# Southeast Asian Ministers of Education Organization (SEAMEO) 's Role in Digitalisation for Vocational Education Development: A Comparative Analysis of Indonesia and Thailand

Miss Anastasia Sylvia

จุฬาลงกรณ์มหาวิทยาลัย
Chulalongkorn University

A Thesis Submitted in Partial Fulfillment of the Requirements
for the Degree of Master of Arts in International Development Studies
FACULTY OF POLITICAL SCIENCE
Chulalongkorn University
Academic Year 2022
Copyright of Chulalongkorn University

# บทบาทขององค์การรัฐมนตรีศึกษาแห่งเอเชียตะวันออกเฉียงใต้ (SEAMEO) ในการส่งเสริมให้อาชีวศึกษาสู่ยุคดิจิทัล: การศึกษาเปรียบเทียบประเทศอินโดนีเซียกับประเทศไทย

น.ส.อนัสตาเซีย ซิลเวีย

จุฬาลงกรณ์มหาวิทยาลัย
CHULALONGKORN UNIVERSITY

วิทยานิพนธ์นี้เป็นส่วนหนึ่งของการศึกษาตามหลักสูตรปริญญาศิลปศาสตรมหาบัณฑิต
สาขาวิชาการพัฒนาระหว่างประเทศ ไม่สังกัดภาควิชา/เทียบเท่า
คณะรัฐศาสตร์ จุฬาลงกรณ์มหาวิทยาลัย
ปีการศึกษา 2565
ลิขสิทธิ์ของจุฬาลงกรณ์มหาวิทยาลัย

| | |
|---|---|
| Thesis Title | Southeast Asian Ministers of Education Organization (SEAMEO) 's Role in Digitalisation for Vocational Education Development: A Comparative Analysis of Indonesia and Thailand |
| By | Miss Anastasia Sylvia |
| Field of Study | International Development Studies |
| Thesis Advisor | Vong-on Phuaphansawat, Ph.D. |

Accepted by the FACULTY OF POLITICAL SCIENCE, Chulalongkorn University in Partial Fulfillment of the Requirement for the Master of Arts

..... Dean of the FACULTY OF POLITICAL SCIENCE
(Associate Professor PRAKORN SIRIPRAKOB, Ph.D.)

THESIS COMMITTEE

..... Chairman
(Assistant Professor KASIRA CHEEPPENSOOK, Ph.D.)

..... Thesis Advisor
(Vong-on Phuaphansawat, Ph.D.)

..... External Examiner
(Associate Professor Nongluck Manowaluilou, Ph.D.)

จุฬาลงกรณ์มหาวิทยาลัย
Chulalongkorn University

อนัสตาเซีย ซิลเวีย : บทบาทขององค์การรัฐมนตรีศึกษาแห่งเอเชียตะวันออกเฉียงใต้ (SEAMEO) ในการส่งเสริมให้อาชีวศึกษาสู่ยุคดิจิทัล: การศึกษาเปรียบเทียบประเทศอินโดนีเซียกับประเทศไทย. ( Southeast Asian Ministers of Education Organization (SEAMEO) 's Role in Digitalisation for Vocational Education Development: A Comparative Analysis of Indonesia and Thailand) อ.ที่ปรึกษาหลัก : อ. ดร.วงอร พัวพันสวัสดิ์

วิทยานิพนธ์นี้มุ่งเน้นที่จะศึกษาบทบาทของ SEAMEO (Southeast Asian Ministers of Education Organization – SEAMEO) ในด้านการพัฒนาอาชีวศึกษาในยุคของการปฏิวัติอุตสาหกรรมครั้งที่ 4 หรือ อุตสาหกรรม 4.0 (Industry 4.0) ในปัจจุบัน มีความต้องให้การภาคการศึกษาพัฒนาสอดคล้องกับอุตสาหกรรม 4.0 หรือการศึกษา 4.0 (Education 4.0) ในปี 2565 SEAMEO พร้อมด้วยองค์กรความร่วมมือระหว่างประเทศของเยอรมัน (GIZ) เปิดตัวโครงการ Regional In-Service Training Modules เพื่อให้การสนับสนุนอาชีวศึกษาในอุตสาหกรรม 4.0 (Industry 4.0) งานวิจัยนี้เปรียบเทียบถึงผลลัพธ์ของโครงการ Regional In-Service Training Modules ในสองประเทศที่มีผลการศึกษาระดับกลางในภูมิภาคเอเชียตะวันออกเฉียงใต้ ได้แก่ ประเทศอินโดนีเซียและประเทศไทย

