-efficacy is interest, according to the theoretical line of the SLT, SCT, and SCCT. Unfried et al. (2015), for example, claimed that STEM attitudes have been studied along with interest in STEM careers, which has been developed under the framework of SCCT. One of the main aims of tertiary education is to help students discover their passion which, in turn, leads to a fulfilled career (Harackiewicz and Hulleman 2010). Therefore, developing learning interest, enjoyment, and passion in students can improve their self-efficacy in the subject matter as well as develop their strong passion in pursuing the subject matter. Like attitudes towards science, interest in science is a multidimensional construct in theoretical terms (Krapp and Prenzel 2011). In Cambodia, viewed as a sub-construct of attitudes towards science, Kao (2020) found that Cambodian students at grade 11 tend to show a positive attitude and enjoyment (which could be implied as interest) in the practical work in science.

Interest in science can be measured in various ways. For one thing, the interest in mathematics and science subjects can be measured by asking students to choose their favourite subjects (van Griethuijsen et al. 2014). In a more rigorous approach, Lent et al. (2001) developed the "math/science interests" scale to measure student interest in eight subjects on a five-point scale (from 1=strongly dislike to 5=strongly like). Later, they proposed measuring the "technical interest", also using a five-point scale (1=very low interest to 5=very high interest), in achieving seven activities (such as solving complicated technical problems and reading articles or books about engineering issues). Blankenburg, Hoffler and Parchmann (2015, 367) further conceptualised interest in science as a four-dimensional construct: interest in a particular domain (e.g. chemistry), interest in a particular subject matter or topic in a domain (e.g. combustion), interest in a particular context which is embedded in a topic (e.g. combustion in everyday situation such as burning a candle), and interest in a particular activity that is connected to the context and therefore to the topic (e.g. investigating the burning of a candle). So, like perceived learning experiences and self-efficacy in mathematics and sciences, interest in learning sciences and mathematics can also offer important insights into the understanding of perceptions and attitudes towards sciences or STEM as a whole.

13.2.3. Research methodology

The study was based on a positivist quantitative research paradigm with a descriptive design. The researchers measured the focused variables and further observed the patterns of differences (based on the different attributes of the selected variables) to gain insights into the data.

13.2.3.1. Research instruments

This cross-sectional quantitative study used a questionnaire survey as the key instrument to collect data. The questionnaire was designed with six main sections: 1) personal and school information; 2) streaming choice (subject) and major choice; 3) attitudes and behaviour towards streaming choice; 4) personal traits towards science stream, including interest in mathematics and sciences, self-efficacy in mathematics and sciences, outcome expectations, and streaming choice goals; 5) environmental traits towards stream choice, including perceived contextual supports and barriers related to the pursuit of stream choice; and 6) family information. It should be noted that this chapter is part of a larger research study that focuses on upper secondary school streaming choice, so only some parts of the questionnaire survey were used for the analysis of this chapter. The measures of the variables were largely based on previous studies that adopted the Social Cognitive (Career) Theory of Lent et al. (2003) and to a lesser extent on the engineering survey questionnaire and the middle school student questionnaire of Cooper, Kortegast and Heavrlo (2009). The measurement items were adjusted to fit the Cambodian context of learning sciences and mathematics at upper secondary school in Cambodia. Further consultations with experts and a pilot study of around 80 students from two secondary schools (one provincial and the other Phnom Penh-based) were conducted.

13.2.3.2. Sampling and data collection

The data from the survey constituted 35 upper secondary schools in nine provinces and the Phnom Penh municipality, covering five regions across the country (classified based on Cambodia Socio-Economic Survey (CSES) 2016 (see NIS 2017)). A sample size of 2,441 grade 12 students in the academic year 2017/18 *(n)* was expected, using Yamane's or Slovin's formula[2] with 2 percent margin of error (as suggested in Ryan 2013, 20). The total number of grade 12 students (*N*) stood at 103,112, based on the number registered for the national examination in the academic year 2016/17 from the Examination Office of MoEYS.

The first stage of sampling involved a purposive selection of the regions, provinces, and upper secondary schools. The number of upper secondary schools in each province were selected, using data from EMIS (Education Management Information System) CD outputs 2014–15 (MoEYS 2015). This was done in order to ensure that the issue of

2 $n=N/(1+Ne^2)$ where N= total population size, n=sample size, and e= the margin of error.

regional and urban-rural differences is resolved and so the grade 12 student samples can be representative nationally. The grade 12 students at each school were then randomly selected using the probability-proportional-to-size sampling method (in other words, the larger the size of students in each school, the larger the probability of them being sampled). In the actual data collection, eventually, we obtained 2,981 grade 12 students from 35 upper secondary schools, with a 100-percent response rate.

The data collection was conducted at the end of the first semester from mid-February to early March 2018, so that the participating students would have a reasonable amount of experiences (in learning mathematics and science subjects) to respond to the questionnaire. Before collecting the data from the students, several steps were taken. First, permission to conduct the survey was sought from the Examination Office of MoEYS, which governs the management of the selected upper secondary schools. After the permission was granted, the researchers and trained enumerators contacted the focal person assigned by each school to set up the survey schedule. On the survey day, students were approached in their classrooms, with permission from their class teacher and school principal. The researchers and the enumerators took five to ten minutes to explain the purpose of the study, and then the students were requested to fill in the questionnaire survey (paper-based). The questionnaire survey was written in Khmer, and it took the students approximately 30 to 45 minutes to complete the survey. A pen was offered as an incentive for their participation.

13.2.3.3. Variables, measures, and data analyses

The dataset of the 2,891 grade 12 students was cleaned, inputted, and analysed using Stata (version 14). Following are the four main sets of variables and their specific measures in the analyses:

- ***Personal background variables (seven variables):*** *Gender* was coded 0 for female and 1 for male. *Age* was dichotomised into two groups (0=18 years old or younger, 1=over 18 years old). *Grade 9 exam result* was a proxy for previous learning achievements (with 1=average, 2=good, 3=very good), which were then recoded in just two categories (1=average, 2=good and/or very good) because there was no significant difference between students receiving "good" or "very good" grades in terms of their experiences, interest, and self-efficacy in learning mathematics and science. *Grade 12 stream choice* was coded 0 for social science stream and 1 for science stream. *Intended major choice at university* was dichotomised (0=STEM major, 1=non-STEM major); *future career prospects* was also dichotomised (0=STEM career, 1=non-STEM career). And, finally, *time spent studying maths and science* was also dichotomised into two groups (0=10 hours or less, 1= more than 10 hours) after calculating the mean and median of the hours per week the students spent on studying or doing mathematics and science homework. These seven variables were selected based on their possible relationship with perceived

experience, interest, and self-efficacy in learning mathematics and sciences based on previous studies (e.g. Maokler and Kim 2004; Lent et al. 2003; Regan and DeWitt 2015; Kao 2013; Eng and Szmodis 2015; Eam et al. 2019).

- ***Students' perceived experiences in learning mathematics and sciences*** was measured originally by 13 items on a seven-point scale from 0 to 6 (0=never, 1=very rarely, 2= rarely, 3=occasionally, 4= frequently, 5=very frequently, 6=always). The scale was developed to measure "mathematics and science classes and teachers influence" and based on the questionnaire developed by Cooper, Kortegast and Heavrlo (2009), with some adjustments to fit the context of the current study. This instrument had three subscales: (1) *teacher's efforts to increase students' understanding* (measured by four items with a Cronbach's alpha value of 0.66 and an eigenvalue of 2.01) refers to teachers' knowledge and proficiency in mathematics and science teaching (e.g. "my teachers ask us to apply what we have learned to real-life situations outside class"; (2) *diversity of effective teaching approaches* (measured by six items with a Cronbach's alpha value of 0.77 and an eigenvalue of 2.83) refers to how teachers engage their students in lessons and use technology to enhance learning experience (e.g. "my mathematics and science teachers use technology to assist in teaching mathematics and science lessons"); and (3) *open learning environment* (measured by three items with a Cronbach's alpha value of 0.57 and an eigenvalue of 1.62) refers to a supportive academic learning environment (e.g. "my mathematics and science teachers do not punish or shame me in order to encourage me to learn mathematics and science").
- ***Students' self-efficacy in learning mathematics and sciences*** was measured originally by 12 items on a ten-point scale (0=no confidence at all to 9=complete confidence) and developed from the engineering questionnaire survey of Lent et al. (2003) and adapted to fit the current study's context. It loaded two factors: (1) *belief in collective performing efficacy in different mathematics and science subjects* (measured originally by four items, with a Cronbach's alpha value of 0.89 and an eigenvalue of 3.02) refers to students' confidence in their ability to successfully complete the requirements of mathematics and science subjects with a "very good grade" or higher; and (2) *belief in coping efficacy of mathematics and sciences* (measured originally by eight items, with a Cronbach's alpha value of 0.94 and an eigenvalue of 5.64), which refers to students' confidence in their ability to manage an array of potential barriers or obstacles (e.g. "continue studying mathematics and science although your teachers and friends think you cannot do it").
- ***Students' interest in learning mathematics and sciences*** was measured originally by ten items on a five-point scale (1=very low interest, 2=low interest, 3=medium interest, 4=high interest, 5=very high interest) and was developed based on the "interest in engineering" item in the engineering questionnaire survey designed by Lent et al. 2003 with some adjustments to fit the present study's context. It loaded

two factors: (1) *collective interest in different mathematics and science subjects* (measured by four items, with a Cronbach's alpha value of 0.79 and an eigenvalue of 2.46) refers to students' interest in mathematics and science subjects (e.g. "interest in mathematics", "interest in chemistry", "interest in physics", and "interest in biology"); and (2) *interest in pursuing mathematics and science knowledge* (measured by six items, with a Cronbach's alpha value of 0.82 and an eigenvalue of 3.24) refers to students' level of interest in doing mathematics and science activities (e.g. "solving practical mathematical and science problems").

Overall, the results were analysed using descriptive statistic tools (i.e. frequency, percentage, mean, standard deviation) to show the magnitude of the perceived experiences, self-efficacy, and interest in learning sciences and mathematics as well as their respective sub-constructs.

Then, the single sample t-test analyses were performed to compare the observed magnitudes of the three variables (and their sub-constructs) with their respective expected values. That said, for the ***perceived experiences*** of students, the expected value of "3" was used as the benchmark score (as this value is the neutral point on the 7-point Likert scale (0=never to 6=always)); for the students' ***interest***, the benchmark score was also "3", which is the neutral point on the 5-point Likert scale from (1=very low interest to 5=very high interest); and for the students' ***self-efficacy***, the benchmark score for comparison was 4.5, which is the neutral point on the 10-point Likert scale (0=no confidence at all to 9=complete confidence).

Next, the study analysed the patterns of differences in the sub-constructs of the three variables in relation to a number of variables by using the independent sample t-test. Those variables include gender, age, grade 9 result, grade 12 stream choice, time spent learning mathematics and sciences, intended major choice at university, and future career prospects.

13.3. Characteristics of the participants

Table 13.1 illustrates the characteristics of the 2,981 grade 12 students, 56 percent of whom were female. The age of the students ranged from 15 to 27 years old (with an average age of around 18 years old and a standard deviation of around 1.12 years). The majority of them (63.57 percent) were 18 years old or younger. Most students (67.19 percent) achieved either a good or a very good grade in their grade 9 exam result. About 64 percent of them were enrolled in the science stream. Most students (approximately 58.67 percent) spent less than ten hours a week studying or doing mathematics and science homework. Overall, the number of hours dedicated to self-study or homework ranged from 0 to 56 hours a week, with a mean score of 10.98 hours and a standard deviation of 6.86 hours, indicating that the number of hours spent studying varied greatly among students. Only 33.61 percent of the students said they would consider choosing a STEM major at university, and only 36.56 percent of them thought of pursuing a STEM career.

Table 13.1: Descriptive statistics for all variables in the analysis

Variables	Attributes	Frequency	Percentage
Gender (n=2,981)	0=Female	1,668	55.95
	1=Male	1,313	44.05
Age (n=2,981)	0=18 years old or younger	1,895	63.57
	1=over18 years old	1,086	36.43
Grade 9 result (n=2,947)	1=Average	944	31.67
	2=Good and/or very good	2,003	67.19
	.=Missing	34	1.14
Grade 12 stream choice (n=2,981)	0=Social science	1,069	35.86
	1=Science	1,912	64.14
Intended major at university (n=2,690)	0=STEM major	972	32.61
	1=Non-STEM major	1,718	57.63
	.=Missing	291	9.76
Future career prospects (n=2,953)	0=STEM career	1,090	36.56
	1=Non-STEM career	1,863	62.50
	.=Missing	28	0.94
Time spent studying maths and sciences (n=2,981)	0= Less than or 10 hours/week	1,749	58.67
	1= More than 10 hours/week	1,232	41.33

13.4. Findings

To restate, the overarching purpose of this study is to understand perceptions and attitudes of Cambodian upper secondary school students with regards to learning mathematics and sciences. To achieve this purpose, we specifically measured and conducted preliminary analyses on their perceived experiences, interest, and self-efficacy in learning mathematics and sciences.

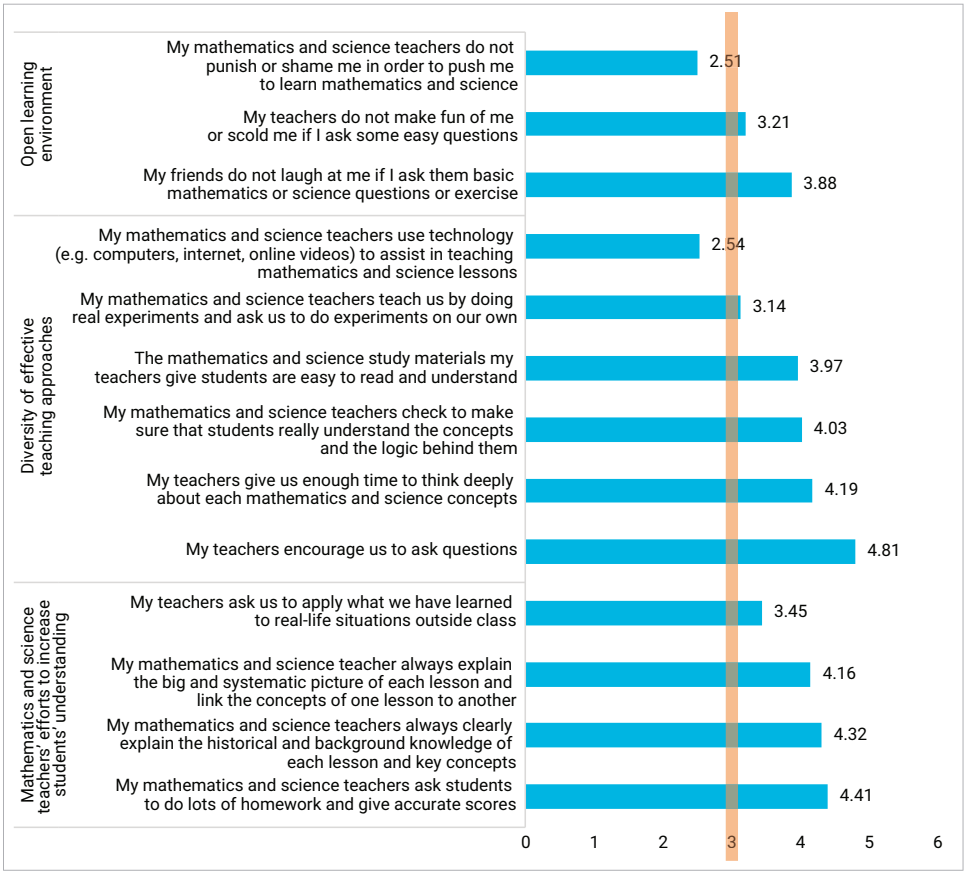
13.4.1. Magnitudes of perceived experiences, interest, and self-efficacy in learning mathematics and sciences

13.4.1.1. Students' perceived experiences in learning mathematics and sciences

The results of analyses of the three sub-constructs of students' perceived experiences of learning mathematics and sciences show that: (1) the *open learning environment* sub-construct was significantly higher than its benchmark score of 3 (Mean=3.20, SD=1.26, t=8.86, p<0.001); (2) the *diversity of effective teaching approaches* sub-construct was significantly higher than its benchmark score of 3 (Mean=3.78, SD=0.91, t=46.72, p<0.001); and (3) the *teachers' efforts to increase students' understanding* sub-construct was also significantly higher than its benchmark score of 3 (Mean=4.09, SD=0.91, t=64.90, p<0.001). The results overall indicate that Cambodian students in general have a positive perception towards their experiences of learning mathematics and science subjects. Please refer to Table 13.2 for the detailed statistics.

As we observed specific items in each sub-construct (see Figure 13.2), we noticed that, in terms of the open learning environment sub-construct, students tended to have concerns over how the mathematics and science teachers use punishment or mockery approaches to encourage them to learn mathematics and sciences (Mean=2.51, SD=1.67, t=-15.86, p<0.001). Likewise, in terms of the diversity of effective teaching approaches sub-construct, the students rated low on the uses of technology in the learning of science and mathematics subjects (e.g. computers, internet, and online videos) (Mean=2.54, SD=1.59, t=-15.72, p<0.001).

Figure 13.2: Mean score of specific items of students' perceived experience in learning mathematics and sciences



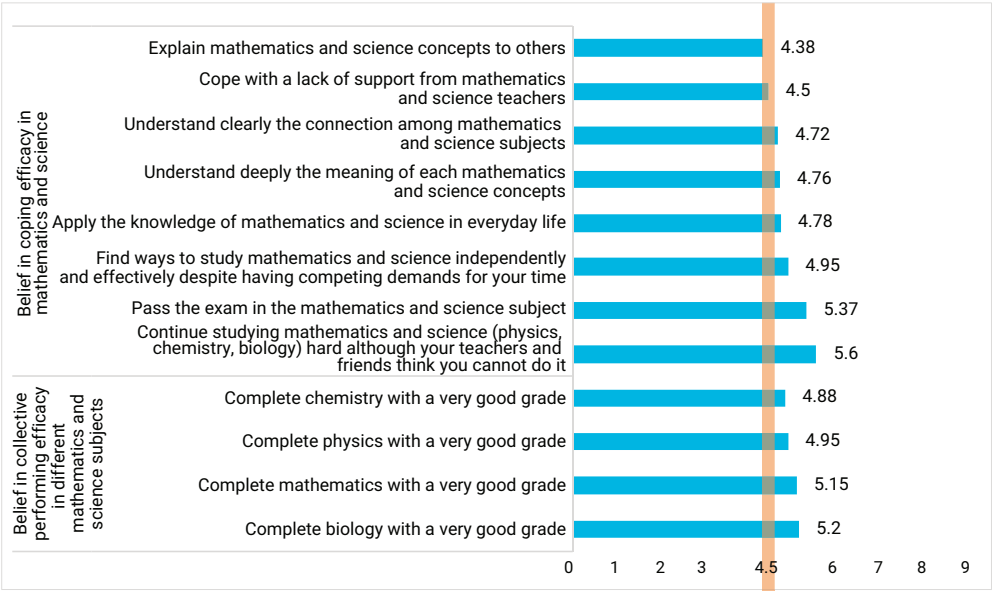
13.4.1.2. Students' self-efficacy in learning mathematics and sciences

In analysing the two sub-constructs of self-efficacy in learning mathematics and sciences of Cambodian students, the *belief in collective performing efficacy in different mathematics and science subjects* sub-construct obtained a mean score of 5.05 (SD=1.79), significantly higher than the benchmark value of 4.5 on the 9-point Likert scale at p<0.001 (t=16.77), and the *belief in coping efficacy*

of mathematics and sciences (Mean=4.88, SD=1.69, t=12.51, p<0.001) was also higher than the benchmark value of 4.5. The results indicate in general that Cambodian students posit positive belief in their ability in learning mathematics and sciences, albeit slightly above the average. Please refer to Table 13.2 for the detailed statistics.

As we observed specific items (see Figure 13.3), we learned that the rating of students indicated the lack of confidence in their ability to explain mathematics and science concepts to others (Mean=4.38, SD=2.03, t=-2.95, p<0.01) and that they were indifferent in their confidence in coping with the lack of support from their mathematics and science teachers (Mean=4.5, SD=1.98, t=0.17, p>.05).

Figure 13.3: Mean score of specific items of students' self-efficacy in learning mathematics and sciences



13.4.1.3. Students' interest in learning mathematics and sciences

The results also show positivity in terms of the students' interest in learning mathematics and sciences. Compared to the benchmark score of 3, the results of the analyses of the two sub-constructs were positive. The *interest in mathematics and science subjects* sub-construct obtained a mean score of 3.29, with a standard deviation of 0.80 and a p-value less than 0.001 (t=20.09). The mean score of the *interest in pursuing mathematics and science subjects* sub-construct was 3.14, with a standard deviation of 0.73 and a p-value less than 0.001 (t=10.90). Please refer to Table 13.2 for the detailed statistics.

By further analysing specific items (see Figure 13.4), the results suggest that students were less interested in working on school projects or participating in debates involving mathematics and science concepts and approaches (Mean=2.91, SD=1.00, t=-4.81, p<0.001).

Figure 13.4: Mean score of specific items of students' interest in learning mathematics and sciences

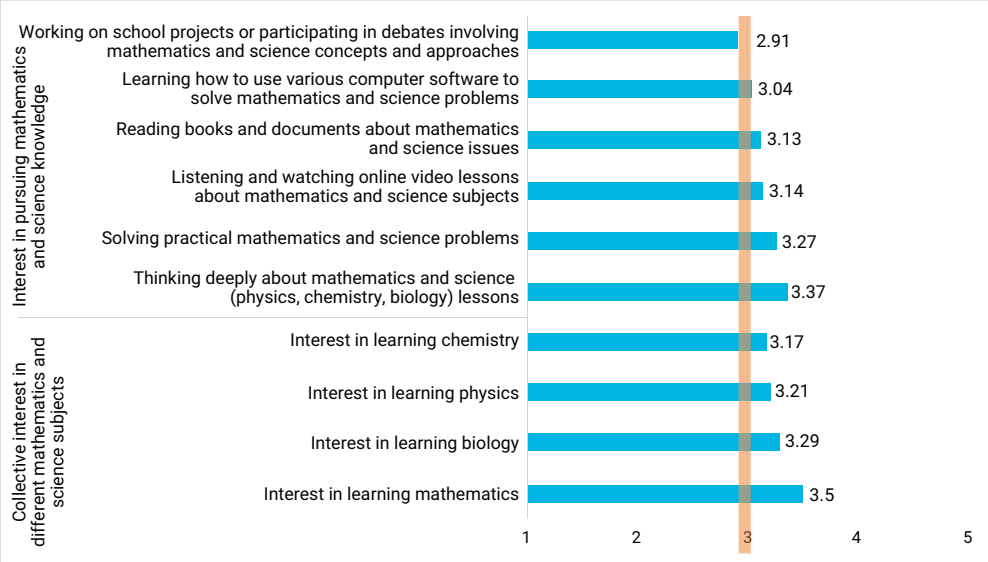


Table 13.2: Single sample t-test of perceived experiences, self-efficacy, and interest in learning mathematics and sciences and their sub-constructs

Variables and sub-constructs	Items	Mean (SD)	t-test
Perceived experiences in learning mathematics and sciences			
Teacher's efforts to increase students' understanding	4	4.09 (0.91)	64.90***
Diversity of effective teaching approaches	6	3.78 (0.91)	46.72***
Open learning environment	3	3.20 (1.26)	8.86***
Self-efficacy in learning mathematics and sciences			
Belief in collective performing efficacy in different mathematics and science subjects	4	5.05 (1.79)	16.77***
Belief in coping efficacy of mathematics and sciences	8	4.88 (1.69)	12.51***
Interest in learning mathematics and sciences			
Collective interest in different mathematics and science subjects	4	3.29 (0.80)	20.09***
Interest in pursuing mathematics and science knowledge	6	3.14 (0.73)	10.90***

Note: n=number of samples; n = 2,981;
t-test here is a single sample t-test; the positive t value indicates that the mean of each item was higher than the benchmark value, while the negative t value indicates the opposite;
* p<0.05, ** p<0.01, *** p<0.001.

13.4.2. Patterns of differences in perceived experiences, interest, and self-efficacy in learning mathematics and sciences

In further analyses of different magnitudes of the sub-constructs of the perceived experiences, interest, and self-efficacy in learning mathematics and sciences by gender, age, grade 12 stream, grade 9 exam result, time spent studying mathematics and science, intended major choice at university, and future career prospects, we found some significant patterns of differences.

13.4.2.1. Teacher's efforts to increase students' understanding

Table 13.3 suggests that students who chose science stream at grade 12 rated their teachers' efforts to increase students' understanding of mathematics and sciences significantly higher than students who chose social stream ($t=13.65$, $p<0.001$). Students who intended to choose a STEM major at university also rated their teachers' efforts to increase students' understanding of mathematics and sciences significantly higher than students who intended to choose a non-STEM major ($t=7.39$, $p<0.001$). Similarly, students who preferred a STEM career in the future rated their teachers' efforts to increase students' understanding of mathematics and sciences significantly higher than did students who preferred a non-STEM career ($t=7.11$, $p<0.001$).

Students who obtained a good and/or very good grade for their grade 9 exam result rated their teachers' efforts to increase students' understanding of mathematics and sciences significantly higher than those who obtained only an average grade ($t=-3.12$, $p<0.01$). Students who reported spending more than ten hours per week learning (or doing homework of) sciences and mathematics rated their teachers' efforts to increase students' understanding of mathematics and sciences significantly higher than those students who spent just ten hours or less ($t=-10.28$, $p<0.001$).

There were no significant differences in terms of teachers' efforts to increase students' understanding of mathematics and sciences between male and female students ($t=1.35$, $p>0.05$) and between 18-year-old students or younger and students older than 18 years old ($t=0.06$, $p>0.05$).

13.4.2.2. Diversity of effective teaching approaches

Table 13.3 also suggests that students who chose science stream at grade 12 rated the diversity of their teachers' effective teaching approaches significantly higher than students who chose social stream at grade 12 ($t=12.23$, $p<0.001$). Students who intended to choose a STEM major at university also rated the diversity of their teachers' effective teaching approaches significantly higher than those who intended to choose a non-STEM major ($t=7.09$, $p<0.001$). Similarly, students who preferred a STEM career in the future rated the diversity of their

teachers' effective teaching approaches significantly higher than students who preferred a non-STEM career (t=7.27, p<0.001).

Students who obtained a good and/or very good grade for their grade 9 exam result rated the diversity of their teachers' effective teaching approaches significantly higher than those who obtained only an average grade (t=-2.54, p<0.05). Students who reported spending more than 10 hours per week learning (or doing homework of) sciences and mathematics rated the diversity of their teachers' effective teaching approaches significantly higher than those students who spent just ten hours or less (t=-9.73, p<0.001).

There were no significant differences in terms of the diversity of their teachers' effective teaching approaches between male and female students (t=1.27, p>0.05) and between 18-year-old students or younger and students older than 18 years old (t=0.88, p>0.05).

13.4.2.3. Open learning environment

Table 13.3 further suggests that female students rated the open learning environment of mathematics and sciences significantly higher than their male counterparts (t=3.69, p<0.001). Students with a good and/or very good grade for their grade 9 exam also rated the open learning environment of mathematics and sciences significantly higher than those with only an average grade (t=-2.18, p<0.05).

The table shows further that there were no significant differences on the open learning environment of mathematics and sciences between science stream choosers and social stream choosers at grade 12 (t=-1.66, p>0.05), between those intending to study a STEM major and those wanting to pursue a non-STEM major at university (t=-0.19, p>0.05), between those intending to choose a STEM career and those wanting to have a non-STEM career (t=-0.27, p>0.05), between 18-year-old students or younger and students older than 18 years old (t=-1.02, p>0.05), and between students who reported spending ten hours or less per week learning (or doing homework of) sciences and mathematics and those who spent more than ten hours (t=-0.77, p>0.05).

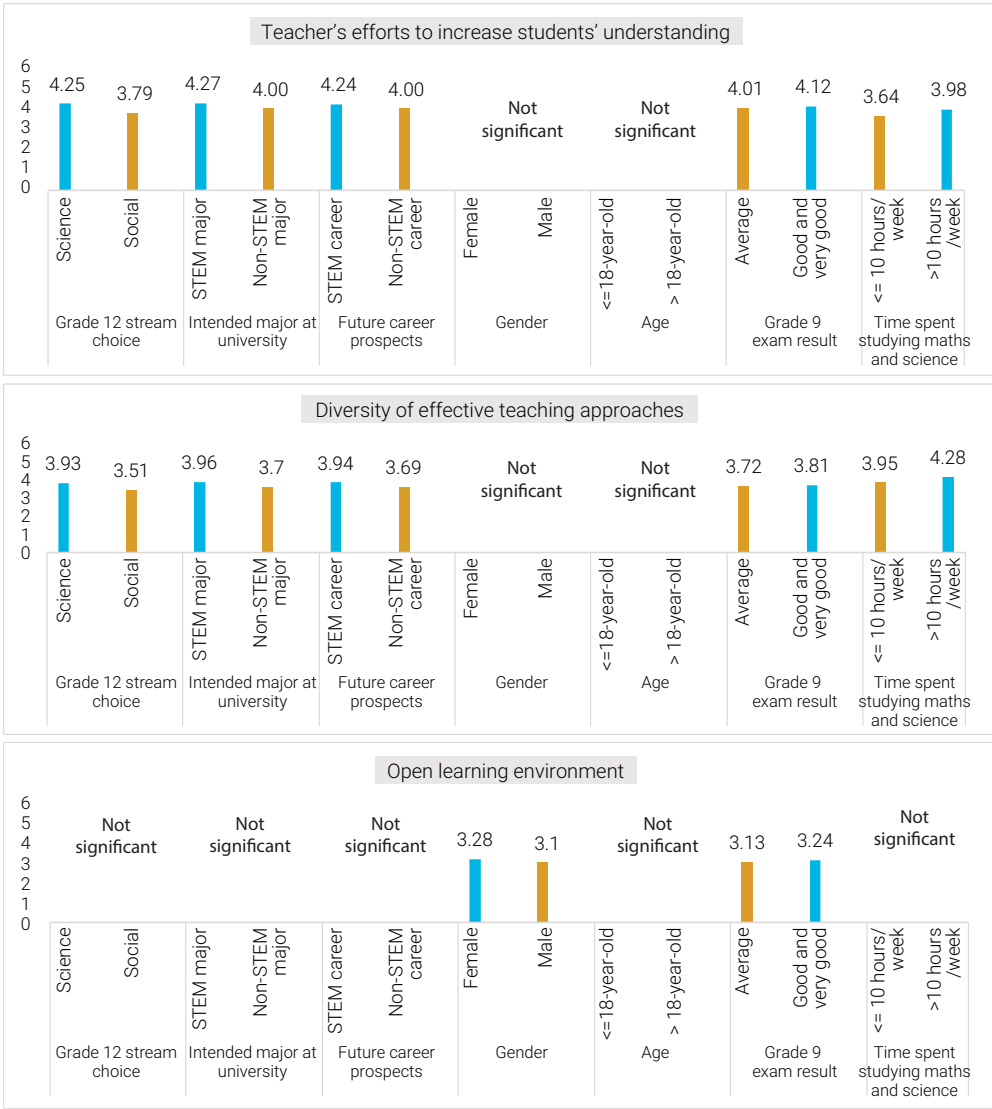
Figure 13.5 presents the magnitude of differences (in mean scores) of the sub-constructs of perceived experiences on learning mathematics and sciences of Cambodian grade 12 students between the different groups or attributes of the significant variables discussed above.

Table 13.3: Analyses of patterns of differences in the sub-constructs of students' perceived experiences in learning mathematics and sciences

Variables	Attributes	n	Teacher's efforts to increase students' understanding		Diversity of effective teaching approaches		Open learning environment	
			Mean (SD)	Independent sample t-test	Mean (SD)	Independent sample t-test	Mean (SD)	Independent sample t-test
Grade 12 stream choice	Science	1,912	4.25 (0.82)	13.65***	3.93 (0.83)	12.23***	3.17 (1.27)	-1.66
	Social	1,069	3.79 (0.98)		3.51 (0.98)		3.25 (1.23)	
Intended major at university	STEM major	972	4.27 (0.82)	7.39***	3.96 (0.82)	7.09***	3.20 (1.28)	-0.19
	Non-STEM major	1,718	4.00 (0.94)		3.70 (0.94)		3.21 (1.25)	
Future career prospects	STEM career	1,090	4.24 (0.84)	7.11***	3.94 (0.83)	7.27***	3.19 (1.27)	-0.27
	Non-STEM career	1,863	4.00 (0.94)		3.69 (0.94)		3.20 (1.25)	
Gender	Female	1,668	4.10 (0.91)	1.35	3.80 (0.89)	1.27	3.28 (1.26)	3.69***
	Male	1,313	4.06 (0.92)		3.75 (0.93)		3.10 (1.25)	
Age	<=18 years old	1,895	4.09 (0.90)	0.06	3.79 (0.89)	0.88	3.18 (1.27)	-1.02
	> 18 years old	1,086	4.08 (0.94)		3.76 (0.95)		3.23 (1.23)	
Grade 9 exam result	Average	944	4.01 (0.94)	-3.12**	3.72 (0.95)	-2.54*	3.13 (1.28)	-2.18*
	Good and/ or very good	2,003	4.12 (0.89)		3.81 (0.89)		3.24 (1.25)	
Time spent studying maths and sciences	<= 10 hours/ week	1,749	3.64 (0.02)	-10.28***	3.95 (0.02)	-9.73***	3.18 (0.02)	-0.77
	>10 hours/ week	1,232	3.98 (0.02)		4.28 (0.02)		3.22 (0.03)	

Note: n=number of samples; * p<0.05, ** p<0.01, *** p<0.001.

Figure 13.5: Mean scores of the sub-constructs of students' perceived experiences of learning sciences and mathematics by different groups of students



13.4.2.4. Belief in collective performing efficacy in different mathematics and science subjects

Table 13.4 shows that students who chose science stream at grade 12 rated their belief in collective performing efficacy in different mathematics and science subjects significantly higher than those who chose social stream ($t=32.46$, $p<0.001$). Students who intended to pursue a STEM university major also significantly rated their belief in collective performing efficacy in different

mathematics and science subjects higher than those who aimed for a non-STEM major (t=17.37, p<0.001). Students who had a prospect for a STEM career in the future rated their belief in collective performing efficacy in different mathematics and science subjects significantly higher than those who preferred to have a non-STEM career (t=17.94, p<0.001).

Male students rated their belief in collective performing efficacy in different mathematics and science subjects significantly higher than the female students did (t=-2.50, p<0.05). Students aged 18 years or younger rated their belief in collective performing efficacy in different mathematics and science subjects significantly higher than did those who were older than 18 years old (t=6.76, p<0.001). Students with a good and/or very good grade for their grade 9 exam result rated their belief in collective performing efficacy in different mathematics and science subjects significantly higher than those with an average grade (t=-11.70, p<0.001). Students who spent more than ten hours per week studying (or doing homework of) mathematics and sciences rated their belief in collective performing efficacy in different mathematics and science subjects significantly higher than did those who spent ten hours or less time (t=-20.99, p<0.001).

13.4.2.5. Belief in coping efficacy of mathematics and sciences

Table 13.4 further suggests that students who chose science stream at grade 12 rated their belief in coping efficacy of mathematics and science significantly higher than those who chose social stream (t=28.49, p<0.001). Students who intended to pursue a STEM university major also significantly rated their belief in coping efficacy of mathematics and sciences higher than those who aimed for a non-STEM major (t=15.87, p<0.001). Students who had future prospects for a STEM career rated their belief in coping efficacy of mathematics and sciences significantly higher than those who preferred to have a non-STEM career (t=16.29, p<0.001).

There was no significant difference between male and female students in terms of their belief in coping efficacy of mathematics and sciences (t=-1.89, p>0.05). Students aged 18 years old or younger rated their belief in coping efficacy of mathematics and sciences significantly higher than those who were older than 18 years of age (t=5.77, p<0.001). Students with good and very a good and/or very good grade for their grade 9 exam rated their belief in coping efficacy of mathematics and sciences significantly higher than those with an average grade (t=-10.22, p<0.001). Students who spent more than ten hours per week studying mathematics and sciences rated their belief in coping efficacy of mathematics and sciences significantly higher than did those who spent ten hours or less time (t=-20.52, p<0.001).

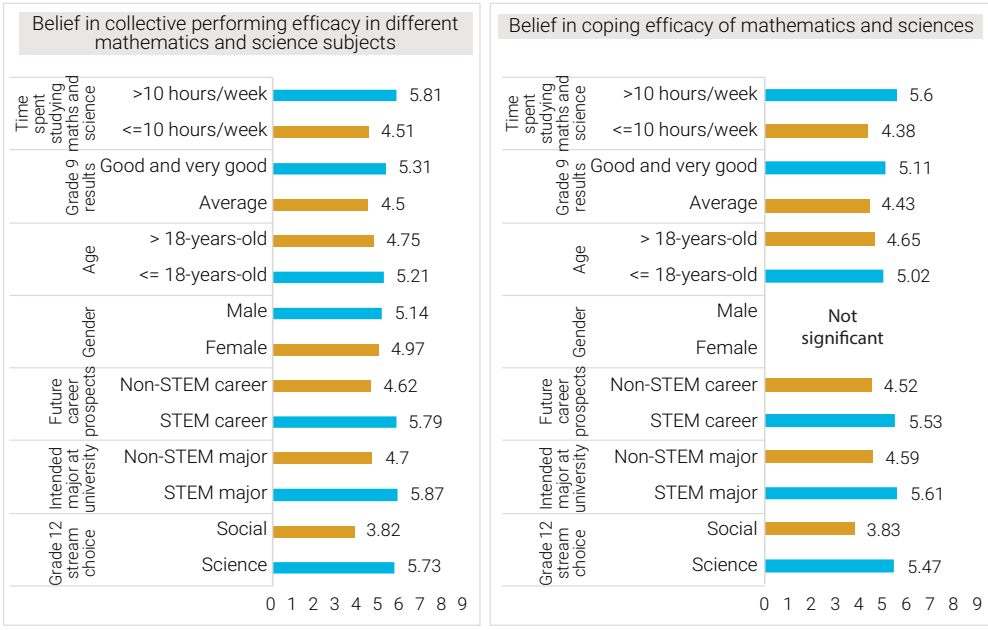
Figure 13.6 illustrates the mean differences between the different groups or attributes of Cambodian grade 12 students in terms of the sub-constructs of self-efficacy in learning mathematics and sciences.

Table 13.4: Analyses of patterns of differences in the sub-constructs of students' self-efficacy in learning mathematics and sciences

Variables	Attributes	n	Belief in collective performing efficacy in different mathematics and science subjects		Belief in coping efficacy of mathematics and sciences	
			Mean (SD)	Independent sample t-test	Mean (SD)	Independent sample t-test
Grade 12 stream choice	Science	1,912	5.73 (1.49)	32.46***	5.47 (1.43)	28.49***
	Social	1,069	3.82 (1.61)		3.83 (1.60)	
Intended major at university	STEM major	972	5.87 (1.54)	17.37***	5.61 (1.44)	15.87***
	Non-STEM major	1,718	4.70 (1.76)		4.59 (1.69)	
Future career prospects	STEM career	1,090	5.79 (1.59)	17.94***	5.53 (1.51)	16.29***
	Non-STEM career	1,863	4.62 (1.76)		4.52 (1.68)	
Gender	Female	1,668	4.97 (1.77)	2.50*	4.83 (1.68)	-1.89
	Male	1,313	5.14 (1.81)		4.95 (1.70)	
Age	<= 18 years old	1,895	5.21 (1.74)	6.76***	5.02 (1.65)	5.77***
	> 18 years old	1,086	4.75 (1.83)		4.65 (1.73)	
Grade 9 results	Average	944	4.50 (1.81)	-11.70***	4.43 (1.73)	-10.22***
	Good and very good	2,003	5.31 (1.72)		5.11 (1.63)	
Time spent studying maths and sciences	<=10 hours/week	1,749	4.51 (0.04)	-20.99***	4.38 (0.03)	-20.52***
	>10 hours/week	1,232	5.81 (0.04)		5.60 (0.04)	

Note: n = number of samples; *p<0.05, ** p<0.01, *** p<0.001.

Figure 13.6: Mean scores of the sub-constructs of students' self-efficacy in learning mathematics and sciences by different groups of students



13.4.2.6. Collective interest in different mathematics and science subjects

Table 13.5 suggests that students who chose science stream at grade 12 rated their collective interest in different mathematics and science subjects significantly higher than those who chose social stream ($t=36.53$, $p<0.001$). Students who preferred to study in a STEM major at university rated their collective interest in different mathematics and science subjects significantly higher than those who preferred a non-STEM major ($t=20.18$, $p<0.001$). Students who intended to have a STEM future career rated their collective interest in different mathematics and science subjects significantly higher than those who aimed to work in a non-STEM career ($t=20.69$, $p<0.001$).

There was no significant differences in the collective interest in different mathematics and science subjects between male and female students ($t=-0.75$, $p>0.05$). Students aged 18 years or younger rated their collective interest in different mathematics and science subjects significantly higher than did those who were older than 18 years old ($t=7.21$, $p<0.001$). Students who performed well and/or very well in grade 9 exam rated their collective interest in different mathematics and science subjects significantly higher than those who were just an average performer ($t=-11.04$, $p<0.001$). Finally, those who spent more than ten hours per week studying mathematics and sciences rated their collective interest in different mathematics and science subjects significantly higher than those who spent less time than ten hours per week ($t=-21.08$, $p<0.001$).

13.4.2.7. Interest in pursuing mathematics and science knowledge

Table 13.5 further suggests that students who chose the science stream at grade 12 rated their interest in pursuing mathematics and science knowledge significantly higher than those who chose social stream ($t=27.69$, $p<0.001$). Students who preferred to study in a STEM major at university rated their interest in pursuing mathematics and science knowledge significantly higher than those who preferred a non-STEM major ($t=15.36$, $p<0.001$). Students who intended to have a STEM future career rated their interest in pursuing mathematics and science knowledge significantly higher than those who aimed to work in a non-STEM career ($t=16.00$, $p<0.001$).

There was no significant difference in the interest in pursuing mathematics and science knowledge between male and female students ($t=-1.39$, $p>0.05$). Students aged 18 years or younger rated their interest in pursuing mathematics and science knowledge significantly higher than did those who were older than 18 years old ($t=4.89$, $p<0.001$). Students who performed well and/or very well in grade 9 exam rated their interest in pursuing mathematics and science knowledge significantly higher than those who were just an average performer ($t=-8.99$, $p<0.001$). Finally,

those who spent more than ten hours per week studying mathematics and sciences rated their interest in pursuing mathematics and science knowledge significantly higher than did those who spent just ten hours or less time per week (t=-19.43, p<0.001).