งานวิจัยนี้ใช้วิธีวิจัยเชิงคุณภาพ (Qualitative Methods) พร้อมกรณีศึกษา (Case study) ข้อมูลรวบรวมจากการสัมภาษณ์เชิงลึกผู้ให้ข้อมูลหลัก 11 คน บันทึกแนวคิด สิ่งพิมพ์ต้นฉบับและวรรณกรรมจากแหล่งที่เชื่อถือได้ ข้อมูลถูกวิเคราะห์โดยใช้วิธีการวิเคราะห์เฉพาะเรื่อง (Thematic Analysis) และโมเดลการประเมิน CIPP (Context, Input, Process, Product) ของ Stuffle Beam เป็นกรอบแนวคิด

โดยภาพรวมของวิทยานิพนธเล่มนี้ สรุปได้ว่า SEAMEO มีความสำคัญต่อการพัฒนาการศึกษาและการสนับสนุนดิจิทัลในการศึกษาอาชีวศึกษาสำหรับอินโดนีเซียและไทย

จากการศึกษานี้ได้มีการค้นพบที่สำคัญทั้งหมด 3 ประการ คือ ประการที่ 1 การศึกษานี้พบว่า SEAMEO ได้ให้การเข้าถึงเพื่อดำเนินโครงการในระดับภูมิภาคและรวบรวมผู้เข้าร่วมจาก 11 ประเทศพร้อมกัน อย่างไรก็ตาม ระดับการแทรกแซงของ SEAMEO นั้นยังมีข้อจำกัด เนื่องจากไม่มีผลผูกพันทางกฎหมายและไม่เป็นการแทรกแซงเช่นเดียวกับอาเซียน ประการที่ 2 การศึกษานี้พบว่าการเปลี่ยนผ่านสู่ดิจิทัลในอาชีวศึกษาไม่ได้หมายความว่าจะเป็นดิจิทัลเต็มรูปแบบ แต่การศึกษาสายอาชีพเปลี่ยนไปสู่การเรียนรู้แบบผสมผสานโดยผสมผสานการเรียนรู้ออนไลน์ (online learning) และเรียนในห้องเรียน (face-to-face learning) จากการวิเคราะห์สรุปได้ว่าทักษะการปฏิบัติในการศึกษาสายอาชีพเป็นเรื่องยากที่จะสอนทางออนไลน์ ประการที่ 3 ผลลัพธ์ที่แตกต่างกันของโครงการในระดับชาติได้รับผลกระทบจากนโยบายระดับชาติ การริเริ่มของผู้เข้าร่วม เงินทุนจาก GIZ และรัฐบาล และศูนย์สำหรับความพร้อมในการฝึกภาคปฏิบัติในการสอนเกี่ยวกับอุตสาหกรรม 4.0

จากการศึกษาวิจัยและการวิเคราะห์นี้พบว่าแนะนำให้ SEAMEO ร่วมมือกับภาคเอกชนสำหรับโครงการที่จะเกิดขึ้นเพื่อปรับปรุงคุณภาพ ประการที่ 2 สถาบันการศึกษาอาชีวศึกษาในอินโดนีเซียและไทยควรกระชับความสัมพันธ์กับภาคอุตสาหกรรม เพื่อทำความเข้าใจเกณฑ์แรงงานที่มีฝีมือที่ภาคอุตสาหกรรมคาดหวัง สุดท้าย รัฐบาลชาวอินโดนีเซียและไทยสามารถเรียนรู้จากกันและกันเพื่อปรับปรุงนโยบายทางการศึกษาให้เหมาะสมยิ่งขึ้น

CHULALONGKORN UNIVERSITY

| | | |
|---|---|---|
| สาขาวิชา | การพัฒนาระหว่างประเทศ | ลายมือชื่อนิสิต ..... |
| ปีการศึกษา | 2565 | ลายมือชื่อ อ.ที่ปรึกษาหลัก ..... |

# # 6384039724 : MAJOR INTERNATIONAL DEVELOPMENT STUDIES
KEYWORD: Regional Cooperation in Education, Vocational Education, Industry 4.0, Digitalisation in Education, Indonesia, Thailand, SEAMEO, GIZ, SEAMEO VOCTECH

Anastasia Sylvia : Southeast Asian Ministers of Education Organization (SEAMEO) 's Role in Digitalisation for Vocational Education Development: A Comparative Analysis of Indonesia and Thailand. Advisor: Vong-on Phuaphansawat, Ph.D.

This thesis focuses on the role of the SEAMEO (Southeast Asian Ministers of Education Organization) role in vocational education development in Industry 4.0. Nowadays, there is a demand for the education sector to align with Industry 4.0, known as Education 4.0. In 2018, the SEAMEO, in collaboration with the GIZ, launched a Regional In-Service Training Modules project to support vocational education for Education 4.0. This study compares the impact of the Regional In-Service Training Modules project in two countries with a medium level of education performance in Southeast Asia: Indonesia and Thailand.

This study employs a qualitative method with a case study. Data are collected from depth-interviews with 11 key informants, concept notes, original publications and literature from reliable sources. Data are analysed using a thematic analysis method and Stuffle Beam's CIPP (Context, Input, Process, Product) evaluation model as a conceptual framework.

Overall, this thesis concludes that SEAMEO matters for education development and supporting digitalisation in vocational education for Indonesia and Thailand.

There are three significant findings from this study. Firstly, this study found that SEAMEO has provided access to conduct a project at the regional level and gather participants from 11 countries simultaneously. However, SEAMEO's level of intervention is limited due to their non-binding and non-intervention nature, like ASEAN. Secondly, this study found that digitalisation in vocational education does not mean going fully digital; instead, vocational education shifts towards blended learning by combining online and face-to-face learning. The analysis concludes that practical skills in vocational education are hard to be taught online. Thirdly, the project's different outcomes at the national level are affected by national policy, participants' initiative, funding from GIZ and governments, and the centre for practical training readiness in teaching about Industry 4.0.

Based on the findings and analysis, this study recommends that SEAMEO collaborate with private sectors for their upcoming project to improve their quality. Secondly, vocational education institution in Indonesia and Thailand should strengthen their relationship with Industry to understand the criteria for skilled labour that Industry expects. Last, the Indonesian and Thai governments could learn from each other to improve education policies.

จุฬาลงกรณ์มหาวิทยาลัย
CHULALONGKORN UNIVERSITY

| | | |
|---|---|---|
| Field of Study: | International Development Studies | Student's Signature ..... |
| Academic Year: | 2022 | Advisor's Signature ..... |

# ACKNOWLEDGEMENTS

First and foremost, I would like to thank my esteemed supervisor Dr. Vong-on Phuaphansawat for her advice, guidance, patience and invaluable support during my study in MAIDS. Secondly, Asst.Prof Kasira Cheeppensook as Chairperson and Asst.Prof Nongluck Manowalailao as External Examiner as my comittee. Their immense knowledge and experience have encouraged me in completing my Master's study. I would also like to thank all informants for their time and willingness to share important information, the SEAMEO Secretariat family, GIZ representatives, all lecturers, MAIDS classmates and Indonesian communities for their support on my study in Thailand. I would also thank MAIDS Coordinator for all the technical and administrative support during my study.

Last, I would like to express my extraordinary gratitude to my parents, family, partner, and close friends for their immense support during my ups and downs in finishing my studies. It would be impossible for me to finish my journey in MAIDS without all the names mentioned in this acknowledgement. As Winston Churchill said, "Success is not final; failure is not fatal: it is the courage to continue that counts." I will continue my journey and further develop what I have learned while studying at MAIDS.