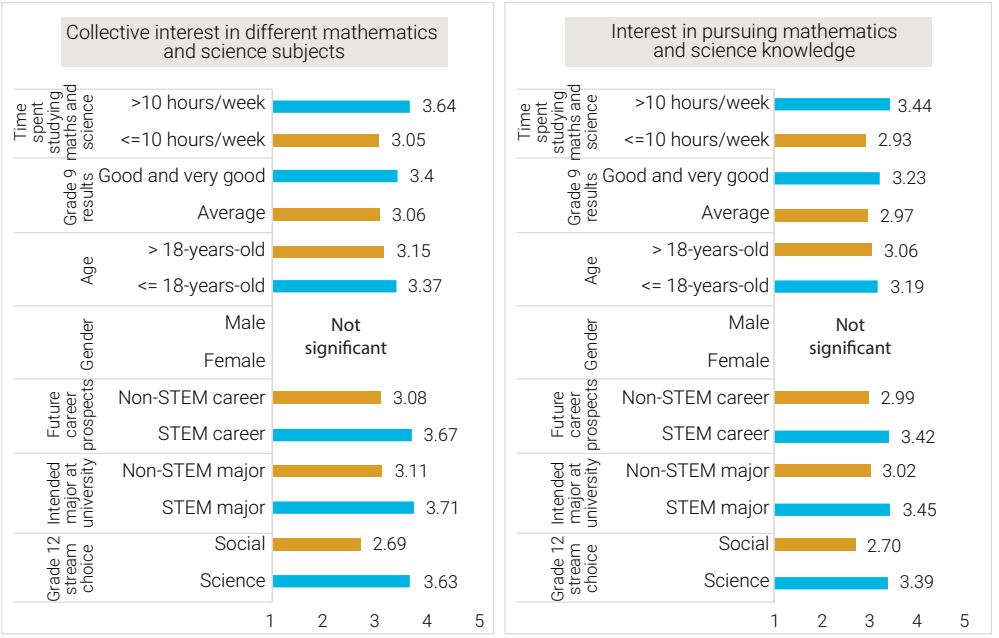
Table 13.5: Analyses of patterns of differences in the sub-constructs of students' interest in learning mathematics and sciences

Variables	Attributes	n	Collective interest in different mathematics and science subjects		Interest in pursuing mathematics and science knowledge	
			Mean (SD)	Independent sample t-test	Mean (SD)	Independent sample t-test
Grade 12 stream choice	Science	1,912	3.63 (0.66)	36.53***	3.39 (0.64)	27.69***
	Social	1,069	2.69 (0.67)		2.70 (0.67)	
Intended major at university	STEM major	972	3.71 (0.69)	20.18***	3.45 (0.64)	15.36***
	Non-STEM major	1,718	3.11 (0.77)		3.02 (0.73)	
Future career prospects	STEM career	1,090	3.67 (0.72)	20.69***	3.42 (0.66)	16.00***
	Non-STEM career	1,863	3.08 (0.77)		2.99 (0.73)	
Gender	Female	1,668	3.28 (0.78)	-0.75	3.13 (0.73)	-1.39
	Male	1,313	3.30 (0.83)		3.16 (0.74)	
Age	<= 18 years old	1,895	3.37 (0.79)	7.21***	3.19 (0.72)	4.89***
	> 18 years old	1,086	3.15 (0.79)		3.06 (0.74)	
Grade 9 results	Average	944	3.06 (0.80)	-11.04***	2.97 (0.75)	-8.99***
	Good and very good	2,003	3.40 (0.78)		3.23 (0.71)	
Time spent studying maths and sciences	<=10 hours/week	1,749	3.05 (0.01)	-21.08***	2.93 (0.01)	-19.43***
	>10 hours/week	1,232	3.64 (0.02)		3.44 (0.01)	

Note: n=number of samples; * p<0.05, ** p<0.01, *** p<0.001.

Figure 13.7 below illustrates the mean differences between the different groups or attributes of Cambodian grade 12 students in terms of the sub-constructs of students' interest in learning mathematics and sciences.

Figure 13.7: Mean scores of the sub-constructs of students' interest in learning mathematics and science by different groups of students



13.5. Tentative conclusions

The purpose of the current study is to understand overall attitudes of Cambodian students towards STEM education by observing the magnitudes and different patterns of perceived experiences, interest, and self-efficacy in learning mathematics and sciences of Cambodian upper secondary school students at grade 12. Each of the three variables were classified into sub-constructs and were analysed using descriptive statistics and classical tests of differences (particularly, the single-sample t-test and the independent-sample t-test).

The observed magnitudes of these sub-constructs generally suggest a moderate level of perceived experiences, interest, and self-efficacy in learning mathematics and sciences, with most of the mean scores (of each of the sub-constructs) lying slightly above the benchmark value (i.e. the middle value) of the rating scale. The findings from this study somehow imply that Cambodian upper secondary school students have positive perceptions or attitudes towards learning sciences and mathematics. A previous local study by Kao (2020) also found such a positive attitude towards certain aspects of science of Cambodian grade 11 students.

In our study, however, students' ratings on specific items of the perceived experiences, interest, and self-efficacy in learning mathematics and sciences tend to imply their concerns over such specific issues as how their teachers use punishment-related

approaches to encourage them to learn mathematics or sciences, their teachers' limited uses of technology in teaching, their own limited ability to explain science or mathematics concepts to others, their low coping efficacy when there is lack of support in learning mathematics and sciences, and their limited interest in collaborative working or competing in science and mathematics projects.

This particular finding of this study is far from conclusive in terms of claiming that Cambodian students at the upper secondary school level in general have a positive attitude towards learning sciences, mathematics, or other STEM-related subjects. Further discourses on the concept of attitudes and the methods to meausre attitudes towards a particular academic subject, academic major, or professional career need further inquiries in Cambodia and developing countries in general.

Table 13.6: Summary of results of all analyses on patterns of differences

Variables and sub-constructs	Grade 12 stream choice	Intended major at university	Future career prospects	Gender	Age	Grade 9 exam result	Time spent studying maths and sciences
Perceived experiences in mathematics and sciences							
Teacher's efforts to increase students' understanding	***	***	***	NS	NS	**	***
Diversity of effective teaching approaches	***	***	***	NS	NS	*	***
Open learning environment	NS	NS	NS	***	NS	*	NS
Self-efficacy in learning mathematics and sciences							
Belief in collective performing efficacy in different mathematics and science subjects	***	***	***	*	***	***	***
Belief in coping efficacy of mathematics and sciences	***	***	***	NS	***	***	***
Interest in learning mathematics and sciences							
Collective interest in different mathematics and science subjects	***	***	***	NS	***	***	***
Interest in pursuing mathematics and science knowledge	***	***	***	NS	***	***	***

Note: NS=Not significant; * p<0.05, ** p<0.01, *** p<0.001

Further analyses of the patterns of differences between groups or attributes of a number of variables (i.e. grade 12 stream choice, intended major at university, future career

prospects, gender, age, grade 9 exam result, and time spent studying mathematics and science) suggest that the sub-constructs of students' perceived experiences, self-efficacy, and interest in learning sciences and mathematics are mostly statistically significant. Table 13.6 summarises these detected significant differences. Overall, these statistical results point to a great divide between STEM-oriented and non-STEM-oriented Cambodian students, high achievers and low achievers, and sometimes between male and female students as well as between young and old students in terms of their perceptions or attitudes towards STEM education.

This preliminary study offers some basic ideas that can be useful for further studies on attitudes towards STEM education as well as on factors explaining subject, major, or career choice of Cambodian students. Further multi-level, multivariate analyses will be conducted to observe relationships between certain significant variables (detected in this study) and the choice of science stream at the upper secondary school level, and the results will be compared with previous studies' findings (e.g. Keo 2020; Kao and Shimizu 2020) in order to offer a more concrete insight into the dynamics surrounding Cambodian students' attitudes, behaviours, abilities, and choices in learning or engaging with STEM-related subjects at the lower level of education, majors at the higher education level, or careers at the post-higher-education phase.

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Section IV

Perspectives on Learning of Cambodian PSET Students in the Discourse of Lifelong Learning

Chapter 14

Teaching and Learning Chemistry at a Public University: Practices and Challenges

Khieng Sothy, Chuong Chantha, Heng Sambath, and Chhem Siriwat

Abstract

Current debates on higher education identify three major educational developments which have shaped adult learning: use of technology, active learning, and interactive teaching methods. Many research studies have documented the current issues facing higher education in Cambodia, but few focused on teaching and learning directly. This study set out to explore teaching and learning at higher education institutions in Cambodia, using as a case study the Department of Chemistry at the Royal University of Phnom Penh. It addresses three research questions: What is the current practice of tertiary teaching and learning in resource-constrained Cambodia? How do those practices conform to good principles of adult education? What are the factors that influence these practices? In addition to catalysing a critical consciousness around approaches to and quality of teaching and learning, we aim to provide evidence and suggestions for educators, academic leaders, and policy formulators to reflect on their practices and institutional and national policy interventions. Although scientific knowledge has advanced at a revolutionary rate, it has had little influence on approaches to teaching and learning in higher education. Several studies have documented the need to anchor curriculum development within chemistry education research. Yet the current study found little evidence to suggest that teaching and learning are supported by or linked in any way to research. If the purpose of Cambodian higher education is "to produce graduates who have acquired technical knowledge, skills, and abilities and are capable of working in both national and international settings" and for graduates to have complete personality and characteristics and promote the scientific, technical, cultural, and social researches in order to achieve capacity, knowledge, skill, morality, inventive and creative ideas, and enterprise spirit to the development of the country, the practice of teaching and learning in higher education must reflect these aspirations.

Keywords: Adult education, science education, learning, andragogy, tertiary education

14.1. Introduction and rationale

The massification and corporatisation of higher education in the past two decades have resulted in a drastic increase in the number of higher education providers and enrolments, but the quality and relevance of higher education in Cambodia are problematic. To address this, the Cambodian Higher Education Vision 2030 set out "to build a quality higher education system that develops human resources with excellent knowledge, skills and moral values in order to work and live within the era of globalisation and knowledge-based society" (MoEYS 2014, 3). One of the four objectives is to "improve quality of learning, teaching and research systems to provide students with knowledge and skills needed in the labour market and contribute to national development" (MoEYS 2014, 3).

Our review of the literature on higher education reveals that adult learning has been shaped by three major educational developments: use of technology, active learning, (Cochran and Brown 2016), and interactive teaching methods. The growing use of technology in education requires that educators reconsider how adult education is delivered. As with child-centred education, adult learners are expected to participate actively in their own learning process (Turcsányi-Szabó 2012). However, teaching has barely changed in the last century in that lecture-based instruction still dominates; in this process teachers are considered holders of knowledge and simply transmit information to students, who are passive receivers. With the abundance of online and offline sources of knowledge, traditional lecturers are increasingly expected to be facilitators, promoting self-directed and group learning as well as critical thinking. To better understand the three issues and ultimately improve teaching effectiveness, we must first understand students' perceptions of teaching and learning practices (Ditcher 2001).

Many research studies have documented the issues facing Cambodian higher education in the last five years but very few focused on teaching and learning directly.[1] The purpose of this research is to explore teaching and learning at higher education institutions in Cambodia using as a case study the Department of Chemistry at the Royal University of Phnom Penh (RUPP). To that end, we sought to address these questions: What is the current practice of tertiary teaching and learning in resource-constrained Cambodia? How do those practices conform to good principles of adult education? What are the factors that influence these practices? In addition to promoting a critical discussion on approaches to and the quality of teaching and learning, the study provides evidence and suggestions for educators, academic leaders, and policy formulators to reflect on their practices and institutional and national policy interventions.

1 Exceptions are Pickles et al. (2019), Vong and Kaewurai (2017), Khieng, Madhur and Chhem (2015), and Kitamura et al. (2015).

The discussion in this paper follows this order: we start with a brief discussion of adult learning theories, and then we describe the research design and sources of data. We dedicate the main part of the chapter to the research findings and analysis and conclude with discussion and implications.

14.2. Literature review: Principles of good practice in adult learning – andragogy

Building on the rationale that teaching and learning in post-secondary education have been transformed by placing learning and learners at the core of all learning activities, while the role of lecturers is to facilitate student learning and learning experiences, we are influenced by adult learning theory or andragogy (Freire 1973; Knowles, Holton III and Swanson 2005). The key assumptions of adult learning theory are:

- ***The need to know:*** Adult learners usually need to understand clearly the reasons for engaging in a learning process before they can devote their time and energy to it. They need to know the benefits of learning or the consequences of not learning something. This in a way is "consciousness raising" (Freire 1973).
- ***The self-concept:*** We expect adults to be self-directed learners in charge of their own decisions. Educators can smooth the transition from teacher-directed learning to self-directed learning by establishing an enabling environment.
- ***Learner experience:*** How adults experience different things in their lives has an impact on their learning. Adults who can connect their experiences as a child or young adult with their learning can enhance their learning experience.
- ***Readiness to learn:*** Readiness to learn is closely related to an individual's developmental stage and everyday life. Timing learning with certain developmental stages can improve the readiness and willingness of adults to participate.
- ***Learning orientation:*** Adult learners are more oriented towards subject- and problem-centred learning and relate learning to specific tasks or real-life problems, whereas children are more subject-centred.
- ***Motivation to learn:*** Adults are more motivated to engage in learning by intrinsic motivations such as self-esteem, confidence, and desire to help others (Knowles, Holton III and Swanson 2005, 160).

Theoretical discussions around the principles of adult learning abound. Mezirow (1978) proposed transformative learning, reflection, and action process (Mezirow 1990). For Freire (1973), education should aim to emancipate learners by raising their consciousness about reality. Dewey's (1997) theory of experiential learning values learning by doing and practical understanding of the world, which is centric to the learning process. And Kolb's (1984) view of such a learning process focuses on individuals making sense of and adapting to the realities around them. Similarly,

the constructivist learning model (Yang 2002; Lueddeke 1999) emphasises the importance of learners' pre-existing conceptions and knowledge; without adapting to this existing knowledge, educators cannot enrich student learning (Fry, Ketteridge and Marshall 2008). In line with the constructivist view of education, Biggs (2003) proposed that quality teaching must align between the purpose, the approach, and the assessment.

14.3. Research design: The learners and educators

We used a qualitative research approach to explore learning and teaching at higher education institutions. We conducted expert interviews with six senior lecturers and in-depth interviews with ten students in the Department of Chemistry at RUPP. We selected this department because we have developed close relationships with academic and other staff across the university, affording us ready access to reliable sources of information.

The lecturers we interviewed had between five to 25 years of experience working in the Department of Chemistry in different capacities, including as advisor and senior administrator. All of them had completed some sort of training abroad, ranging from short courses to a full doctoral program in their field. Only one of the lecturers is female, reflecting the nature of gender imbalance among science faculty members.

The students were selected from year two, three, and four cohorts and aged between 18 and 23 years old. Four of them are female. All of them, bar one, did their high school education in different provinces. They all had part-time private tutoring jobs, and eight of them taught chemistry to first year university students and grade 12 high school students.

The interviews were conducted in early 2018. The interview transcripts were analysed using Nvivo and a systematic two-stage thematic coding process reflecting the research questions and themes explored in the literature review.

14.4. Findings

14.4.1. Motivation for choosing chemistry

The students have different motivations for choosing to study chemistry. For most of them, pursuing this major suited their personal choices. Several chose only chemistry because they failed to pass the entrance exam or could not afford the fees for their first choice of major (e.g. medicine) or university. Others were influenced by their parents, relatives, and high school teachers. Employment prospects and business opportunities were their other motivations, as stated by one interviewee: "I want to have my own business selling chemical substances because then I could

give a chance to those with similar expertise" (SS8). Similarly, two others expressed interest in working in manufacturing (SS3) and food processing companies (SS9). Almost all interviewees were open to opportunities other than teaching. The interest in starting a business and working in the private sector could be a sign that students are becoming more entrepreneurial.

Pressure or suggestions from parents or relatives seem to be less prominent than in the past, when many parents wanted their children to pursue an academic and career path similar to their own. For example, parents who were teachers might have encouraged their children to study medicine; students with a teacher or a doctor in the family might have pursued a major to enter the teaching profession. Six out of the ten of the students we interviewed wanted to pursue a career in education, such as a high school teacher or university lecturer (S1, 3, 6, 8, 9 and 10).

Finally, high school teachers play a role in students' choice of university major. They provide informal career counselling which may contribute to students' awareness of the potential of their knowledge and skills in chemistry. One student said, "My high school teachers encouraged me to choose science because a country can be developed based on science" (S9).

14.4.2. Student perceptions

14.4.2.1. Good teaching approaches

The students had different perceptions regarding what constitutes good teaching (Table 14.1). Independent learning, application of knowledge, group work, clear purpose, and second language proficiency were the main factors raised. On application of knowledge, students want lectures to be related (such as through examples) to everyday life. Group work and activities were deemed much more interesting and meaningful than lectures alone. Among these five factors, the students rated the teachers' ability to promote independent learning as the most important.

Students' perspectives of good teaching were almost diametrically opposite to the practice (and perceptions) of lecturers, who spend most of their time in the classroom lecturing and leading students. The lecture, which mainly involves one-way communication to transmit information to the audience, does not allow student participation let alone time for group work that encourages classroom debate, critical thinking, and independent learning. Although group work is widely acknowledged as an integral part of good teaching, few activities of this sort were reported in the interviews.

Table 14.1: Student perception of good teaching practices

Quotes	Interviewee(s)
Adopting a scientific [approach to] teaching – theory, exercise, and practice	S2 and 3
[More] group work and do assignments….	S2, 4, 5 and 8
Group discussion and group presentation should be encouraged in class. Although it would add pressure, it would help students understand more.	S4 and 5
More experiments should be done to make students think and arouse their curiosity; and when they are curious, they will ask more questions. This can help promote critical thinking.	S10
Relate lessons to daily life, for example, to reality which makes [learning] more interesting.	S8
In a three-hour teaching session, the lecture should take up only 40 percent of the time and the rest should be for students' activities.	S4
Clear direction to guide students during teaching.	S8
Tell the students what to read up on for the next session.	S4
They [good teachers] explain the purpose of learning.	S8
They [good teachers] provide guidance on learning strategies for home- or self-study.	S8

14.4.2.2. Ineffective teaching approaches

To validate student perceptions of good teaching, we asked the students to describe what constitutes an ineffective or bad approach to teaching. The responses fell into three themes: overuse of PowerPoint presentations, heavy reliance on textbooks, and poor or muddled communication. Many students complained about long PowerPoint presentations and the resultant lack of attention to individual student's needs, and lack of classroom discussion and activities.

> In class, the lecturers teach a bit [too] fast and want students to learn as much as they can. I catch only 30 percent of their explanation… there are lots of lessons, one lesson had 100 slides and lasted for six hours, there are 90 students in the class, and there are no group discussions or [practical] exercises. (S1)

> The difference [between high school and university] is the number of students [per class]. In high school, there were around 30 students but in university there are 100 students, which makes it hard to study. There is no time for students to discuss [the topic in class] and they do not feel close to the teacher. (S1)

> Many students have problems because there is no time to ask the lecturer questions. (S7)

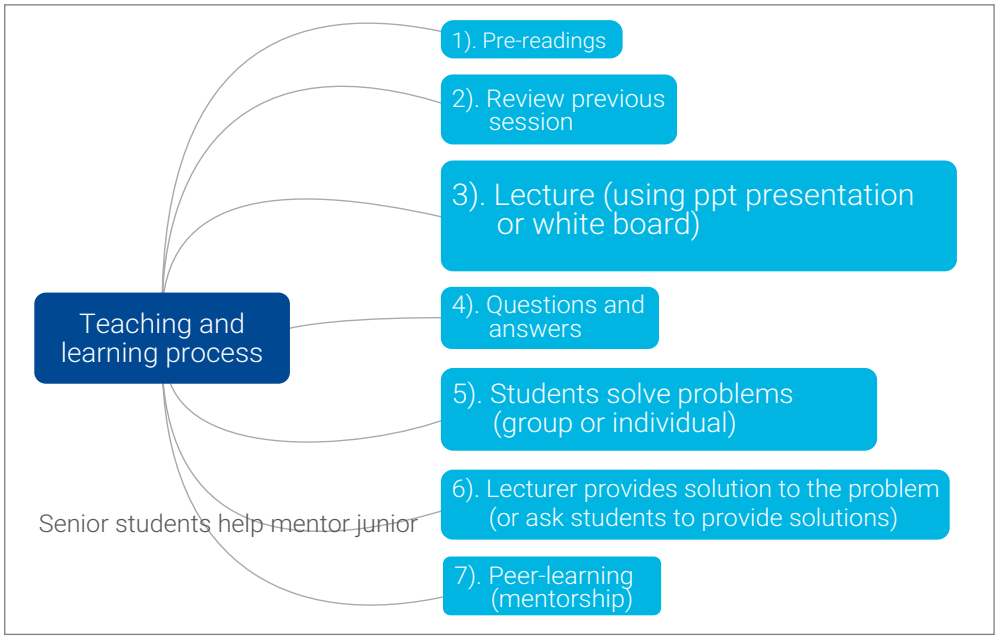
There are issues with the quality of resources and how teachers use those resources. A few teachers reportedly read and copy contents from the textbook onto the board. Some student interviewees reasoned that the different teaching approaches stem from whether teachers have been trained abroad or locally. In addition, students find it harder to follow lectures and materials in English without corresponding Khmer language materials.

14.4.2.3. Teaching and learning approaches in practice

14.4.2.3.1. Teaching approach

Based on narrative analysis, the teaching approach in the Department of Chemistry usually follows the steps illustrated in Figure 14.1, with most time and effort in the classroom given to lectures using PowerPoint presentations or textbooks. According to one lecturer who has more than ten years of experience teaching chemistry, "I can generalise and conclude that most teachers prefer lecturing over other teaching modes" (T2).