Anastasia Sylvia

จุฬาลงกรณ์มหาวิทยาลัย
Chulalongkorn University

# TABLE OF CONTENTS

**Page**

ABSTRACT (THAI) ..... iii
ABSTRACT (ENGLISH) ..... iv
ACKNOWLEDGEMENTS ..... v
TABLE OF CONTENTS ..... vi
LIST OF TABLES ..... viii
LIST OF FIGURES ..... ix
CHAPTER I INTRODUCTION ..... 1
1.1 Problem Statement ..... 1
1.2 Research Questions ..... 3
1.3 Research Objectives ..... 3
CHAPTER II LITERATURE REVIEW ..... 4
2.1 Vocational Education ..... 4
2.2 The Implication of Digital Transformation for Vocational Education ..... 5
2.2.1 Digital Economy: Industry 4.0 or Smart Manufacturing in ASEAN Countries ..... 7
2.3 Digitalisation in Education ..... 10
2.4 Regional Cooperation in the Education ..... 12
2.5 Indonesia and Thailand ..... 14
2.6 Vocational Education in Indonesia and Thailand ..... 17
2.6.1 General Overview of Vocational Education in Indonesia and Thailand ..... 18
2.6.2 Vocational Education in National Agenda for Digital Economy ..... 20
2.6.3 Challenge for Vocational Education in Indonesia and Thailand ..... 22
2.7 Conceptual Framework ..... 26
CHAPTER III RESEARCH DESIGN ..... 30
3.1 Research Design ..... 30
3.1.1 A Case Study: Regional In-Service Training Modules ..... 31

จุฬาลงกรณ์มหาวิทยาลัย
Chulalongkorn University

3.2 Data Collection ..... 33
3.2.1 Key Informants ..... 33
3.3 Data Analysis ..... 34
3.4 Data Analysis Matrix ..... 35
3.5 Significance of Research ..... 36
CHAPTER IV FINDINGS AND ANALYSIS ..... 38
4.1 Project Overview: Regional In-Service Training Modules ..... 38
4.2 Comparative Analysis Indonesia and Thailand: Stufflebeams's Evaluation Model ..... 43
4.2.1 Context Analysis ..... 43
4.2.2 Input Analysis ..... 49
4.2.3 Process Analysis ..... 51
4.2.4 Product Analysis ..... 60
4.3 Conclusion ..... 69
CHAPTER V CONCLUSION AND RECCOMENDATION ..... 71
5.1 SEAMEO support in the context of digitalisation in education ..... 71
5.2 SEAMEO's role as regional cooperation in education ..... 72
5.3 SEAMEO's role in development agenda. ..... 74
5.4 Recommendation ..... 76
REFERENCES ..... 80
ABBREVIATION ..... 87
APPENDIX ..... 88
VITA ..... 93

จุฬาลงกรณ์มหาวิทยาลัย
Chulalongkorn University

# LIST OF TABLES

**Page**

Table 1 .....15
Table 2 .....18
Table 3 .....31



จุฬาลงกรณ์มหาวิทยาลัย
CHULALONGKORN UNIVERSITY

# LIST OF FIGURES

**Page**

Figure 1 Industry 4.0 System in Manufacturing ..... 8
Figure 2 The spectrum of labor by skill level in several Southeast Asia countries .... 10
Figure 3 DigiCompEdu diagram ..... 11
Figure 4 Indonesia Education System Chart ..... 16
Figure 5 Thailand Education System Chart ..... 16

จุฬาลงกรณ์มหาวิทยาลัย
CHULALONGKORN UNIVERSITY

# CHAPTER I

## INTRODUCTION

This chapter consisted of three main parts: (i) Problem Statement, (ii) Research question and (ii) Research objective. The goal of this chapter is to present the problem, and overview about the topic that will be examine for this study

### 1.1 Problem Statement

The Southeast Asian Ministers of Education Organization (SEAMEO) has existed as a form of regional cooperation for education development in the Southeast Asian Region for more than fifty years. Nevertheless, the SEAMEO's popularity in the eyes of the public is not as enormous as the Association of Southeast Asian Nations (ASEAN), although they remain active as regional intergovernmental organisations until nowadays. This study aims to interrogate the role of the SEAMEO in education development by discussing how significant the impact of its project to support digitalisation in vocational education in two member countries: Indonesia and Thailand.

The SEAMEO is the oldest regional intergovernmental organisation established by the Ministers of Education across Southeast Asia in 1965 to support regional development through education platforms. The mission of the SEAMEO has been to facilitate Southeast Asian countries to cooperate with other countries, development agencies, and private sectors in the domain of education. The SEAMEO's work has been based on the assumption that strengthening regional cooperation is essential to support the development progress of countries in the Southeast Asian region. Today, the SEAMEO already has 27 regional centres across Southeast Asia, each of which covers specific education areas or topics. One of the centres is the SEAMEO Vocational and Technical Education and Training (SEAMEO VOCTECH), established in 1991. It is specifically designed for vocational education. The establishment of the SEAMEO VOCTECH has indicated the SEAMEO's attention on the field of vocational education development for over thirty years.

As a matter of fact, intra-regional gaps in education quality and equity remain high in Southeast Asia. Currently, Singapore is the only country in Southeast Asia with robust educational performance and is regarded as an education hub (ibid). The

CLMV nations (Cambodia, Lao PDR, Myanmar, and Vietnam) are in the bottom ranks, while Indonesia, the Philippines, Thailand, and Malaysia are in the middle ranks (Khalid et al., 2019). Cuyvers (2019) found that regional development initiatives are often insufficient in CLMV countries (Cambodia, Lao PDR, Myanmar, and Vietnam), which are mainly affected by economic factors and poverty rates (Cuyvers, 2019). Given the different levels of educational development among countries in Southeast Asia, the question is, are regional projects effective enough to support education development in countries with middle-rank educational performance?

Over the past seven years, the fourth industrial revolution (Industry 4.0) has gained attention from developed and developing countries to transform their country's economic development by transforming the manufacturing industry into smart manufacturing industry. As a consequence, the education sector should align itself with the emergence of Industry 4.0 to ensure that students will be part of the future workforce that is agile with changes. The demand for the education sector to align with the changes brought by Industry 4.0 is known by the term ‘Education 4.0.’

As Indonesia and Thailand have faced the agenda to transform their economy into the digital one, the smart manufacturing industry (Industry 4.0) has become one of the goals. Therefore, vocational education, which maintains the most intimate link with the industry world, has to adjust accordingly. Faced with the industry demand for digitally literate manpower, vocational education systems in Southeast Asia are in the process of shifting to education 4.0 by developing curricula and teaching methods and adopting the latest technology for learning. In that regard, the SEAMEO VOCTECH has committed to supporting Education 4.0 in vocational education by collaborating with the GIZ to create a project that places Industry 4.0 as the theme, specifically the Regional In-Service Training Modules.

Hence, this research will look into the implementation of the Regional In-Service Training Modules project in Indonesia and Thailand. They are two countries with similar national agendas in welcoming Industry 4.0, an education system, culture, and diverse demography.

Using Stufflebeam's CIPP (Context, Input, Product, and Process) evaluation model, this research will generate a comparative analysis of the project design and

จุฬาลงกรณ์มหาวิทยาลัย
Chulalongkorn University

implementation of the Regional In-Service Training Modules project in Indonesia and Thailand. This comparative analysis aims to compare the effectiveness of the regional project in countries with a medium level of education. Furthermore, this research aims to find how the SEAMEO has contributed to educational development through the project. Lastly, this research will assess the overall impact of the Regional In-Service Training Modules project and provide insights on factors that affect the project's outcomes in different member countries for upcoming projects to support Education 4.0 in vocational education.

### 1.2 Research Questions

- How has the SEAMEO's role been reflected in the Regional In-Service Training Modules? To what degree does the SEAMEO's role matter in supporting Education 4.0 in vocational education?
  - How does the Regional In-Service Training Modules project assist Education 4.0 in vocational education development in Indonesia and Thailand?
  - Have teaching styles, classrooms, and curriculums in Indonesia and Thailand vocational colleges changed after completing the Regional-In Service Training Modules? What are the obstacles to change?

### 1.3 Research Objectives

จุฬาลงกรณ์มหาวิทยาลัย
Chulalongkorn University

- To identify the effectiveness of the Regional In-Service Training Modules project in countries with a medium level of education.
- To identify the impact of Regional In-Service Training Modules in Indonesia and Thailand.
- To provide insights into what Indonesia can learn from Thailand and vice-versa to support the project's sustainability.
- To provide insights for the upcoming regional projects that assist digitalization for vocational education in Southeast Asia with a medium level of education.
- To interrogate the SEAMEO's role as a form of regional cooperation in Southeast Asia.
- To identify the SEAMEO's role in supporting digitalization in vocational education through the Regional In-Service Training Modules project.