Figure 14.1: Teaching approach in the Department of Chemistry, RUPP

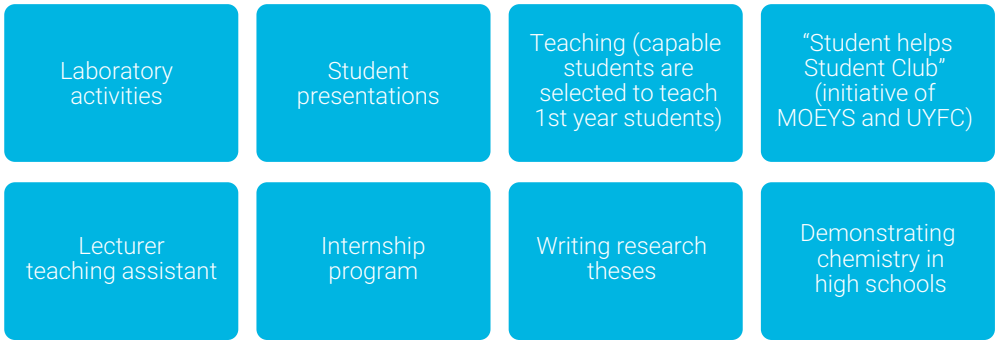


Source: Authors' illustration

Due to the focus on transmitting information through lectures, independent learning activities such as group work or peer learning are rare or sporadic. Two senior lecturers who have been with the department for more than ten years, described this process: "Normally, the lecturers replicate their own experience – the way they were taught when they were students in Cambodia: lecturers stand and explain, while students sit and listen" (T6 and T2). Lecturers have the freedom to design their own course syllabi and contents and teaching approach; the themes, however, are proposed by the department head. Because "lecturers can choose the topics they teach and just have to make sure that the quality of teaching is effective", they adapt different approaches "depending on the subject, curriculum, materials used, and especially the circumstances" (T5).

One senior manager refuted the statement that teaching in the Chemistry Department lacks student activities or is centred on the lecturers. According to him, "a teacher-centred approach is used about 30 percent of the time while a student-centred approach is used 70 percent of the time" (T4). He stressed that the former "is used [mainly] for theoretical contents and [many] other methods such as the following are applied":

Figure 14.2: Main teaching and learning activities described by senior managers



Note: UYFC stands for Union Youth Federations of Cambodia

14.4.2.3.2. Learning approach

In addition to some group work in the classroom, students embark on different learning modes, including online courses, group learning, use of academic libraries, learning-by-teaching, and practical experiments. Many students supplement classroom and laboratory sessions with YouTube videos, Google search, Khan Academy, and social media (i.e. Telegram and Facebook groups). Students use YouTube more than any other web-based platform to learn from lectures and experiments. Two students attributed online learning to advice from foreign teachers in the department. One student used YouTube videos as a replacement for reading set textbooks, especially when printed copies were inaccessible.

Table 14.2: Online learning pract

Quotes	Interviewee
[I study] from the internet, and watch YouTube videos to learn how to do experiments four times a week; this is an easy way to learn.	S6
I learn from the [mobile] application called Khan Academy, which was introduced by Korean teachers.	S8
I surf the internet and focus on [International Mathematics] Olympiad exercises because they offer many tricks [to learn from].	S9
I sometimes watch YouTube, so I don't have to read books.	S4
I know which links and websites to study from thanks to foreign teachers.	S10
I watch YouTube mostly for experiments.	S10
I also learn from social media like Facebook.	S10

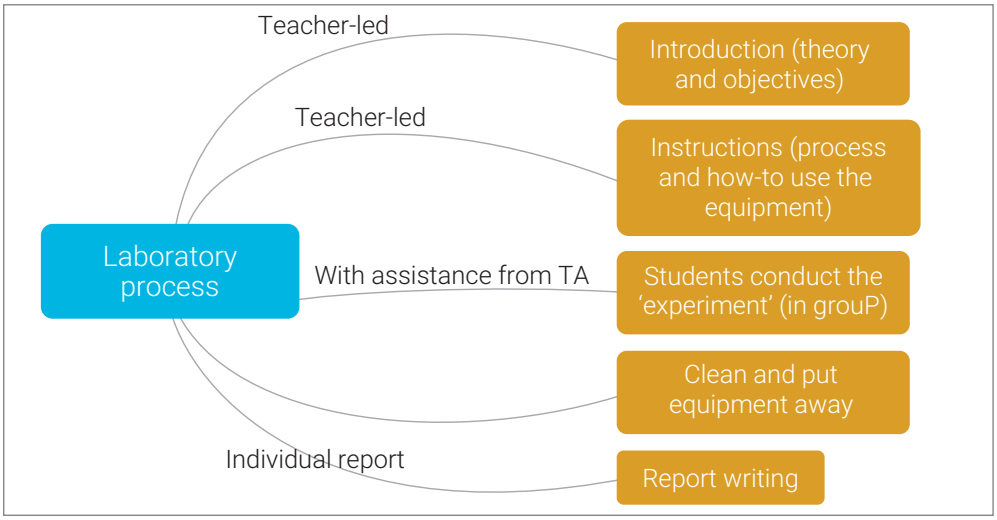
The second most reported form of self-study involves making and reviewing lecture notes and reading appropriate materials before and after class. These extra efforts include working on subject workbooks, doing additional research, and preparing questions for class. Only a few of the students use the university library for study. One student attributed the lack of library use to inadequate library orientation and inadequate advice and guidance on how to learn: "There are no courses on how to format references in an assignment. I only knew about it from a friend" (SS7).

Half of the interviewed students found teaching others, including their juniors, and private tutoring helpful for their own learning and reflection. Among these students, some mentor groups of first- and second-year students on a voluntary basis. Others engage in private tutoring where they teach one or more students at a private school or students' homes.

14.4.2.3.3. Laboratory work process

Based on narrative synthesis, the laboratory process involves the lecturer introducing the theory and objective, instructing students how to do the experiment and use the equipment, performing the actual experiment, and writing report. The report writing is expected to be completed after the laboratory session and submitted one week later.

Figure 14.3: Laboratory process



Source: Authors' illustration

For one lecturer, the practical experiment follows this process:

> I start the practical session by giving instructions about the experiment for one and a half hours. I then ask students if they have any questions. Then, the students practice and I stand by and control the activities. After the experiment, students clean up and put the equipment away. The report is done after the practical session and is to be submitted within a week. The conclusion is drawn from the report. (T1)

Another lecturer does things slightly differently:

> First, the theory is explained to the students before they do the experiment. Students are divided into three groups to discuss and gather the substances and equipment needed for the experiment. Students must submit the report to the teacher towards the end of the semester. (T2)

One lecturer explained that "In the laboratory, students follow the lecturer's guidance. [We expect] no new discovery from the students themselves because of the lack of equipment, the feeling of potential danger, and so on." (T5). The comprehensive instructions for laboratory activities imply that students know what results to expect.

> I think there are many experiments carried out in the lab but what they do in the lab is not a true experiment. It is akin to combining ingredients for following a recipe because the students are forced to follow instructions, and both the students and the teacher know the result before they do the experiment. The reason for doing an experiment is to address questions for which we do not have answers. Knowing the outcome beforehand does not construe an experiment. It does not encourage students to think critically by themselves. What is worse is that students are forced to follow the exact procedures that teachers set; if the students dare to stray from the teacher's directions, they are made out to be wrong (T6).

14.4.3. Factors influencing teaching and learning modes

Several aspects shape teaching and learning approaches. First, whether lecturers were locally trained or internationally trained influences the way they teach. Second is the quality and quantity of high school leavers. Third, national and institutional curriculums and policies play a role in shaping the teaching content and workload of lecturers and the number of students per class. The final aspect concerns the constraints (e.g. rigid organisational culture and inadequate resources) on implementing innovative pedagogical practices in the classroom and the laboratory. We discuss each of these four issues in turn.

14.4.3.1. Lecturers teach the way they were taught

First, the current classroom situation can be attributed to how the lecturers were trained. We assume that lecturers in the Department of Chemistry teach the way they were taught when they were studying for their degree at RUPP and undertaking pedagogical training at the National Institute of Education (NIE). Younger lecturers who have a degree, particularly those who pursued postgraduate studies abroad, tend to be much more aware than older lecturers of the different approaches and potential of creativity and innovation in science teaching and learning.

> ...if they have never been abroad, they will use the ways they were taught when they were students. Although the teachers were trained at NIE [National Institute of Education] before they could start teaching, NIE does not teach

> new techniques. In the chemistry department, there are both old and new teachers. If we look at the CVs of those who studied in the 1980s and 1990s, their learning is still low and they teach students in a bad way. And those students, if they become teachers, will teach their students in that way. If we look at other countries in Asia, we can see that their ways of teaching are like those in Cambodia. I do not want to put the blame on teachers because it [the poor quality of teaching] is related to history. Some teachers nowadays, …. Now we see the consequences of history. (T6)

Few in-service professional development programs were reported. One lecturer mentioned a one-off two-week training program on curriculum design, a collaboration between the Faculty of Education and Charles Darwin University in Australia, in which two faculty members from each faculty participated. Yet, when an inquiry-based learning workshop was organised and sponsored by a development partner, hardly anyone from the Department of Chemistry or RUPP for that matter attended. On that occasion, it seems that none of the faculty members were motivated to engage in personal and professional development. Indeed, one faculty member declared, "We do not need to do this, even though this way is good, because the school has no policy or no reason for us to change" (T6). Similarly, when there was a proposal to establish a Centre for Teaching and Learning, the university could not support the initiative because as a public institution it does not have the authority to create a specialist centre within one of its schools (T6).

14.4.3.2. Quantity and quality of university entrants

The drastic increase in student numbers since the introduction of fee-paying programs and, recently, the promotion of science majors among high school leavers, are major issues facing teaching and learning in the Department of Chemistry, particularly given that the number of teachers remains unchanged. A senior leader acknowledged that, with time constraints and market demands, the Department cannot implement teaching and learning methods that promote active student participation in classes of around 80 students (T4). A senior lecturer echoed this sentiment: "People now make education a business. They tend to care about the quantity of students to generate more profit rather than the quality of education, which depends on being more selective with student enrolment. For instance, there should be ten to15 students, not 30, in one lab session" (T2). In this case, the quality of high school leavers is another constraint. Generally, students have a low-grade foundation, poor academic skills and little or no exposure to inquiry-based learning methods, making it difficult for them to transition to independent or self-directed learning (T1,2 and 3). An interviewee pointed out that "…before the grade 12 exam was reformed, most students passed the exam without knowing anything" (T6). Other similar issues include the single shift study sessions (either morning or afternoon), students' inability to balance work and study, and students' poor English language proficiency.

14.4.3.3. National and institutional curriculums and policies

On average, there are four credits per subject per semester. One credit, the equivalent of one hour a week, is for practical laboratory work; and three credits, the equivalent of two hours a week, are given for theory sessions. The number of first and second-year students per class ranges from 70 to 110, whereas students are divided into groups of four or five for laboratory sessions. While the teaching approach is important, the curriculum plays a role as well (T6). Although courses are taught in Khmer, Khmer language materials do not exist and course instructors have to translate materials from English or other languages such as French. Poor quality translations may be one of the reasons for students' complaints that the language in set textbooks is hard to follow. One senior lecturer reported that "Every three years, there is a discussion in the department to discuss chapters to be added or deleted, but lessons are prepared by the teachers under the themes they discussed" (T2). Ultimately, the department head has the authority to decide on the themes and curriculum.

In addition, when asked why lectures based on PowerPoint presentations are the preferred approach, one lecturer indicated three main factors: the large number of students per class, the number of lessons per course, and the number of public holidays (T5). "Mostly he teaches the students in order to get through the lessons as quickly as possible." (T5). Another lecturer agreed that he has to rush through the materials he is expected to cover in order to finish on time. Curriculum and textbook issues can be traced to general education, including upper secondary school. It is also in lecturers' interest to reuse existing teaching materials and handouts to avoid spending additional time doing research. Teachers are paid hourly, so they normally maximise the number of teaching hours to supplement their monthly civil service income. One said, "if we were to change the technique, we would need to spend more time preparing lessons. The teachers do not have lesson plans, clear learning outcomes, or proper assessments. This is a direct factor affecting learning and teaching. Motivation is worth more than money if the basic needs are fulfilled" (T3).

In addition, the high school chemistry curriculum does not promote critical thinking. For example, in one of the lessons in a grade 10 chemistry textbook, there is a question on the types of medicine; according to the book, there are two types: lawful and unlawful.

> Students can answer differently, however. But if they give a different answer to that in the set text, say from international sources they know of or from their own understanding, they are deemed to be wrong. This forces students to not think by themselves but just follow the books slavishly, unless the book is wrong, then they can find other answers. But all the textbooks in high school are written in that way, a way that forces students to blindly accept what they are taught. We know the school curriculum allows the teacher to finish all the lessons in the book, but teachers and students do not really care about learning all the lessons but care more about the exam curriculum. Teachers teach the students to pass the exam; they don't really care about bookish knowledge but about exam questions, and that is exactly what some teachers in the chemistry department do. (T6)

14.4.3.4. Contexts: cultural issues and inadequate resources

Rote learning and memorisation are common practices throughout general education, with the possible exception of quality private schools (T3). This tradition of teaching and learning "…produces bad consequences since students are forced to learn that way [at university]. The way that they do not think and the way that they are taught for the exam may reflect Cambodian culture" (T6).

> There used to be a teacher/researcher [from abroad] who taught the students differently from other teachers. He taught them his way of learning. He would first ask the students questions and allow them time to think and come up with an answer, and he would keep asking why and why. (T6)

Moreover, the limited capacity and resources for both national and institutional curriculum development are an obstacle to quality teaching and learning. In some cases, curriculum development still involves "shop and steal"; we certainly follow books from other countries through translation and addition of information of local contexts.

> No one in the Department of Curriculum Development has the capability to develop a study program or curriculum. No one has this certificate. No one can write textbooks. MoEYS also acknowledges that we can't write our own books and that we have to use books from other countries such as Singapore. The books have to be translated and information added. (T6)

Higher education institutions' lack of merit-based recruitment and lack of autonomy in hiring and firing staff also contributes to limited human resources (T3 and 6). A senior university leader once said during an informal conversation that "they cannot fire the old guard as they are civil servants." Another added,

> People in the new departments such as social work and engineering have new ways of teaching, but people in the old departments still prefer teaching in the traditional way. In the old departments, many older teachers have not retired yet and cannot be fired because they are civil servants. This is the problem facing human resources management. (T6)

Enabling environments and resources, such as materials and equipment, mode of instruction, and language of instruction, are also key factors. Many students complained about the resources and facilities at various laboratories where instruments and equipment are either obsolete or inadequate for the number of students (S2, 5, 6, 7 and 8). This also applies to the classroom and library, though to a lesser extent (S7). Using English as the language of instruction (i.e. in PowerPoint presentations) is a recurring issue as students find the instructions, handouts, and other materials hard to understand. One student said, "Language is also a challenge for me because most documents are [translated] from English… terminology is hard to understand when it is translated…it loses its original meaning because of poor translation" (T1).

On a brighter note, the current issues and challenges can be an opportunity for change. There are signs that change is on the way. One lecturer was planning to

adopt the flipped classroom mode, where a 15-minute voice-over presentation is assigned to students prior to class. He intended to dedicate class hours for questions, quizzes, and discussion as well as assign projects (for project-based learning) to each student to help them develop research skills and to encourage independent learning (T3).

A senior manager had plans to improve (not change) the curriculum and class size and to offer more facilities to support group and self-study. He added that,

> We are considering the STEM method. An expert in STEM from Sweden came to show this method to our teachers. The difference between that and our [traditional] teaching methods is this. We tell students to do this, to do that. When students achieve the results as we told them, that's it. But the STEM method makes students wonder, then lets them analyse the results themselves. But implementing the STEM method takes time. (T4)

After all, for positive change to happen, the best way forward might be to equip local faculty with competency in curriculum development, exposure to new ideas and knowledge through graduate-level short courses, or international exposure visits. Other prerequisites include incentive schemes, performance assessments and disciplinary reviews, and continuing professional development for faculty and support staff. In addition, some practical exposure to independent and practical work throughout general education, and new student orientation at university would help smooth students' transition from teacher-directed to self-directed learning.

14.5. Discussion

The findings of this exploratory study raise important issues related to learners' motivation, self-concept of learning, orientation or approach to learning, and the importance of context and experience.

14.5.1. Role of motivation

We learned through this study that students are motivated by various factors. The factors they identified as intrinsic motivation include their personal interest in the subject, the opportunity to help their peers and high school students through tutoring, and their intention to become a high school teacher. Those identified as extrinsic motivation include career or business prospects, peer pressure, and parental advice. Compared to the authors' experiences at RUPP two decades ago, students today are much more aware of the job market, business opportunities, and career options other than being a teacher (of chemistry or science). A new study on the factors that influence STEM major choice among first year students in Cambodian universities indicated similarly that exposure to STEM career prospects motivates students to choose STEM-related majors (Eam et al. 2019). In addition, Ditcher (2001) observed

that many students are motivated by having a degree and finding a rewarding job. In this case, students' motivation could be improved if they were able to connect their studies and skills with their lived experiences, future employment needs, or business opportunities.

14.5.2. Learners' self-concept

Communicating learning objectives to students, one of the principles of adult learning, is as important as course content (Knowles, Holton III and Swanson 2005). As with any task in any setting, students like to be aware of the direction of learning and have a sense of purpose before they can engage productively in class activities. However, we found no evidence to suggest that chemistry students were aware of their course objectives. This is consistent with the literature, which points to huge discrepancies between lecturers' intentions for students' learning and actual learning outcomes (Ditcher 2001). Ramsden (2003, 10) argues that "in order to understand how this happens, we must study our educational practices through the eyes of students; only when we understand learning at this level can we improve the effectiveness of our teaching."

Our study suggests that rather than promoting active and independent learning, lecturers spend most of their time lecturing and prefer students to follow them passively, which is contrary to the principles of good learning. Indeed, such practice is almost diametrically opposed to the aim of national curriculum policies, "to produce active learners and adaptive workforce through inquiry-based learning", and the national effort to adopt student-centred approaches (Ngin 2018). This finding supports an earlier review of textbooks by Chet et al. (2014), who found that course contents and pedagogical practice did not provide an enabling environment for active and creative learners, a critical element for higher-order learning.

Educators' practice that centre on teaching, teachers and textbooks can be explained by cultural and religious influences that regard the teacher as a guru or repository of knowledge and Buddhist philosophy that emphasises conformity and passivity (Pellini 2005; Tan 2008; Morris 2000). Such contextual underpinnings are not conducive to the development and acceptance of new or scientific knowledge (Tan 2010, 473–74). The cultural practice of education can be traced back to the early years of education and is best summarised as follows:

> Teachers still strongly believe that they need to control the class and that pupils must listen to them carefully. They are hesitant to relax their authority for the sake of pupils' rights and freedom. It is a long-held propriety in Cambodian society that children should listen, respect and not question elders. To some extent, this cultural practice runs counter to the principle of SCA [student-centred approach], which encourages pupils' active participation in the teaching and learning process. For teachers to adopt SCA, they would have to change their cultural beliefs. (Song 2014, 79)

14.5.3. Learning orientation or approach

Although adult learners should be oriented towards problem and context-based learning (Knowles, Holton III and Swanson 2005), our research indicates the rote approach is still common and much of the learning is theoretical and based on lectures copied from foreign textbooks. Laboratory experiments and research work are not designed to encourage students to think critically by solving real world problems but for them to follow lecturers' step-by-step instructions where both parties are fully aware of the answer. Again, lecturers continue to practise this "surface approach" to learning (Ditcher 2001) even though students demand more than memorisation or knowledge acquisition. Heavy teaching workloads may contribute to lecturers' lack of research time and students' lack of study time to assimilate course materials. The situation has barely changed over the past 15 years.

14.5.4. Learners' experiences and readiness to learn

Experience and readiness to learn are keys in adult education. Compared to 20 years ago, students at RUPP appear to be more actively engaging in both voluntary activities and paid part-time jobs (serving at wedding receptions, coffee shops, restaurants, and bars), in addition to private tutoring relevant to their major. Overall, there are two different patterns. The first is that lecturers and the curriculum are not really linked to students' experiences or developmental stage. The irrelevance of their studies or lectures to their real-life needs means that course syllabi are probably outdated. A major study by Eam et al. (2019) also found associations between student working experience and preferred choice of a science major. The second pattern, however, suggests that students' learning approaches are linked with their perceived employment or job prospects. There tends to be a big gap between the expectations of students and the practices of lecturers in teaching and learning. This finding can also be attributed to the problem of the poor "academic preparedness of students entering higher education" or so-called "pre-higher education failure" (Dy 2014, 32). Moreover, privatisation and commercialisation of higher education put pressure on the already low quality and limited teaching and learning resources in Cambodia. The shift from elitist towards mass higher education means that the quality of students entering university may be compromised and that some of them are unprepared for academic life at university.

14.6. Conclusions and future research directions

Our exploratory study investigated students' and educators' perceptions of teaching and learning and of the themes in that process. Through the lens of adult learning principles (Knowles, Holton III and Swanson 2005), three broad themes have emerged: conceptions of teaching and learning, approaches to teaching and learning, and contents and experiences of learners.

A huge disparity exists between educators' and students' conceptions of a good learning approach. This implies a failure of the function of the university curriculum committee. Social, cultural, and religious contexts help shape these conceptions and practices. With a heavy focus on teachers and textbooks as sources of knowledge, a student-focused approach to learning will not suffice until there is a change in the intention and practice that education is to transmit knowledge or lecture notes. Change is also imperative to move away from the perspective of the teacher/lecturer as a guru and the source of knowledge. Different approaches may be needed depending on the intention of teaching staff: whether they intend to continue merely transmitting information or revise their misconceptions of students (Trigwell, Prosser and Taylor 1994).

Reliance on lecturers as the primary source of knowledge is increasingly threatened by the digital age and artificial intelligence. Integrating technology into the learning process is not easy and can be resource intensive. However, if academic leaders and educators do not seek to redefine their roles and their authority in the learning process, they will risk frustration and embarrassment in front of their students (Cameron 2004, 342) and community members, most of whom probably have a device, such as a smartphone, and internet connection to search, read, research, and verify any topic anytime, anywhere.

Scientific knowledge has advanced at a revolutionary rate, but that knowledge has little influence on the approach to teaching and learning in higher education (Gabel 1999). Various studies (van Hoeve-Brouwer 1996; Ben-Zvi and Hofstein 1996) have documented how curriculum development should be based on chemistry education research (Gabel 1999). However, our research found little evidence to suggest that teaching and learning is supported by or linked in any way to research. If the purpose of Cambodian higher education is "to produce graduates who have acquired technical knowledge, skills and abilities, and are capable of working in both national and international settings" and for graduates "to have complete personality and characteristics and promote the scientific, technical, cultural and social researches in order to achieve capacity, knowledge, skill, morality, inventive and creative ideas and enterprise spirit to the development of the country [*sic*]" (MoEYS 2017, 7), the practice of teaching and learning in higher education must reflect these aspirations.

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Appendix 14.A: Informant profiles

Lecturers

Code	Position	Gender	Highest education qualification
T1	Lecturer	Female	MSc
T2	Lecturer	Male	MSc
T3	Former lecturer	Male	PhD
T4	Senior manager	Male	MBA
T5	Lecturer	Male	BSc
T6	Lecturer	Male	MA

Students

Code	Gender	University cohort
S1	Male	2nd year
S2	Male	3rd year
S3	Male	3rd year
S4	Female	4th year
S5	Female	4th year
S6	Female	2nd year
S7	Female	2nd year
S8	Male	4th year
S9	Male	3rd year
S10	Male	3rd year

Chapter 15

Igniting the Learning Spirit in Cambodian Students at a Different Space? Some Lessons from RadClub

Eam Phyrom

Abstract

To get ready for the age of knowledge, Cambodian students and professionals need to embody the learning spirit. Formal, non-formal, and informal educational spaces need to sync together seamlessly to promote lifelong learning. This study stems out of an interest to understand learning that happens outside of formal school settings, which has so far received scant attention from Cambodian researchers. The study explores learning experiences of a group of future professional radiologists who participated in the so-called RadClub initiative. The researcher interviewed eleven of the RadClub's participants (individually or in group) and examined information about the RadClub's learning process on its Facebook private group page, recorded between 2016 and 2018. This exploration reveals that the RadClub somehow epitomised an informal learning-(how)-to-learn platform that engaged its participants in knowledge sharing, allowed them to lead their own learning, and guided them to understand learning opportunities and directions surrounding their professional major and career. The participants valued what they viewed as different but vital learning experiences and associated their views with the role of the RadClub's advisor/mentor. The interviews with the participants also generate some perspectives on the RadClub's space for learning, which was based outside of the participants' formal educational setting. This case study ventures to suggest that the role of a learning advisor/mentor and the informal learning space can be significant in the promotion of learning, especially in terms of learning motivation, among Cambodian students or professionals.

Keywords: Independent learning, self-directed learning, lifelong learning, learning space, learning how to learn

15.1. Introduction

15.1.1. Context of the study

The main purpose of this study was to explore experiences of a group of future professional radiologists with regards to the so-called RadClub initiative in which they participated. The RadClub – the shortened name for Radiology Club – was initiated and operated as an informal platform to support and advise a number of qualified radiology trainees mostly in their advanced training years at a leading Cambodian medical university. Its original aim was broadly to share knowledge between the RadClub's advisor/mentor and its participants around the issues of learning and practices of the radiology profession.

At the outset, the researcher was interested in (a) how those participants thought and felt about their experiences with the RadClub, especially on how the initiative has or has not changed the way they learn as a student and/or as a professional and (b) learning outside of the formal educational space. As the study began, there were no explicit theories or prior assumptions guiding it besides a number of broad exploratory questions: (a) how does the RadClub's learning initiative work? and (b) how do the RadClub participants experience this learning initiative? The researcher's background at the time of conducting this study was far from being relevant to the areas of cognitive psychology, learning theories, or learning science. In fact, the decision to conduct this study emerged out of a number of conversations between the researcher and the advisor/mentor of the RadClub. Both the RadClub's advisor/mentor and the researcher were serving at the same organisation during the conduct of the study, and both were interested in how to innovatively support and improve the learning attitudes of Cambodian students and professionals.

Conducting this study is arguably necessary. To thrive in the academic world, knowing what to learn and knowing how to learn are equally important and are essential for making a student successful (Savin-Baden 2008). To thrive in the professional life in the 21st century, learning attitudes, competences, and habits are also increasingly required. As the RadClub's participants were in a transition stage from being radiology trainees at university to becoming professional radiologists at workplace, their experiences of and reflections on their own learning may provide some good lessons to understand learning of Cambodian students. The knowledge and practices of learning outside of the formal school setting have remained far from being saturated (even in the context of countries with advanced economies and highly performing education systems), which makes the study of the RadClub that happened in Cambodia a rather unique case to explore. It should be noted that the RadClub falls into the definition of informal learning, as set by the United Nations Educational, Scientific and Cultural Organisation (UNESCO):

> Forms of learning that are intentional or deliberate but are not institutionalised. It is consequently less organised and structured than either formal or non-formal education. Informal learning may include learning activities that occur in the family, workplace, local community and daily life, on a self-directed, family-directed or socially-directed basis. (UNESCO 2012, 80)

In 2019, Cambodia issued its Lifelong Learning policy, further suggesting the need to promote the roles of informal and non-formal learning to complement the formal education. Understanding how Cambodian students and professionals learn outside the formal educational setting becomes necessary. It should be noted, however, that the selection of the RadClub initiative as a case study was purposive and on a convenient basis, and so this study was by no means aimed at generalising its findings to other learning contexts.

To situate the current study into a proper research background, we need to understand a number of global and national movements and changes in educational research, educational policy making, and educational practices – especially, the movements intentionally occasioned by supranational organisations and tech giants – as the world and Cambodia are navigating the digital and knowledge-based 21st century, characterised by ambiguities, uncertainties, tensions, and rapid changes.

15.1.2. Discourses and directions of learning in the 21st century

15.1.2.1. The shift from teacher to learner and teaching to learning

Advocated since the second half of the 20th century, the learner-centred philosophy and approach to education have become a paradigm shift. This educational paradigm has convinced us that teachers are no longer the only source for knowledge, that the teacher-centred approach to education is not as relevant anymore, and that schools and higher education institutions (HEIs) are no longer the sole place for learning. This paradigm is associated with, and heightened by, a number of major global education agenda – such as the UNESCO's Education for All (EFA) declaration and framework for action (in Jomtien in 1990 and in Dakar in 2000); the Lifelong Learning agenda occasioned by the 1996 Delors Jacques' report on "Learning: The Treasure Within" to UNESCO; and currently the UNESCO's 2005 World Report: "Towards Knowledge Societies", among others. Some of the early leading minds of educational psychology (e.g. Jean Piaget with his educational constructivism and John Dewey for his educational pragmatism and active learning) are key contributors to this progressive paradigm shift.

These developments, however, do not imply the descent of the enterprise of teaching, nor do they lessen the significance of schools and HEIs. They rather suggest the need for teachers to transform their behaviours and habits of mind and perhaps for schools and HEIs to transform their idea of learning place and space (as discoursed by Savin-Baden 2008). The roles of learning facilitator, supporter, helper, advisor, coach, counsellor, and/or mentor (see Mynard 2011) have become more connected to the

roles of teacher and more relevant at both the traditional educational institutions and the learning places or spaces outside of them.

15.1.2.2. Lifelong learning, learning places, and learning spaces

Lifelong learning becomes an educational "ideal" and "real" at the same time for the global citizens and the work organisations of the global era, as punned by Edward D. Hess "Learn or Die" in the title of one of his books. Completing a university degree does not imply that one may stop learning. Students and professionals alike not only need to achieve and prove adequate expertise in order to get employed but also to progressively improve their expertise over time through continuous learning (at the workplace and throughout life). Professionals need to continuously learn in order to remain adaptable and stay as an expert or a master of the field. The definitions of professional expertise and mastery are no longer fixed as professionals start to lose the exclusive authority of their knowledge due to the rapid sharing of, and access to, knowledge of those outside of the profession (Scanlon 2011, 29). This makes continuous professional learning and lifelong learning become two closely intertwined concepts, especially when being discoursed in the context of work or profession.

The formal educational places and modalities (both of the general track and the vocational track) have been viewed as limited in coping with the complex diversity of students and educational seekers as well as their learning conditions. The learners-centric and lifelong learning discourses have now been directed in a way that brings learning beyond the temporal boundary of formal schooling years as well as the physical boundary of school or university building and into new kinds of learning places and with new learning modalities. Many countries have introduced non-formal and informal education policies, strategies, and programs. As demands for new kinds of competencies to learn, work, and live in the 21st century rise, putting in place a functional non-formal and informal education system is a useful measure.

In the meantime, a new space emerges. Students now spend a large amount of their time in the digital space with mobile and computing technologies, especially on the online social networking platforms. In the field of education, advanced technologies (such as virtual classrooms and artificial intelligence supported systems) are increasingly used (from training delivery to learning assessment). The rapid advancement of digital technology and virtual reality allows access to more high-quality open online knowledge resources and training courses – in the form of MOOC, COOC, or SPOC[1]. These technology-driven online platforms have grown with intensity as a new space for learning (e.g. Song and Hill 2007; Savin-Baiden 2008; Olivier 2020). Such a space for learning and learning interaction, along with new developments of learning theories and science (resulting in new learning strategies and tools), will continue to impact

1 MOOC = Massive Open Online Course; COOC = Corporate Open Online Course; SPOC = Small Private Open Course

education globally and further enhance the shift from teaching to independent learning, as well as the magnitude of learnability outside of the formal educational setting. In this sense, where and when learning takes place will be an important matter for education in the digital and global knowledge economies and societies.

These trends further result in attempts by researchers to institute new ideas such as learning space or eduscape, among others, which seemingly bind the traditional ideas of place and time. Learning spaces are not necessarily physical places; they can be interactive digital platforms or virtual event platforms (Savin-Baiden 2008, 152–154). Central to the concept of learning spaces, according to Savin-Baiden (2008, 7), is the notion that there are "diverse forms of spaces within the life and life world of the academic where opportunities to reflect and critique their own learning position occur". These developments may not be taken as a descent of the physical places of education, but perhaps a new lead into an educational landscape or space (both place and time) less bounded by the physical geography or the constructed idea of nation. And such spaces may provide new opportunities for students to engage meaningfully with learning because we have to acknowledge that students spend most of their time not at school but at home, in communities, or at public places.

15.1.2.3. Self-directed learning and learning (how) to learn

The learner-centred paradigm also gives way to self-directed learning (Olivier 2020, 10). Self-directed learning, according to Knowles (1975, 18), is:

> "… a process in which individuals take the initiative, with or without the help of others, in diagnosing their learning needs, formulating learning goals, identifying human and material resources for learning, choosing and implementing appropriate learning strategies, and evaluating learning outcomes."

Self-directed learning, basically rooted in educational constructivism and pragmatism, suggests that to learn effectively adult students need a certain level of proactivity and leadership on their own in designing and controlling their learning experiences and outcomes. In that sense, the need for such self-direction and self-regulation applies well into the learning context of post-secondary education and training (PSET) in general and higher education (HE) in particular. The application of the self-directed learning concept is even more realistic at the advanced level of PSET leading to a master's or doctoral degree, whereby students need to join professors in the kind of educational pursuit centric on "a unity of research, teaching, and study" and "a seamless web of commitment to the advancement of knowledge" (Clark 1995, 1).

To be self-directed and independent in learning, students need to learn (how) to learn. There has been a rise in such advocacies to promote "learning how to learn" or "learning to learn" (i.e. how to learn, why to learn, what to learn, where to learn, and/or when to learn), especially in the research areas related to adult education (see, for example, Smith and Haverkamp 1977; Crick 2007). In research about the relationship

between adult education and lifelong learning, learning to learn is considered the core intersecting focus (Smith and Haverkamp 1977; Sheridan 2007). Smith and Haverkamp (1977, 3) asserted, "… helping students learn how to learn has been called the true purpose of education." Leri (1993) cited Moshi Feldenkrais (1975) as claiming:

> I am going to be your last teacher. Not because I'll be the greatest teacher you may ever encounter, but because from me you will learn how to learn. When you learn how to learn, you will realise that there are no teachers, that there are only people learning and people learning how to facilitate learning.

These articulations of educational thinkers on learning (how) to learn clearly transform the learning philosophies, approaches, modalities, and/or spaces. Learning now is viewed as a skill, a competence, or an area that can and should be developed for every citizen of the digital and knowledge economies and societies of the 21st century. In this epoch of "knowledge" and "learning", the cost of not knowing how (and what, where, why, and when) to learn is not negligible.

15.1.3. Learning in Cambodia in brief

Certain learning-related education policies and interventions have been promoted to directly or indirectly improve the Cambodian students' engagement in learning and the country's learning culture. One of them is the child-centred reform. Cambodian policy makers and educators have tried to change instructional approaches at schools from "teacher-centred" to "child-centred" since the start of the 21st century. The aim is to improve the role of teacher as a facilitator and to engage students more actively and progressively in learning. Another policy is the current Lifelong Learning policy (see RGC 2019). This policy is centric on concerns around the high rate of drop-outs at lower-level education, the issue of education quality, and the low productivity of Cambodian workforce in general (RGC 2019, 2). The Cambodian Lifelong Learning policy is treated as an upgrade from the non-formal education policy, with the purpose to ensure "learner literacy and numeracy skills, technical skills, professional skills, and 21st-century skills (RGC 2019, 2-3). The Basic Education Equivalency Program (BEEP), with its application-based online learning platform, is a clear example of instruments that Cambodian Ministry of Education, Youth and Sport (MoEYS) and Ministry of Labour and Vocational Training (MLVT) jointly create to fill the formal schooling and learning gaps and to expose the beneficiaries of the program to lifelong learning. More recently, MoEYS (2021) issued the Cambodia Secondary Education Blueprint, in which a strong vision, centred on the spirit of knowledge society, is declared:

> The Ministry of Education, Youth and Sports vision is to establish and develop human resources that are of the very highest quality and are ethically sound in order to develop a knowledge-based society within Cambodia. (p. 1)

Obviously, these policies, blueprints, and programs show a positive progress of Cambodian education reform. However, to ignite further discussions (theoretical, policy-oriented, and practical) on learning in Cambodia, both in the formal system and outside of it, a number of trends and cautions should be raised as intellectual inquiries.

According to the UNESCO data (in 2014 and 2015), Cambodian population (25 plus years of age) spends an average of only 3.64 years of schooling, which is one of the lowest in the ASEAN region, compared to 11.56 of Brunei, 11.44 of Singapore, 10.03 of Malaysia, 8.84 of the Philippines, 8.05 of Thailand, and 7.87 years of Indonesia. This aggregate trend of school years may be partly caused by the prolonged wars in the country in its recent past. Still, this very low extent of schooling years needs to be brought to attention as we start discoursing how to "develop a knowledge-based society within Cambodia". Two questions can be brought about from this statistic alone. First, because the exposure of formal schooling is limited in general, we shall imagine what kind of mental model the general Cambodian population has as they look at education, knowledge, and learning. Second, the question of how to design learning outside of the formal school system (especially, for adult learners) that helps Cambodia mend the consequences of having so many of her population unexposed to formal schooling should be pursued.

Now, let's turn specifically to learning within a formal school context. With regards to the child-centred reform in Cambodia, Song (2015) used the term "mismatch" to point to the gap between policies and practices and questioned the real impacts of the child-centred reform on Cambodian students at primary schools. He voiced:

> Cambodian primary school teachers do not translate their strong support for child-centred pedagogy into classroom practices. This failure to act on their beliefs stems from two reasons: on the one hand, teachers take up the reform only at face values without critically examining its meanings and, on the other hand, their teaching is heavily constrained by unfavourable classroom environments such as crowdedness, pupils' uneven ability, and scarcity of resources. (p. 43)

Whether the learner-centred practices at Cambodian schools improve their educational performance, promote their learning interest, and develop a competence to learn independently and strategically have remained a big question for Cambodian educational researchers.

Another interesting case study was conducted to examine how Cambodian university students perceive independent learning and the factors associated with it. Sam, Ros, Keo and Sophal (2012) surveyed 360 foundation-year Cambodian students at the Institute of Foreign Languages (IFL) and interviewed a number of them and found that they had some ideas about independent learning but were "independent learners only to a certain extent" (p. 50). The vast majority (94.0 percent) of the students preferred their lecturers to motivate them towards self-study (Sam et al. 2012, 44, 48). What this finding implies is that the role of lecturer in helping Cambodian students at the post-secondary level learn is important, especially in the affective-motivational aspect of learning, and whether Cambodian students at the post-secondary level in general can learn independently remains to be investigated. We may then ask whether Cambodian students and citizens in general are self-directed, self-regulated, or self-motivated learners at all (and to what extent) and whether they remain as a learner after they leave their HEIs or during their

working years (i.e. as a lifelong learner). How much they think of or experience how, why, what, when, and where to learn (efficiently and effectively) is also an important question to pursue. While research studies have focused on learning that takes place in institutionalised contexts (i.e. formal schooling and non-formal educational setting), we have seen a very limited number of research studies that observe and evaluate informal educational happenings and spaces in Cambodia so far. We still have had a meagre amount of data and information on whether Cambodian students and professionals independently learn enough outside of their school or university times and how they exactly view or approach their learning in such informal setting.

This brief literature discussion on schooling and learning in Cambodia is far from being exhaustive. This quick discussion, however, may be enough to remind us that Cambodian students in the 21st century need to become self-directed learners and to get deeply into their learning, more deeply than just going to schools or HEIs to get degree(s) and leaving schools or HEIs not being sure whether their degree(s) mean(s) anything for their workplace or is/are useful for their social life. The general trend of studying in the formal educational setting from kindergarten to bachelor degree graduation is no longer enough in the face of rapidly changing work environment and globalised societies. This study stems out of an interest in understanding learning that happens outside of the temporal boundary of formal schooling and the physical boundary of educational buildings in Cambodia.

15.2. Research purpose and methodology

To restate, the main purpose of this study is to explore experiences of a group of future professional radiologists with regards to the so-called RadClub initiative in which they participated. The current study is more humanistic than scientific (i.e. positivist or empiricist) in approach. It is exploratory in purpose and inductive in reasoning, rather than confirmatory and logico-deductive. It is a qualitative case study, not a quantitative generalisable study. The researcher drew on a rather phenomenological approach to interview the RadClub's participants and understand their experiences. The researcher asked them to describe what happened during the RadClub's learning sessions and allowed them to reflect, or co-reflect (with the researcher himself), on how they feel about those experiences. The respondents were allowed to express themselves as the researcher was actively listening to their reflections and continuously in dialogue with them. The researcher's core interest was the embodied experiences of the RadClub's participants. To obtain a practical and realistic understanding of the RadClub in its entirety, the researcher also asked the participants some contextual and behavioural questions (see Appendix 1). To supplement the qualitative data from the in-depth interviews, the researcher further obtained factual information about the RadClub's activities from its Facebook private group page, recorded between 2016 and 2018.

The interviews were scheduled to take place between November and December 2017. However, they were not completed until January 2018. The participants were contacted

through emails, phone calls, or Facebook Messenger. For their convenience, all the participants were able to choose the date, time, and location of the interview. Most of the interviews were conducted at a café in Phnom Penh, Cambodia, and others were done via Skype or Facebook Messenger.

There were eleven participants in total (see Appendix 2), four of whom were male and seven were female. At the time of the study, the participants were between 25 and 33 years old. It should be noted that the RadClub's participants were quite a homogenous group in terms of their educational background. All of them were trainees (residents) of the medical profession, specialising in radiology, at a public university in Cambodia and were (at the time of the interview) required to serve at a hospital. The most senior of them had graduated by the time of the interview. Most of them were also working part-time at private clinics, and three were studying abroad (two in France and one in Thailand).

After all the interviews had been conducted, the voice recordings and field notes were fully transcribed. The researcher started by sensitising the data and thoroughly reading the transcripts and the information from the Facebook source to build a 'big picture' of RadClub and the respondents' experiences of it. The researcher went into more details on the essential meanings that can be inferred from the transcripts while exploring the themes and sub-themes. In the analysis of the interview transcripts, a lot of instances of "bracketing" were made, meaning that the researcher allowed his judgement to come into the analyses, acknowledging this as a natural process of reflective thinking which could not be avoided. The researcher then used the themes that emerged from the data to reflect on the RadClub's participants' experiences on learning and connect those experiences to the existing theoretical and empirical literature. This data-driven, inductive approach was employed iteratively in Nvivo 12 platform, where all datasets (transcripts, Facebook records, shared documents, relevant websites, and relevant research articles) were stored. To present these data and analyses, the perceptual and factual pieces of evidence of the participants' experiences were demonstrated in two forms throughout this chapter: direct quotes from the participants and excerpts from the interview conversations between the researcher and the participants. The back-and-forth process of data exploration, reflection on the data, article writing, and revision of the writing (multiple times) has lasted for a span of three years (between 2019 and 2021).

15.3. Findings and discussions

15.3.1. How the RadClub works

The purpose of RadClub was primarily to promote learning of a group of future professional radiologists through knowledge sharing, exchange, and dialogue. RadClub was an informal learning platform that took place outside of the formal school setting. It was organised and operated via two modalities: (a) a learning session where the learning activities took place and (b) an online platform (i.e. Facebook private group page) where further information sharing and networking activities among the participants took place.

15.3.1.1. The triangular interaction in the RadClub's learning session

The RadClub's main learning session generally took place at a café. The choice of the café was not fixed to any particular one, however. These sessions were organised once a month (i.e. on Sunday of each month) and generally lasted between two and three hours. Generally, the number of participants varied from one session to another. Table 15.1 presents a detailed list of the 14 RadClub sessions held between January 2016 and September 2017 and the focused theme, date, venue, and number of participants.

Table 15.1: List of all sessions of the RadClub, January 2016–September 2017

Sessions	Focused theme	Date and time	Number of participants (based on photos)	Venue
RadClub 1	First gathering (no set theme)	31 Jan 2016	11	Not recorded
RadClub 2	What does it mean to be a good medical doctor and a good radiologist?	28 Feb 2016	11	T&C Coffee
RadClub 3	How to get a fellowship in USA	3 Apr 2016 (10.00–12.00)	Not recorded	T&C Coffee
RadClub 4	How to write a good radiology report	24 Apr 2016 (10.00–12.00)	Not recorded	Park Café
RadClub 5	Radiologic pathology correlation	5 Jun 2016 (10.00–12.00)	6	CDRI
RadClub 6	The language of fractures	14 Aug 2016	Not recorded	Y5 Coffee
RadClub 7	Chest imaging	18 Sep 2016 (10.00–12.00)	14	Y5 Coffee
RadClub 8	RadJS2's presentation and presentation on medical writing	23 Oct 2016 (10.00–12.00)	Not recorded	Y5 Coffee
RadClub 9	Presentation on pleural effusion and history of medical radiology	18 Dec 2016 (10.00–12.00)	Not recorded	Y5 Coffee
RadClub 10	Aids to radiological differential diagnosis and two other presentations	15 Jan 2017 (10.00–12.00)	Not recorded	Brewhouse Coffee
RadClub 11	Radiologist-surgeon relationship and one presentation	25 Feb 2017 (10.00–12.00)	Not recorded	Brewhouse Coffee
RadClub 12	Radiology apps and presentation	23 Apr 2017 (10.00–12.00)	Not recorded	Brewhouse Coffee
RadClub 13	RadClub's first anniversary celebration	10 Aug 2017 (10.00–12.00)	Not recorded	Not recorded
RadClub 14	Artificial intelligence vs human radiologists	2 Sep 2017 (10.00–12.00)	Not recorded	Pheapbol's Brewhouse

Source: Author's summary of information posted on the RadClub's Facebook private group page

The learning process during the main RadClub sessions can be viewed as a triangular interaction among three actors: the advisor/mentor, the senior participants, and the junior participants. According to the interviews with the participants, each of these three groups seemingly had its own role during the learning sessions, despite not officially stated due to the fact that the RadClub's learning sessions were very informal (See Figure 15.1). The advisor/mentor played a number of key roles, including guiding/directing the learners, exploring how students learn, providing counselling and motivation, and engaging as a discussant, commentator, or feedback giver. Both the senior and junior participants took roles as the organiser and coordinator of the whole program, engaged as a learner, and joined the discussion and commentary during each session. The seniors, however, sometimes shared more academic experiences and comments during the discussion and they took lead in organising the meeting and promoting the RadClub. The senior participants were seen as playing very important roles in getting the RadClub moving. The junior participants could take the opportunity to discuss with the advisor/mentor, and other senior participants, about their learning issues and challenges.

Presentations delivered by the junior or senior participants, questions raised by the advisor/mentor, and discussions and dialogues (and sometimes debates) were the most common activities in each of the RadClub learning sessions. Strategic guidance or advice on learning or how to improve learning in the academic as well as professional contexts were given based on the experiences of the advisor/mentor. These monthly sessions therefore allowed the participants to learn from the advisor/mentor and their peers through interaction, dialogues, guidance, feedback, and reflection on one's performance. A participant answered when asked what RadClub was like for her:

> RadClub is like peer learning to me... but there is someone who guides us... it is not passive learning; it is active learning... we have the chance to discuss... give inputs and take outputs... exchange ideas with him [the advisor/mentor]... For me, it is peer learning but guided by someone. [RadJ4]

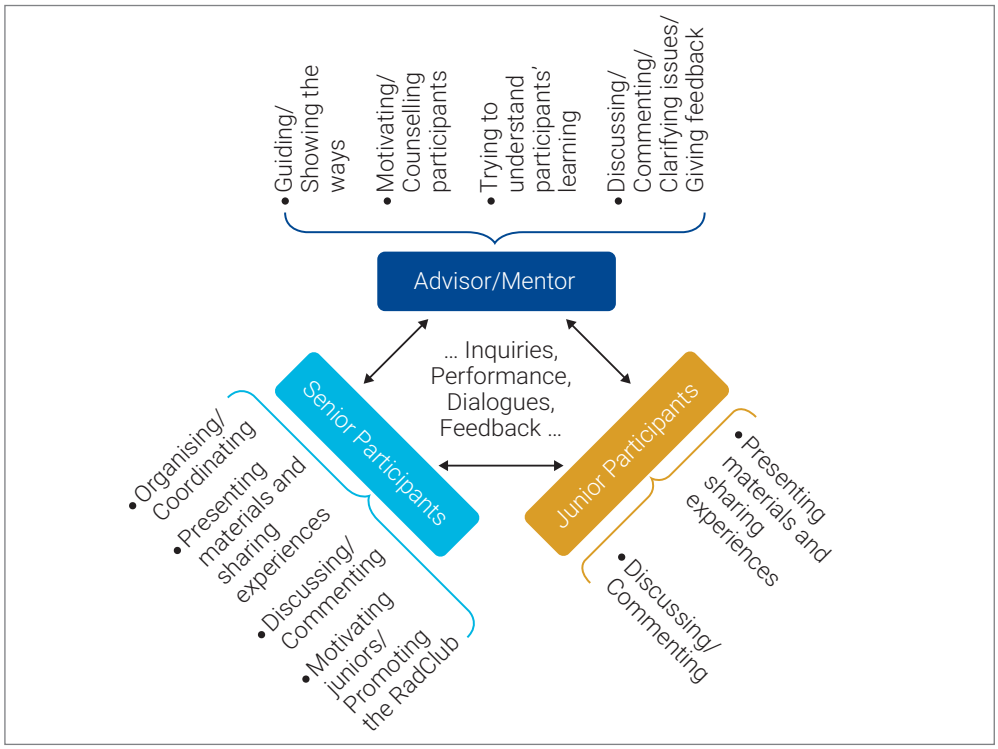
The following excerpt from a conversation between the interviewer and two RadClub participants further illustrates how the learning allowed students to express themselves:

> Interviewer: Lok kru [advisor/mentor] talks a lot during the learning session?
>
> RadJS1: Lok kru waits for students to respond and then listens to them... and each has to start to express their opinions first...

This structure of learning session is comparable to the idea of a research seminar, whereby the research supervisor, senior doctoral students, and junior master's students join the discussion of their research topics. The idea of research seminar is rooted in the German Humboldtian tradition and has been implemented in most research-oriented doctoral programs around the world. Unlike a practical laboratory session or a small-group tutoring or coaching session, whereby students generally engage in professional and highly structured practices with framed guidance and instruction,

the research seminar aims more at improving the discussion and dialogues of the students and so their metacognitive skills, allowing them to reflect on and understand their own thinking and learning and to co-construct knowledge and ideas around a particular research theme. However, the RadClub's sessions' themes were not always about empirical research findings. Most of the themes were generic topics, and the focus was more on learning and related skills. The RadClub's learning sessions are also similar to the so-called FAM model (i.e. Freshmen-Apprentices-Master model) through which the freshmen learn their professional craft under the guidance and support from the apprentices and the advice and feedback from the master (see Pol 2012). The difference between the RadClub and the FAM, however, is that the RadClub is not operated as a formal program.

Figure 15.1: Structure of the RadClub's learning sessions and roles of key actors



Source: Author's construction through information from the participants and the Facebook private group page

Some participants reported that they generally engaged in independent research and reading on a specific theme (or themes) prior to the meeting. The selection of the theme for each meeting was based on a collective agreement among the participants and based on what they wanted to learn. Sometimes an actual medical report was used as a case for the discussion. Sometimes, a practical case of professional challenge during actual clinical works was presented for discussion. In this sense, the participants chose what they learned, and they took lead in coordinating and facilitating

their learning. These specific technical themes in the RadClub learning sessions (see Table 15.1) were not discussed with an aim for the participants to master the contents of the subject matter but more for them to learn how to learn and to metacognitively reflect on their learning and professional practices.

Thus, the core characteristics of the RadClub's learning sessions could be summarised as follows:

- informal and less-structured in design;
- oriented towards improving learning and other learning-related skills (such as self-direction in learning, research skills, or communication skills), rather than towards the breadth and depth of the disciplinary, technical, or professional knowledge;
- participants being independent in leading, organising, and coordinating the learning process as well as in choosing what they want to learn;
- highly demanding in terms of prior reading and presentation preparation;
- using dialogic, interactive, and, to some extent, collaborative and co-constructive learning approaches;
- using authentic problems in real educational or working context of radiologists;
- providing sincere learner-focused counselling and motivation; and
- using different methods (e.g. maieutic methods) to reveal the learners' hidden learning or performance issues and so deriving personalised solutions to individuals' learning challenges.

15.3.1.2. The RadClub's online platform as a digital learning space?

The second platform for the RadClub initiative is digital. The senior participants – who were assigned the coordinating role by the advisor/mentor – created the Facebook private group page as a medium for communicating and networking among the participants. Specifically, the main activities on the Facebook private group page include sharing information (as an extension from what were discussed during the learning sessions), promoting academic or professional events and opportunities, setting the RadClub's learning sessions' schedule, planning learning activities, sharing motivational and constructive comments, sharing reflections on the learning sessions, and promoting the RadClub's activities to other students who had not participated.

Activities recorded on this online platform confirm that the senior participants played important roles in organising, (event) planning, leading, connecting, sustaining and motivating junior students to join RadClub. The digital platform added values to the face-to-face learning sessions at the café in that it allowed the participants to take the lead and independently organise their own learning. The digital platform was itself a learning space, as discussed in Savin-Baden (2008, 152-154), defining it as those

spaces in which communication and interaction are assisted, created, or enhanced by digital media. For the RadClub, its digital space was where the participants engaged in further debates and exchanges of ideas on vaious topics, which moved their learning experiences beyond the physical space (i.e. at the café). However, how rich and meaningful the discussions and dialogues among the participants on the digital platform of the RadClub was remains to be questioned and explored.

15.3.2. The necessary roles of learning advisory/mentorship of the RadClub

A key lesson from RadClub is the need for learning advisory/mentorship to develop learning-(how)-to-learn competences, self-directed learning attitudes, and lifelong learning habits in students and professionals. Since the beginning of the discourse on self-directed learning, Knowles (1975) acknowledged the need for what she termed "facilitator" to support adult learners in learning, and Hinsdale (2015) similarly noticed that the roles of mentors become more important and relevant for school pupils as well as adult learners to master learning.

We shall start by defining what a mentor and/or an advisor are/is. Different authors may use different terms (e.g. learning facilitator, supporter, helper, advisor, coach, counsellor, or mentor (see, for example, Mynard 2011) to mean the same thing, or use them together to indicate their similarity. Some see them as different concepts. In the RadClub, we can consider the process of guiding or teaching as both an advisory and mentorship practice and the roles of its initiator as both an advisor and a mentor. According to Carson and Mynard (cited in Mynard 2011, 1), the concept learning advisory in language learning was defined as:

> the process of assisting students in directing their own paths in order to become better, more autonomous language learners.

Straus and Sackett (2014, 2, citing Standing Committee on Postgraduate Medical and Dental Education) defined mentorship as:

> A process whereby an experienced, highly regarded, empathetic person (the mentor) guides another usually younger or more junior individuals (the mentee) in the development and re-examination of their own ideas, learning, and personal and professional development.

To do this, the mentors and/or advisors are expected to help students improve their cognitive, metacognitive, affective, and organisational aspects of their learning (Pol 2012, 224-225). Similarly, in terms of learning in the professional context, Engel-Hills and Chhem (2012, 8) viewed the mental mode as important and asserted that it is only through the conscious, critical, and reflective mental paradigm can the exceptional professionals achieve expert performance. To make students achieve such excellent learning outcomes, especially in the professional context, a number of characteristics have been identified as key qualities of an effective mentor for the learning-(how)-to-learn program. According to Straus and Sackett (2014, 13, citing Sambunjak, Straus

and Marusic 2006), the mentor needs to have: 1) ***professional attribute*** (altruistic/generous, enthusiastic, understanding/compassionate, non-judgemental, patient, honest, responsive, trustworthy, reliable, and being excellent at active learning, motivating, and self-appraising); 2) ***behaviours towards mentees*** (being accessible, working hard to develop an important relationship with the mentee, consistently offering help in the mentee's best interests, identifying the mentee's potential strengths, assisting mentees in defining and reaching their goals, holding a high standard for the mentee's achievements, and being compatible with the mentee's practice style, vision, and personality; and 3) ***professional stature*** (already successful and well-respected in their field and well connected to sources for additional help).

15.3.2.1. The RadClub's advisor/mentor and the motivation for learning

The advisor/mentor of the RadClub is viewed as a highly capable guide in terms of motivating the participants to learn, improving their positive behaviours of learning (especially, by providing strategic guidance for them to take actions that lead to behavioural changes), promoting their social skills (by creating dialoguing and networking opportunities), and arousing their cognitive and metacognitive abilities (by sharpening critical thinking and clarifying knowledge). According to the participants, the affective-motivational aspect of learning was highly activated in the RadClub's learning sessions, and that lead to behavioural changes in the participants. The participants referred to the advisor/mentor as a guide who showed them the ways and as a caring and patient individual, and his intention to understand the participants and help them grow was seen as genuine. One participant articulated:

> The thing is about motivation... every time we finished a two- or three-hour session, when I got home, I would think to myself – if I study hard, I will get this result... for me... it is the motivation... after I learned... I came back home... I studied hard... I set a timetable and set goals to finish this book or that book... [RadJ3]

One junior participant stated:

> For him, everything is possible. I wanted to say that… I get inspired by his courage… he guided us to be bold… the session is organised so that we all have a chance to present [a topic] … we can pick any topic… so we started to learn how to give a presentation… another thing… the reason I still attend the RadClub is that… I feel that he always gives the weak a chance… I know I am not brave… I do not talk much… he always invites me to talk… and I talk… he is outstanding, but he does not look down on the weak… I feel he likes students who study hard even though they are not smart… I know I'm not a smart worker… but hard work is possible for me… for example… teleconference that I organised… I got selected to do that because I work hard, not because I work smart. [RadJ1]

Most participants even remarked on the (somehow) parental nature of the participants-mentor interaction and relationship. The senior participants who had the chance to

work closely with the mentor experienced such a sense of closeness as one of them put it:

> We sat around a table like a family (brothers, sisters, grandpa, grandma)... and we talked ... and *lok kru* [the advisor/mentor] asked us what is it like at school now... and we shared... and we seemed unafraid of looking weak... because in reality we are weak... so we just admitted that to him... just as we go to our parents to report the problems we have at school… we come to RadClub to tell *lok kru* ... so he told us that we should do this and that... in a sense that we can go from one place to another place on our own... That means he does not give us fish, but teaches us how to fish... That is not the same as learning at school. [RadJS2]

For the RadClub, imperfection was acceptable as long as the participants were committed to learning and change. The participants were motivated to change and to continue to change. For example, one interviewee decided to start improving her English skills again after she had long given up on that goal. She applied for a seat in an English training program. She described what motivated her:

> Mostly, he pushed me to choose to do new things… for example, he changed my way of thinking, by pushing me to learn English… I had never thought of learning English again… I thought my only way would be… when I passed my specialisation exam… I have to study French hard… to go to France… there is a degree in French proficiency called Dep B2 [sic]… when I have that degree and have passed the specialisation exam… I can go to France… that is my only way… when I met him, he told me that this is not the only way… there are many ways… he told me those other ways and to avoid thinking just one way straight… because… as you may know… going to France is not easy… it is competitive… so he encouraged us to focus on the English system… which is more open… Because of RadClub, I started to study English… until I took the IELTS test… My previous way of thinking was too narrow… just one way. [RadJ1]

Similarly, another participant, who has long defined herself more as a follower, started to improve her leadership and social skills. She said:

> First, I'm a follower... just follow the school things... after RadClub... I depend on myself to research, not based on the school alone... Second, I was not a bold person before... I dared not share much... and I'm very gentle... even if people were wrong, I dared not correct them... When we learned with *lok kru* ... he's a bit strict... not strict as a compulsive person... but as a clear-minded person... when we know something it has to be clear so we can share [knowledge] with others without fear... actually... in the third year... there is a presentation on the theme of cancer... and I decided to present that topic because I get the motivation from him... and so I dare... I now can see the world in a broader perspective... [RadJS2]

In this sense, the RadClub's mentorship/advisory tended to touch the affective domain of learning more than the other dimensions – such as the cognitive, metacognitive, and organisational aspects of learning.

15.3.2.2. The RadClub's advisor/mentor aside from motivation

As earlier mentioned, the RadClub's learning activities were designed with less formality and structure, and the senior participants were assigned to independently and proactively take lead in the organisation and coordination of the learning sessions and the online platform. By doing this, the participants, to a certain extent, took ownership and self-direction in their own learning. The learning during the RadClub sessions was special in the context of Cambodia in that it promoted constructivism (particularly, co-constructivism among the advisor/mentor and the participants), and the participants generally expressed this, using such terms as "sharing" and "learning from each other". One senior participant showed his impression:

> I feel happy… when we share what we know with those who don't know… we can share a lot… before, although we knew things… we did not know with whom to share… so through this we can help others without doing much… easy… so I feel happy. [RadS1]

A junior participant asserted, appreciating the chance to learn together with their seniors:

> Because there are seniors... I think they can guide us... I like that... we can ask seniors when we do not understand... but if we were all at the same age... we would feel that no one knows better than anyone else... not much trust... mixing seniors and juniors... is better. [RadJ2]

Similarly, in the words of a junior participant in response to what she thought about learning to learn during the RadClub's meeting sessions:

> Some of them I know... but most I don't... like applications related to radiology... how to read journals related to what we are learning... we were not that interested in them before... but he [the advisor/mentor] told us... and motivated us so that we can improve. [RadJ2]

Traditionally, independence in learning organisation and knowledge construction are rare and impractical in Cambodia, and in most Asian contexts, given the dominant teacher-centric and elder-centric philosophy (sometimes criticised as ageism). In the learner-centred, self-directed, or lifelong educational principles, students should co-create knowledge as they engage in assignments and peer dialogue (e.g. Wells 2004). Similarly, students should make their own decisions about whether or not they need to change their learning behaviour. Forced changes in behaviour may not work in the long run. This claim is best expressed in Poerksen's (2005, 472) interpretation of Heinz von Foerster's constructivism:

> Heinz von Foerster's constructivism is fundamentally opposed to any view that involves a simple, nicely portioned transfer of knowledge: it foregrounds the human learner as the active and autonomous maker of knowledge. Learning cannot be manufactured, one of his central theses runs, it can only be rendered practicable. Teachers can create environments and conditions

> that, when successful, even attract people who are inclined to be resistant to fascination. Learning, to recall an attractive image from Heraclitus, has therefore nothing to do with the filling of vats but everything with the lighting of torches. If you want to teach, Heinz von Foerster's thoughts suggest, you must learn how to learn, in order to be able to teach people something that you believe to be of importance to them. You must focus on your students and rely on their autonomy.

Multiple theories and concepts of learning in the 21st century corroborate this constructivist principle. In the independent learning concept, teachers and lecturers "are viewed as guides who direct students' learning" (Sam et al. 2012, 50). In theory, adult learners cannot merely follow instructions all the time, nor can all adult learners learn alone without any guidance. "As teachers, we are at our best when we guide learners to new or deeper understandings … In essence, guided instruction is saying or doing the just-right thing to get the learner to do cognitive work" (Fisher and Frey 2010, vii). Similarly, the idea of "mediated learning", which is an approach to learning that "relies on the guidance of an adult whose role is to help interpret the complex world of input from the environment so that the child can focus, frame and consider relationship" (Hopkins 2010, 11), is also highly related to the constructivist approach.

One of the important roles of co-construction in learning is feedback from the teacher, mentor, and/or advisor. The advisor's attempts to listen to understand how the students think and justify their points are needed to co-construct knowledge. The informal design of the RadClub encouraged such independence and autonomous decision in knowledge exchanges and construction. Unlike the formal educational settings where students must follow rigid rules and fulfil a number of criteria (sometimes not of interest to them) to get a degree, the nature of the RadClub did not exert such control over the participants. In this sense, behavioural changes in the students were not forced but emanated from within themselves.

More to the point, though the affective/motivational aspects associated with the advisor/mentor dominantly characterised the RadClub's strength, the RadClub's advisor/mentor was also viewed as an intellectually and professionally competent teacher by most participants. In the RadClub, the importance is not placed on content knowledge but on the observational and reflective abilities of the students, that is the ability of the students in thinking about their learning and their performance. The RadClub achieved this through its question-and-answer approach, commentaries, discussions, and dialogues. In this sense, learning during the RadClub's sessions happens as both an intellectual activity and a dialogical activity and goes hand in hand with not only the acts of cognising (i.e. thinking and remembering) but also meta-cognising (e.g. reflecting and self-questioning). It should be noted, however, that the evidence from the participants' opinions is quite limited in claiming that the metacognitive skills of the participants improve in a significant way after they participated in the RadClub, and the claim requires further investigation for more concrete evidence.

After all, learning advisory, supervisory, mentorship, or coaching has become an important (capacity development) part of many professions or an independent position on its own. In the area of teacher education and training, mentorship plays an important role (Goodwyn 1997). In the field of academic medicine, mentorship frameworks, skills, and principles have been well formulated (see, for example, Straus and Sackett 2014; Scoggins, Pollock and Pawlik 2018). In most doctoral education programs around the world, the supervisor-supervisee system remains functional in developing research skills in young academics. The idea of teacher as a supervisor, an advisor, a facilitator, and currently a mentor or a coach in higher education (HE) has been proven an important transformation in the 21st century due to the movement from teacher and teaching centrality to student and learning centrality in education.

15.3.3. Building a learning space beyond school in Cambodia? The RadClub's lessons

As discussed throughout this chapter, where RadClub's learning took place was not in a formal educational setting. Thus, an important inquiry in this study is what we can learn from the RadClub in terms of its different learning place or space. It should be noted that the findings from the current analyses are far from being saturated in making any firm conclusions. Rather than committing any serious claim on the real impacts of learning place or space, the current study highlights some insights from the experiences of RadClub into the context of learning in Cambodia in its modern age of knowledge.

To discuss the RadClub's learning place or space, we need to understand the new perspective on learning place or space in educational theory and policy discourses. Accumulated research evidence has suggested that school-based settings place too much emphasis on content knowledge and technical skills and leave little space for students to reflect on what they have learned or on their learning approaches and methods. Students may need a new kind of space that allows them to synthesise knowledge and form connections or structural links of those accumulated knowledge chunks. This kind of space provides students a foundation to construct their own knowledge and to be aware or conscious of how they learn. In the discourse of lifelong learning of the 21st century, supported by advanced digital technologies, the policies and practices of education should be innovatively designed in a way that synchronises between the formal academic learning place or space (which is structured, controlled, and competitive) and the learning place or space outside of that formal setting (which is the reflective, free, ardent, and dialogical). In the words of Colardyn and Bjornavold (2004, 69):

> … one approach to lifelong learning studies the distinction between formal and nonformal (and informal) learning to examine if the relationship and links between various types of learning would help in the formulation and implementation of lifelong learning policies.

Creating such spaces "where ideas and creativity can grow and flourish, … where being with our thoughts offers opportunities to rearrange them…" (Savin-Baiden 2008, 8) means "re-engagement with our understandings and presuppositions of what counts as knowledge, curriculum and pedagogy" (Savin-Baiden 2008, 34). According to Savin-Baiden (2008, 8), learning spaces, as discussed in the academic context, take many forms but are often categorised into:

- physical and/or psychological removal from the normal learning environment; for example, conference events, writing retreats, or overseas work;
- specific times for writing and/or reflection;
- social learning spaces for dialogue and debate; and
- digital spaces for discussion and reflective practice with and through others.

In sociology, the idea of the Third Place (Oldenburg and Brissett 1982; McComb 2015) tends to merge effortlessly with the idea of a learning space (Savin-Baiden 2008) and together provide us some perspectives on why the place or space for learning matters significantly. Establishing informal or non-formal learning places/spaces within different social groups (e.g. families, residential communities, workplaces, or schools themselves) is needed in the move towards a learning society. In the field of higher education, researchers (such as Clark Kerr (Kerr 2001) and relevant ones) used such terms as "the city of intellect" rooted from the traditional idea of university whereby the space is exclusively designed for its members to immerse deeply into learning and free inquiries.

This idea is not only of interest to the academics. There have also been growing actions occasioned by major international organisations. UNESCO, for example, ideates the notion "Learning City", and even offers a guideline to design one. It does not occasion such ideas without contexts. UNESCO in fact seems to imagine this idea of a city in alignment with its advocacy for global citizenship and as the future space for the global societies in which knowledge rules and learning naturalises. Ideal as it is, this new form of learning place or space can become real as we start to observe and project our minds into the future.

In this conceptual lens of new learning place or space, the activities of the RadClub can be taken into consideration in formulating an alternative kind of learning place or space to support the synchronising among the formal, informal, and non-formal educational setting of Cambodian students, professionals, and/or general citizens. The purposes of the RadClub's learning sessions were not generally experienced at the traditional school settings. The participants generally came to understand this hidden purpose after taking part in a few sessions. One of them uttered in excitement:

> I am interested in what they said about "things not taught at school" … so I decided to participate … when I participated… first it was hard for me… I didn't know the others… I felt it was strange… they told us that it is not something

> we learned at school… when I met him [the advisor/mentor]… when he said something… it is different from what I learned in school… and his thinking is quite different from what other teachers taught us at school… so I am interested… [RadJ1]

Similarly, another asserted:

> I noticed that it is strange and is more special... in a good sense... I have never learned those things at school... we do not focus on technical things... not like teachers at school... a b c d... not like that... he teaches us about the way to walk... how to study... [RadJS1]

In this sense, the RadClub served to emancipate students from their conventional educational settings. The learning and meeting venue of the RadClub (i.e. at the café) is somehow similar to what the sociologists call the third place, as opposed to the first place (i.e. the home) or the second place (i.e. the workplace or school). For some participants, such a place is more suitable for informal learning and collective sharing, without too many structural burdens. Learning how to learn in a learner-centred way is not always appropriate for traditional formal settings which rigidly focus on academic achievement, competition, and intellectual status. In this sense, the principles underlying the RadClub's learning practices – i.e. the dialogic and reflective approaches to co-constructing knowledge, the learner empowerment and motivation, and the behavioural changes to address learning gaps (in academic and professional domains) – could be daunting if practiced in a purely academic or professional training environment. The principle of a learning space, outside of conventional education places, is responsive to the needs for personalised learning and the development of meta-cognitive and reflective skills among students. Such an alternative (third) learning space that amalgamates sociability and learning, and where learners develop self-reliance in managing their own learning, could be a significant value-added cultural capital in Cambodia. Indeed, "spending more time outside the classroom maximising their learning opportunities was of vital importance" to the Cambodian students interviewed for a study on independent learning (Sam et al. 2012, 50).

However, it is too fast to consider an alternative initiative like the RadClub as a successful or effective learning space and that it really contributes to promoting the learning tradition in Cambodia. Although the participants' expressions of positive experiences dominated the interviews, some negative experiences also emerged.

15.3.3.1. The intertwined complicacies among perceived ability, sense of hierarchy, and communicability in the RadClub's learning sessions

A sense of hierarchy and feelings of anxiety pervaded the RadClub. Among the three RadClub's actors (i.e. the advisor/mentor, the seniors, and the juniors), the challenge of hierachy was generally experienced by the junior participants. Although there was no explicit discrimination, they generally felt that they were "not confident enough" to engage in the culture of debate or dialogue. Some junior participants related this

problem to their lack of ability to express themselves clearly and fully in English. One junior participant confirmed:

> … the hardest thing for me is that he used English… I use French… I abandoned English about 10 years ago. [RadJ1]

Similarly, another junior said:

> … I already have a degree, but I'm not good at languages. French... because we're exposed to it more... medical terms are taught in French... we can easily understand... and it's hard to change to English... we just can use it in some ways... reading is quite hard. [RadJ2]

A few participants even thought that the RadClub was designed only for outstanding, elite students. Those who were not interested in reflecting on their own thinking and learning approaches were not particularly interested in this type of learning platform. Because the juniors generally had more learning problems than the seniors, their problems could have become the focus of discussion in the RadClub's learning sessions, possibly making them feel embarrassed or uncomfortable. This issue teaches us an important lesson in terms of promoting learning among Cambodian students – that is, the space for learning should not be a hierarchical or judgement-oriented, and students should be motivated in a way that they no longer have fear or sense of inferiority in their learning.

For some, their experiences with the RadClub seemed to be unable to change their mind that the technical competences related to the profession are more important than the thinking and learning skills. Those who think that way generally expected to learn the hard and technical skills needed in the workplace and were not interested in learning about thinking or acquiring generic knowledge on learning how to learn. One of them said:

> … we Cambodian students... don't know much about deep things... general knowledge... we're weak... say the exams to apply for a scholarship... we don't have much knowledge about that... so it's hard... when we listen to that, we don't know... we know it's important, but we don't understand it... so we feel we don't know much... [RadJ2]

15.3.3.2. Organisation, time, and sustainability issues

Organising the time and venue of the RadClub's learning sessions to suit everyone was not easy. Because of the nature of their formal university training, including schoolwork, hospital-based practicum, and part-time hospital jobs, the participants did not have much free time. Some had a 12-hour night shift of work at the hospital, from 8 pm to 8 am. Without a high level of commitment, a clear understanding of the RadClub's purpose, and a flexible arrangement of their study, training, and work, the participants would question whether joining the RadClub was the right thing to do. One participant, who had to choose whether he or his colleague could attend certain

RadClub sessions, complained:

> Actually, I didn't attend the club that much after half a year... after [the senior] who created this club went to France and my other friend assumed his role in RadClub... First, I did not have much time... Second, he [the senior] worked at the hospital on the same day as I did... and so when the session came around... it was the day that I had to work at the hospital... I could not miss the practicum.... and because the other two had joined the RadClub already... it was hard for me to also join... I needed to stay and work at the hospital... so my attendance of RadClub declined. [RadJ3]

With regard to the difficulty in finding a venue that was convenient for everyone, and allowed more participants to join the RadClub's learning sessions, another interviewee claimed:

> A common challenge is finding a venue. It's hard to find a venue that is quiet, with proper chairs and tables and a projector… It's hard to find one… [RadS1]

Furthermore, even though the RadClub significantly influenced the participants' learning at the emotional, behavioural, and intellectual level, this platform may not be applicable in terms of sustainability. The RadClub platform at large was unstructured by design (despite some inherent structures in terms of discussing or presenting principles), making it hard to accommodate more participants. This relates strongly to the question of who is capable of organising this kind of platform and advising/mentoring others and doing that in a committed and sustainable way. When asked about the RadClub's applicability in the formal school setting, a junior respondent had a mixed feeling:

> Interviewer: Do you think it is applicable to formal schooling?
>
> RadJ1: To some extent… but it's hard to say… different contexts… it's good to know that competent mentors exist … and to know that we can follow teachers' approaches.

The departure of some senior participants left the RadClub somehow stuck, raising another question on its dependency on key individuals. The question of dependency is possibly related to both the senior participants (who were the coordinators) and the advisor/mentor. Without them, running the platform would have been challenging. This issue, although not clearly expressed by the participants, could be closely linked to the difficulty of arranging a mutually convenient time for an event that happened only once a month. A senior participant opined:

> We need a strong and committed guide like *lok kru*... he's very busy... yet he devoted half a day every month to meet us... some couldn't see the value in this... I think that it's a lot... and understand the students... know what the students lack... students are different... some are good at research... some are good at English... *lok kru* knows that... he knows I lack English ability... radiology students have jobs... so they have to decide whether to study or earn money... students specialising in other fields... don't have as much work... The point is whether students value the RadClub. [RadS2]

So far, the discussion suggests that establishing, sustaining, and staying committed to the informal learning space outside of the formal and structured educational setting are not easy. A serious level of intention, commitment, and persistence is needed to avoid the bubbling state of the informal learning space – emerging and dissolving in a short matter of time.

15.4. Tentative conclusions

The current study sets to explore how the learning-(how)-to-learn platform, called the RadClub, worked, and how its participants experienced it, with the intention to shed light on the design and development of an alternative space for learning to support Cambodian students in their educational and professional journey and to develop their independent and lifelong learning attitudes, competences, and habits. In using the qualitative, phenomenological approach to interview, dialogue, and co-reflect with the participants (who were becoming professional radiologists at the time of the study) about their experiences with the RadClub and trace the recorded information on the RadClub's Facebook private group page, the study re-confirms previous studies (for example, the study by Sam, Ros, Keo and Sophal, 2012) that Cambodian students at the post-secondary level still need strong motivation and emotional support from their lecturers, teachers, or mentors/advisors in their learning journey. This study highlights the important roles of advisors/mentors in guiding, providing direction, developing a learnable atmosphere, and allowing students to take the lead and have freedom in their own learning. The study further points to the need for an informal learning space outside of the school place and time – a space that offers a different learning experience for students. Such a space is important for the future development of the learning culture in Cambodia and to revive the students' learning spirit as a lifelong learner.

In Cambodia, the limited practices of self-directed learning from early childhood education through to secondary education makes it hard to encourage and motivate students to learn independently at a higher level of education and in a lifelong manner. The distance between teachers and students (separated by multiple factors from time to social hierarchy) further negatively influences the motivation to learn and the self-direction in the learning of the students. The current state of competitiveness and academic capitalism in the academic environment of Cambodia is also not conducive for a learning space that is free from pressures and distractions and that kindles the spirit of lifelong learning. Still, Cambodian students need this self-directed learning capability to navigate the 21st-century global knowledge economies and societies, with clear minds and assured self-confidence. To get ready for the age of knowledge, more broadly speaking, Cambodian students (and professionals alike) need to embody the learning spirit, Cambodian organisations need to put in place their learning system, and the whole Cambodian society needs to embrace her learning culture.

In principle, to develop a functional platform for learning (how) to learn (in academic, professional, or informal setting), multiple questions need to be considered: where to hold it (classroom-based, campus-based, social-place-based), who to lead, what to learn, how to structure the program, etc. Having the right advisor/mentor influences the learners to a large extent, especially on their affective and motivational aspects. In thinking about the learning-(how)-to-learn platform design, it must also be kept in mind that specific learning strategies are important for students' academic achievement (e.g. Caballos and Esteban 1988; Diseth 2011; Erdamar 2011) and that learning strategies involve not only study skills (e.g. memorising, referencing quality resources, organising data and information, reading and listening for comprehension, note-taking, and concentration) but also self-motivation (e.g. growth mindset, self-efficacy, open-mindedness) and higher-order intellectual activities (e.g. meta-cognitive skills, critical thinking, systemic thinking, creative thinking, and innovative thinking). As a theoretical framework, the cognitive, meta-cognitive, affective, and organisational dimensions (as discussed in Pol 2012) are important components to focus on in order to to ensure the success of the learning-(how)-to-learn project.

To promote a learning-(how)-to-learn culture and transform students to be self-directed learners, using an informal learning space in Cambodia, a number of specific lessons learned from RadClub should be considered:

1. The most fruitful learning-how-to-learn platform contributes to making students believe in progressive and independent learning and so balances between guidance and freedom.
2. The learning-how-to-learn platform should focus sincerely and thoroughly on learners and the real conditions (i.e. personalised issues) that shape their learning difficulties.
3. The learning-how-to-learn platform should be dialogic and co-constructivist in a way that individual learners can reflect on, discuss, and so achieve a meaningful understanding of what they learn.
4. The learning-how-to-learn platform should create a clear sense of purpose and guidance even if they use unstructured or indirect approaches.
5. Not everyone can be an advisor/mentor. Without adequate personal, professional, and communicative capabilities, with proven experiences and success, an advisor/mentor may lack direction, competence, devotion, and persistence in their role.
6. Scientific research and academic skills are important competencies to support independent lifelong learners in their learning journey.
7. Learning tradition is important for a knowledge-based economy, culture, and society, and therefore spaces for learning need to be reconsidered by relevant stakeholders in Cambodia.

As a broad implication for the Cambodian educational institutions, especially at the post-secondary level, the key task of education in the 21st century is no longer to passively inculcate or indoctrinate knowledge into the students' mind but to actively develop their learning interest, their active (physical, intellectual, emotional, and social) engagement in the learning process, and especially their meta-cognitive understanding of how they think and learn. That is not only important during their educational years but also for their professional life journey. Another implication for the educational institutions, especially those at the post-secondary level, is that there is a need to rethink their learning support for students, the function of the scholarship of learning and teaching, and professional development of their personnel.

The study is not without limitations. One of them was that the researcher could not obtain a chance to participate in the actual learning sessions. This was because the learning sessions had paused before the research was conducted due to changes in the participants' study and work arrangements. The lack of direct observation of the participants' behaviours and of ethnographic experiences with the participants and in the actual phenomenon, limited the study from offering detailed depictions and concrete evidence of the operation and the atmosphere of learning. Likewise, this gap made it hard for the researcher to triangulate the interview-based and the Facebook records-based results with the real happenings of the sessions. Another limitation was the inability of the researcher to approach those participants who attended just a few RadClub sessions but then left and did not return. Having their opinions could offer more diverse perspectives that reduce some possibly biased conclusions of the study. But this is beyond the control of the researcher since the participation in this study was totally voluntary. The final limitation was that the research could be prone to subjective biases due to, as highlighted at the beginning of this article, the existing relationship between the researcher and the RadClub's advisor/mentor as they were working for the same institution at the time of the study. Although the biases could have occurred, this type of qualitative research approach – to explore a phenomenon via perceived experiences of those who directly participated in it – views bias as inherent and so acknowledges its existence in some ways. In fact, the triangulation of data sources (the RadClub participants' interview transcripts and the records on the RadClub's Facebook private group page) helped to minimise the biases and inappropriate inferences to a large extent.

To give further insights, the researcher plans to return to some RadClub's participants and ask them to honestly and critically review this article. Likewise, the researcher plans to conduct case studies of other similar learning platforms in order to compare and contrast learning experiences of Cambodian students, with the hope to find a new model, approach, and/or space of learning and learning-(how)-to-learn in Cambodia – a model, approach, or space in which the true spirit of learner-centred philosophy, lifelong learning ideology, and the culture of a learning society prospers and sustains.

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Appendices

Appendix 15.A: List of interview questions

Can you tell me about yourself? [e.g. name, age, position, institution, academic background, and work experience…]

1. How would you define the RadClub meetings in which you have engaged? Can you elaborate? Have you had a similar experience before?
2. Why do you think the RadClub is created? How do you know the RadClub? What make you decide to participate?
3. What do you expect from the RadClub learning sessions? Do you get what you expect? Please elaborate on your outcomes. Why do you think so?
4. What is the learning process like? Please elaborate! [Content, time, schedule, venue, discussion environment, discussion leader, materials…]. Is the learning experience in the RadClub sessions different from other learning experiences you have had?
5. Do you think it is important/necessary? Do you think students need their professors to lead these kinds of activities? Why?
6. What experience do you have while engaging in these RadClub activities? How does it feel to be part of the RadClub?
7. Do you face any challenges participating in this forum? What are they?
8. What do you recommend to improve the quality of this forum?
9. Will you participate in this kind of forum if there are more of them? Why?
10. Would you want to take a leading role in such activities in the future? How? Why?
11. Are there any other experiences you would like to share?

Other questions and thanks to participants.

Appendix 15.B: Participant list and interview information

No.	Pseudonym	Gender	Date	Time	Interview medium/venue
1	RadS1	M	29 Nov 2017	7:30–8:30 pm	Skype call
2	RadJ1	F	9 Jan 2018	2:30–3:20 pm	F2F/ Gloria Jean Café IFL, Phnom Penh
3	RadJS1	F	1 Mar 2018	8:30–9:30 pm	Skype call
4	RadS2	F	1 Mar 2018	5:30–6:30 pm	F2F/ Gloria Jean Café Toul Kork, Phnom Penh
5	RadJS2	F	16 Mar 2018	8:00–9:00 pm	Via Skype call
6	RadJ2	F	1 Mar 2018	12:30–1:30 pm	F2F Brown Café TK, Phnom Penh
7	RadJ3	M	12 Jan 2018	9:00–1200 pm	Via Facebook call
8	RadJ4	F	9 Jan 2018	4:00–5:10 pm	French School, Phnom Penh
9	RadJ5	F	9 Jan 2018	4:00–5:10 pm	French School, Phnom Penh
10	RadJ6	M	9 Jan 2018	4:00–5:10 pm	French School, Phnom Penh
11	RadJ7	M	9 Jan 2018	4:00–5:10 pm	French School, Phnom Penh

Note: All of the voice-recorded interviews were fully transcribed.

Conclusion and Implications

Chapter 16

Towards a Consolidated PSET Development for Cambodia

Khieng Sothy, Eam Phyrom, Leng Phirom, and Song Sopheak

16.1. Summary

This edited book inquires into the roles of Cambodian Post-Secondary Education and Training (PSET) in the global knowledge economies and societies. Such inquiries become a critical task for all nations as they need to develop a strong system and institutions of Higher Education (HE) and post-secondary Technical and Vocational Education and Training (TVET) that thrive in the changing contexts of the world economy and human society. Despite constraints from all directions, the Cambodian PSET system and institutions have no choice but to engage in the highly-competitive intellectual and vocational ecosystem at the local, international, regional, and global level. A recent Times Higher Education article by Keith Burnett (2021) reads: "All our universities are local and indeed personal in their impact. But all also need to be part of a global endeavour to seek out understanding for the greater good." Although Burnett used only the term "universities", his message, in fact, applies to all kinds of institutions of PSET.

Today's Cambodian PSET system was developed in a different period from the present time and for a rather different economy and society. In the past six decades, both the Cambodian HE and post-secondary TVET sub-sectors have been challenged by structural issues such as access, quality assurance, governance, finance, teaching and learning, curriculum, and research. The two sub-sectors also have to shoulder various responsibilities particular to their own domain; for instance, the HE sub-sector needs to concentrate on achieving academic excellence while the post-secondary TVET sub-sector tries to improve its image to attract more students. As the two sub-sectors try to grow and meet their own needs, their educational missions and activities sometimes overlap, and the boundary of identities of their institutions becomes a blur.

In light of the global knowledge economies and societies of the 21st century, the future direction and position of the two sub-sectors are further plagued by so many

emerging local and international priorities and changes. Over the last century, the world has experienced and benefited from remarkable industrial and technological advancements. Since the first modern automobile was introduced in the late 1880s, present cars are capable of parking and driving autonomously, with many parts equipped with sensors that enable real-time tracking and better safety. Telephony has drastically improved from wired, bulky, and poor voice quality to modern bezel-less mobile phones with three cameras and 5G features. For the last decade, in particular, we have witnessed the intensified and advanced development of technologies such as the internet of things (IoT), blockchains, robotics, artificial intelligence (AI), virtual and augmented reality (AR), as well as 3D printing. The digital and data revolution has already had a huge impact on health, education, agriculture, and security. With all these changes, how to exploit the great amount of knowledge available; how to adopt new technologies in the educational or training process and promote science, technology, engineering, and mathematics (STEM) education; or how to respond to the need for more knowledge workers are just some core questions that the Cambodian PSET sector (both the HE and the post-secondary TVET) has to consider, adding to the existing structural and cultural challenges – from governance and finance to access and quality.

The current edited volume takes the multiplicity of Cambodian PSET issues into serious consideration. The book covers four major aspects of Cambodian PSET: HE and the changing academic profession; post-secondary TVET and the changing world of work; STEM education and the 21st-century competencies; and learning experiences in the lifelong learning discourses. Specific topics include HE internationalisation; academic identities in HE; research education, training, and development; HE accountability; Public-Private Partnership (PPP) in TVET; talent development; apprenticeship development; workplace and organisational learning; STEM major choice; the relationship between financial support and STEM major; attitudes towards learning science and mathematics; learning and teaching chemistry; and learning (how) to learn in an informal setting. The discussions of these topics are not only guided by scholarly research literature but also based on relevant policy discourses and primary research data of the contemporary Cambodian PSET. The book draws on these discussions as a way to re-examine and reflect on possible situations or models of both the HE and post-secondary TVET sub-sectors of the Cambodian PSET.

An overall conclusion from this edited book is that the Cambodia PSET in the global knowledge economies and societies should reconsider how to innovate the knowledge functions of its HE (focusing especially on the creation of knowledge and intellectual capitals) (as discussed in Chapter 1, 2, 4, and 5); how to collaborate to develop vocational value and build professional culture of its post-secondary TVET (as discussed in Chapter 1, 2, 7, 8, 9, 10, and 15); how to develop a strong STEM ecology (i.e. systematically improving science at the lower-level education, promoting STEM majors at the post-secondary

level, and preparing an optimal concentration of STEM-related workforce at the career stage) (as examined in Chapter 2, 11, 12, 13, and 14); and finally how to transform lifelong learning capabilities and cultures (by growing learning spaces and habits) (as discussed in Chapter 2, 14, and 15). Achieving these missions will allow the HE sub-sector and the post-secondary TVET sub-sector to co-thrive in the new societies at both the national and international level, with each sub-sector having a clearer sense of leadership direction and governing position (as discussed specifically in Chapter 3 and 6).

16.2. A reflection on future development approaches of Cambodian PSET

We have witnessed tremendous changes in the development of policy, institution, and system of Cambodian PSET since its revival after the collapse of the Khmer Rouge. From the 1996 privatisation policy to the 2003 establishment of the Accreditation Committee of Cambodia (ACC) to the 2010 promotion of research and further to the 2017 introduction of internationalisation, many positive reforms and interventions have been made to improve the HE sub-sector in Cambodia. Likewise, from the setting up of the National Training Board (NTB) in 2005 to the 2012 release of the Cambodian National Qualification Framework (CNQF) to the promotion of PPP in TVET in 2017, the Cambodian post-secondary TVET sub-sector has also improved and contributed significantly to the whole domain of PSET development.

The current development of Cambodian PSET has been guided by various key documents such as the Policy on Higher Education 2030 (shaped by the global Higher Education 2030 agenda), the Higher Education Roadmap in 2017, the Cambodia's Education 2030 Roadmap, the new Education Strategic Plan 2019-2023, the TVET National Policy 2017-2025, and the National Strategic Plan for TVET 2019-2023, all aiming at contributing to the economic and social development of Cambodia. At the base, Cambodia now has the Education Law (while the TVET Law is being drafted) and the CNQF as the guiding documents that cover and link its education and vocational training sectors. Also, the preparation of the HE governance and the HE financial policies, as well as the strategies to modernise the TVET system and link it to the national employment and occupation systems, will help the policy makers, developers, and practitioners of both sub-sectors to steer and support the system further.

The loans and grants from key development partners (such as the World Bank and the Asian Development Bank [ADB]) as well as the government's increased financial contribution also ascertain that the needed financial resources are optimal for efficient, effective, and impactful implementation of the Cambodian PSET development. Other relevant national policies – including the 2015 Industrial Development Policy; the 2021 Digital Economy and Society Policy Framework; the Cambodian Roadmap of Science, Technology and Innovation 2030; and the 2019 Lifelong Learning Policy – also partially highlight the important role of Cambodian PSET in driving Cambodia towards

achieving its economic prosperity and a functional knowledge society. These inputs and relevant approaches are believed to provide ideas and solutions to key issues in the development of the fragmented Cambodian PSET.

However, we cannot overlook the fact that a multiplicity of challenges has still been reported regarding the development of the Cambodian PSET system and institutions. With research-based insights (from both theoretical perspective and empirical evidence) and constructive intellectual exercises of the editors and authors, all of whom are researchers, this edited volume implicates a number of principles on the future development approaches of Cambodian PSET in the emerging new kind of economies and societies.

Firstly, the future development of the Cambodian PSET system in the emergent global knowledge economies and societies should be well consolidated in different aspects: among different knowledge and skills related sectors; between local and international concerns; and between support given to lower-level education and support at career phase. For the first aspect, the PSET system may need to take a central role in the new national aspirations to construct knowledge (and science, research, innovation, and skills) system as well as the hopes to reconstruct indigenous knowledge system of Cambodia. Cambodian PSET may no longer be discoursed as an isolated or a peripheral sector in the global knowledge societies, but as a well-consolidated and well-integrated sector that is centric to other knowledge-related sectors, given its authority in performing the knowledge creation and workforce development functions. To support the organisation and connection among such national systems, the use of an inter-ministerial approach remains practical and relevant. Contributions from the Office of Council of Minister; the Ministry of Education, Youth and Sport; the Ministry of Labour and Vocational Training; the Ministry of Industry, Science, Technology and Innovation; the Ministry of Post and Telecommunication; the Ministry of Culture and Fine Arts; and other relevant ministries are much needed to build a strong foundation of Cambodian knowledge system. As a matter of fact, these ministries have their own institutions that perform the educating or training roles. So all of them more or less have roles related to knowledge performance, workforce development, and social development. The participation of professional associations, civil society organisations, and non-governmental organisations will enrich the diversity in perspectives and increase resources needed to transform the central role of the PSET sector.

As a second point for the consolidated approach, we need to emphasise that PSET development cannot be directed based only on local concerns but also in response to international, regional, and global megatrends (both the trends within the PSET sector and those without). All universities need to be both local and global (Burnett 2021). Leng (see Chapter 3) calls for more proactive internationalisation strategies of Cambodian HE. Chapter 6 further suggests that Cambodian HEIs need to balance among governmental control, market force, academic culture and condition, and international or global agenda. It is impossible for the Cambodian PSET to avoid international and global engagement, learn from international best

practices, and continuously share its own experiences with other countries. In fact, such engagements have already been started in some ways by Cambodian HEIs and post-secondary TVET institutions. However, the Cambodian PSET system and institutions should not just merely engage but find a dignified space in the global system. To do that, the Cambodian PSET needs to consider how to respond to the different needs of stakeholders and to strike the right balance between global ideals and local realities.

For the final point of this consolidated approach, the PSET sector, its institutions, and its various aspects of education (e.g. STEM and learning) should be designed in connection with (and to be supportive of) both education at lower level and employent at career phase. In this sense, the PSET sector can provide support and mitigate problems challenging students since their lower-level education years while also relating itself closely to industry and the world of work. Such a consolidating support mechanism may create a structural flow of lifelong and life-wide engagement in knowledge for Cambodian students and professionals. As suggested and exemplified in this edited book (see Chapter 11 and 13), to encourage students to move into the STEM pipeline, what they experience at secondary school and what they perceive of their future career are important drivers. Dy (2015) once highlighted the important role of HE to connect with and give support to lower-level education. Chapter 10 of this edited book also calls for Cambodian work organisations to thrive to become a learning organisation, which implies that forming partnerships with PSET institutions in their training, development, and learning functions can be an innovative and strategic option for Cambodian business companies or industrial enterprises to try.

Secondly, while the system design needs to be consolidated, the institutionalisation of Cambodian PSET still needs to embrace diversities. The expansion and diversification of PSET institutions have been unavoidable since the time the Cambodian government issued the privatisation policy and as it [the government] has currently sought to increase the gross enrolment rate that moves Cambodian PSET from the elite phase to the mass phase (and in the future to the universal phase) of its development. To offset negative impacts as a result of the uneven expansion and diversification of the PSET institutions, a typology and classification of those institutions is crucial. The national PSET institutions (and their paths) must be differentiated with differing aims, operations, and structures in order to respond to different needs of students, community, and society (Varghese 2014) and especially to the national labour market demands (Chhem 1997, 26-27). Performance-based typology and classification should not be seen or treated as a tool to weaken or exclude certain types of institutions but to clarify their positions and empower them. While clear-cut differences can be hard to realise in practices, clarity in policies and principles remains necessary. Diversities need to be embraced, and Cambodian institutions of HE and post-secondary TVET should be allowed and supported in the clarification (and innovation) of their HE or TVET ideas, models, and approaches.

From a theoretical perspective, there have been different models or scenarios of PSET institutions in post-industrial societies. In the HE sector, within a span of 20 years, between the proposed idea of the entrepreneurial university by Clark (1998) and that of the ecological university by Barnett (2018), there have been multiple other models of universities suggested by different researchers – for example, adaptive university, virtuous university, or transformative university – and many more will be emerging. With a consolidated frame of thoughts, Ehlers and Kellermann (2019, 48-54) lately suggested four scenarios of future university: the future skill university, the networked multi-institutional university, the personalised university, and the lifelong university, seemingly embracing the different extremes between academic knowledge focus to develop students' mind and vocational skills focus to prepare them for employment. In the post-secondary TVET sector, models of institutions central to such ideas as competence-based model or dual system (that balances between school-based training and workplace-based training) have been well discussed, resulting in different types of institutions such as polytechniques or higher vocational education and training institutes. Some of these developments somehow orient TVET institutions towards (or connect them with) the academic side.

It is hard at this stage to come up with a particular model of PSET for Cambodia in the economic and social contexts full of complex diversities and rapid changes. Still, some previous Cambodian researchers have already attempted to propose certain models of Cambodian HEI, based on some internationally established concepts. For example, Sam (2015) considered the possibility of establishing Cambodian entrepreneurial university, and very recently, Sok and Bunry (2021) imagined a scenario of Cambodian university with transformative leadership. Cambodian post-secondary TVET institutions, on the other hand, have been developed central to the competency-based approach. However, specifically proposed conceptual models of post-secondary TVET institutions are not yet in place although the concepts of competence-based, work-based, or dual programs have been discussed by relevant stakeholders for some time so far.

As we synthesise the international and global trends of education, we must emphasise that the focus on skill development for the world of work as well as the vigorous promotion of hard science and technology must go hand in hand with the nurturing of compassion, moral and ethical values, and respect for other beings in order to ensure good harmony and integration in a diverse and connected world (Faure et al. 1972). The holistic goal of education that "places human development into cognition (to know), psycho-motor, and self-awareness (to be) and adds an important idea of social cohesion and peace (to live together)" (as discussed in Chapter 8) should not be ignored even in the design of a purely skill-based technical education program. Without humanistic and social knowledge, the skill training may create selfish and ignorant workforces and citizens. Without such differentiated identities at the institutional level but consolidated vision at the system level, both the academic HE and the post-secondary TVET institutions risk becoming unwholly irrelevant and losing support from students, parents, employers, communities, educators, and the national accreditation body.

So, it is important that the Cambodian PSET institutions become more creative, rather than restrictive, in the process of institutionalisation, organisation, and incorporation. An example we can give in terms of the creativity we are proposing is the possibility of amalgamation of HEIs, especially the private HEIs, in order to respond more to the vision of excellence and to not only serve the local needs (with a small body of students) but to compete for the larger body of PSET seekers in the regional and global PSET ecosystem. Another example is a scenario whereby different institutions with different identities and specialisations work together in an inter-discipliinary or multi-disciplinary project to solve local or regional problem. Regardless of which scenario, the knowledge function and vocational development capacities of Cambodian PSET need to be well enhanced first (as discussed earlier). Also, creative ideas can only come when strong foundation, sincere intention, open mindset, and collective learning are in place. Evidence, trust, fairness and justice, sharing (resources, responsibilities, and benefits), and empowerment are the key principles.

Finally, besides the cosolidated and diversity-embracing approaches, we agree with Santiago, Tremblay, Basri, and Arnal (2008) that to realise the knowledge societies, (Cambodian) PSET system and institutions should develop a grand and shared vision. In this sense, there is a serious need for policy thinking and making that uplift the strategic ambitions and directions which thrive beyond merely solving the existing problems. A grand Cambodian PSET vision (and missions) needs to be defined in a way that both rebuilds its foundation that has long been weakened by structural constraints (such as governance and finance) and at the same time engages the PSET system in progressive transformation needed by future priorities and uncertainties.

Boosting academic and scientific freedom and establishing spaces for devoted intellectual development can be considered a grand vision. In the knowledge-centric, pan-intellectual ecosystem of HE, a pure, free, and secure space for academic, scholarly, and scientific thinking and learning is seriously needed, especially for educational and cultural development. Similarly, the political, economic, industrial, and commercial dimensions of the Cambodian society may also need to embrace strong scientific knowledge, intellectual creativity, and innovative capacities at the base. Providing supports to such knowledge- and learning-related activities for the economic (and social) sector can also be considered a grand vision. Likewise, connecting the missing links between Cambodian ancient higher learning traditions and the modern Western-modelled system of PSET can also be considered a grand vision. Keeping history unknown to the younger generation of HE thinkers, policy makers, or developers will only further deterioriate the shaky base of the Cambodian PSET sector as well as its other social dimensions. These are grand visions because they cultivate the society in the long term, not merely activate things for short-term gains, and because they are not for serving interests of a particular group of people but for all stakeholders who are willing to engage. Improving these aspects will set Cambodian PSET on the path towards the universality of knowledge and the functionality of its social development role.

The development of a grand vision needs a mutual interplay between analytical investigation and reasonable imagination, which are equally important in the research and the policy-making processes. Without "imaginative and even utopian thinking … higher education as a social institution is liable to be somewhat rudderless and will be subject to the buffeting of large global forces" (Barnett 2014, 9). In the last decade, there have been calls for 're-framing' (Glenn 2008), 're-positioning' (Fitzgerald 2011), and 're-imagining' (Barnett 2014, 9) of education and higher education in particular. These perspectives are "Utopia, some might think, but it is a necessary Utopia, indeed a vital one if we are to escape from a dangerous cycle sustained by cynicism or by resignation" (Delors 1996, 22). As done in this edited book, we do not only collect as many key policy documents, research literature, and empirical data on Cambodian PSET as we can and review them critically, but we also find some space to reconstruct, discourse, and dialogue what we have reviewed and analysed and so generate some insights from the lessons, information, and data we have.

An extended insight from this edited book on this idea of grand vision is that Cambodian PSET, as well as the PSET systems of South-East Asian Nations (ASEAN) in general, should not stay comfortable with the labeled "peripheries" in the global academic and vocational system. Breaking the stereotype (no matter how real) is important for game changing. An outward-looking attitude with realistic and coordinated actions is needed to bring the PSET system, institutions, academics, and professionals of Cambodia closer to the core of the global academic system, at par with other advanced countries in the region and other parts of the world, even it means to leapfrog and fail sometimes. To do this, we need a serious sense of ownership in policy and scholarly thinking, which is far more important now in the context that Cambodia is trying to balance between global agenda and local needs. This book does not necessarily follow any feminist or critical theorist perspectives, but it somehow raises the "deconstructing and reconstructing" principle just to support the idea that an appropriate level of intellectual investigation by the local authorities and academics and clear justification and evidence are needed in order to promote the PSET system beyond the local boundary. This is what Varghese (2014) refers to as indigenisation of the higher education system or what Cambodian scholars refer to as ownership. But we have to make certain that the universal body of knowledge and science created so far (irrespective of which nation creates it) remains priceless for the humanity, and collaboration on a fair and just basis is the way for sustainable development.

16.3. Future research direction

This edited book is an anthology. Only selected topics are included. There are many other topics related to the four major aspects of PSET and approaches to develop PSET not covered in this book. Hence, further inquiries into both the research domain and the policy and practices domain of Cambodian PSET and PSET development approaches may incorporate some of the following themes and questions:

A. Academic and HE development

- How do Cambodian HEIs strategise their internationalisation and global engagement approaches in the context of knowledge societies?
- What enabling environment should Cambodian HEIs build in order to attract and maintain foreign students, experts, and internationally trained Cambodians?
- How can Cambodia ensure that its HE internationalisation will take place in a two-way manner, rather than being dominated and imposed by more economically advanced countries?
- What challenges do Cambodian HEIs face in building and operating their academic development system?
- To what extent are the research, teaching, and learning aspects of Cambodian academics' roles connected?
- How can Cambodia build and sustain a research-centric graduate program?
- How are the different knowledge functions (e.g. knowledge creation, translation, preservation, dissemination) at Cambodian HEIs operated?
- How can Cambodian HEIs develop a measurement framework of HE accountability that balances among Cambodian quality assurance and accreditation framework, the HE financial system and resources, and the market demands?

B. Talent development and workplace learning

- What are the best practices of how to develop understanding and build trust among stakeholders in TVET?
- How does Cambodia formulate a quality- and productivity-centric model of PPP in TVET?
- What are the monitoring and evaluation frameworks and indicators for PPP in TVET that Cambodia needs?
- What are the challenges for Cambodian TVET if it is to employ a holistic education approach (that bridges between academic and vocational paths)?
- What are the principles, philosophies, and applicative values underlying the informal and family-based traditional apprenticeship practices in Cambodia (especially in occupations that are unique to Cambodia)?
- What are the costs and benefits of apprenticeship programs at Cambodian private firms?
- What can be the best approaches and procedures to reward and ensure the qualification standard of apprenticeship certificates offered to firms?
- What is the current status of learning capacity and culture at Cambodian work organisation?

C. STEM pipeline and education design

- What strategies does Cambodia need to promote the academic and career counseling that raises clear awareness in its students about the difference between the general and the technical pathway as well as between the STEM and the non-STEM path?

- How can Cambodian PSET institutions embrace the whole idea of STEM as an integrated and multidisciplinary approach rather than silo subjects of science, engineering, mathematics, and technology?
- How do Cambodian students engage in the STEM pipeline, from choosing the science stream at the secondary school to choosing the STEM-related major at PSET institutions and further to choosing the STEM-related career pathway?
- What are the challenges facing Cambodian females in their whole journey throughout the STEM pipeline (i.e. from secondary-school stream choice to post-secondary major choice and further to career choice)?
- Are innovative financial policies of PSET likely to promote STEM participation?

D. Learning capabilities and cultures

- How can Cambodian PSET engage its instructors/lecturers in the scholarship of teaching and learning?
- What are best practices of technology-driven approaches to HE teaching and learning in the Cambodian PSET context?
- Are there differences in behaviours, attitudes, and mindsets of Cambodian university students towards learning in classroom-based context and learning in online-based context?
- How is the concept of learning mentorship or learning advisory defined and conceptualised in Cambodia?

E. Preparing PSET for the global knowledge societies

- How does Cambodia develop an evidence-based, fair-and-just, and empowering platform for classification and ranking of PSET institutions?
- How can Cambodian PSET institutions develop an optimal learning support system and a functional professional development network to build excellent calibres of academics?
- How should Cambodian PSET learning programs (curriculum, pedagogy, or assessment) be revised, designed, and developed to fit the changing contexts of PSET?
- How can Cambodian PSET institutions promote, design, and sustain learning culture, both within and without the PSET space?
- Which areas and strategies of HE internationalisation should be prioritised to reap maximum benefits for students, faculty members, HEI leaders, and HEIs?
- What are the roles of academics in the current Cambodian HE system governance and its HE institutional governance?
- How can PSET policy makers and institutional leaders design an academic workspace that promotes engagement in global cutting-edge scientific research?
- How can Cambodia build a collaborative knowledge platform (among its PSET institutions and between the PSET instiutions and others) that serves to enhance its PSET position in the global knowledge economies and societies?

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The emergence of global knowledge societies makes it neccessary for Cambodian Post-Secondary Education and Training (PSET) system to:

- accelerate its knowledge-creation function, leading to academic excellence and intellectual prowess;
- cultivate vocational value, professional quality, and workplace learning habits in its students;
- build a robust STEM education and pipeline; and
- enable lifelong and life-wide learning space and culture.

Cambodian PSET institutions need to connect to their origin, expand their field of operation, consolidate their position, and start to engage and compete at a regional and global level.

These missions and perspectives allow Cambodian PSET to grow from within and advance further, like a tree whose roots are all-embracing, firmly-grounded and well enriched; whose trunk is strong and solid; whose branches are resilient to seasonal changes; and whose leaves and fruits are treasured by whomever this tree shelters and feeds. The missions will also develop a new generation of Cambodian well-rounded and independent individuals (students, scholars, scientists, professionals, entrepreneurs, leaders, and citizens), not only with different types of knowledge and skills (academic, professional, or technical) needed by a new kind of society but also a strong character on direction, value, and civility of their work and life.

Works driven by such grand missions and perspectives require collective thinking and sincere participation from not only Cambodian government, its ministerial secretariats, and its educating officials but also Cambodian professional and learnt communities and its cultured families. The current edited volume is part of such works. The book raises some important themes and insights to ignite further scholarly, policy, and public discussion on this fundamental, consolidated, and transformative idea of Cambodian PSET in the global knowledge societies.

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