# CHAPTER II

## LITERATURE REVIEW

The objective of this chapter is to gather the basic information as the baseline of this study and identify the existing research gap. This chapter will be divided into six main themes as the foundation to build the conceptual framework and provide a deeper understanding of the research topic. This chapter has two main sections which are : literature review and conceptual framework.

### 2.1 Vocational Education

This study aims to look at the area of education development; however, as the field of education development is broad, this research focuses on vocational education as one of the education branches.

According to Mikhail's mapping of the difference between vocational and general education, vocational education puts stress on specific skills and competencies, while general education puts more stress on theoretical knowledge and analytical skills (Mikhail 2007; World Bank 2020). On the other hand, OECD defined vocational education as education and training programmes that include both theoretical and practical skills and are tailored for a specific kind of job (OECD, 2009). From the description above, vocational education can be interpreted as education that weighs more on applied skills in a specific area supported by theoretical skills as well.

จุฬาลงกรณ์มหาวิทยาลัย
Chulalongkorn University

The role of vocational education is often associated with supporting particular economic sectors ranging from manufacturing, hospitality, and agriculture. Thus, it is necessary for vocational education to remain up to date with economic trends in a particular sector, which is confirmed by Eichhorost et al. (2015) from a developed country's point of view and Paryono (2017) from a developing country's perspective. Both authors agree that technological innovation often transformed the economic sectors, resulting in the new demand for practical skilled labour. From the industrialised countries' perspective, following the industry trend has become a prominent step for vocational education to provide relevant knowledge for their students (Eichhorst et al., 2015). On the other hand, from the non-industrialised

countries' perspective, vocational education should keep up with trend from top rank economic contributor to their country that is not limited to industry (Paryono, 2017).

Other than the economic trend, vocational education is expected to follow the technological trend to avoid producing graduates that fail to enter the labour market, as highlighted in the study by Bartlett (2009). Vocational education that fails to keep up with the technological trend will potentially exclude its graduate from the opportunity brought by technology (Bartlett, 2009). = However, vocational institutions might require support from external parties such as the government through their policy and funding to help them with the development process. This research is interested in exploring how the regional cooperation effort plays a role as an external party in assisting vocational education to keep up with the technology trend in this research.

In addition, Tilak (2003) quoted Becker that the goal of vocational education is to produce "specific human capital" (Becker, 1964; Tilak, 2003). The word 'specific' mentioned by Becker indicates that vocational education character is exclusively mastering special scope of skills and knowledge, which provide a solid reason for why vocational education should stay up to date with economic and technological trends. As the latest technology transforms the economic sectors, the type of the machine or system will change. Vocational graduates with knowledge of outdated technology and knowledge will face difficulty entering the job.

จุฬาลงกรณ์มหาวิทยาลัย
Chulalongkorn University

Thus, vocational education is vulnerable to the dynamic changes in the labour market that are affected by technology and economic trends. Furthermore, as the education sector is considered a place to support and prepare youth to enter the future labour market, failure to provide relevant knowledge has potentially increased the youth unemployment rate. Therefore, this topic has gained concern from a development perspective, not merely from an education perspective.

### 2.2 The Implication of Digital Transformation for Vocational Education

Nowadays, digital transformation has become the driver behind new economic trends in the 21st Century or the so-called digital economy. Before discussing the implication of digital transformation for vocational education, it is important to first look at the definition of digital transformation and its characteristics.

Udovita (2020) argued that digital transformation is perceived as a process of reshaping the economy, institutions, and society through digital dissemination (Udovita, 2020); while from the other perspective, Dobrica (2019) said digital transformation is defined as elevating the business model and working culture with advanced technologies to optimize the system and production (Dobrica, 2019). One simple example of digital transformation is Netflix and Spotify, which successfully transformed the entertainment business. Based on definitions and simple examples of digital transformation, it seems that changes brought by digital transformation have potentially triggered unemployment and inequality. Referring to Netflix and Spotify as examples, one consequence is that the Blockbuster movie rental business, which had approximately 19,000 stores in the United States, no longer exists, and many people who used to work in these stores had to find new jobs.

Dobrica's argument on unemployment is further explained by Gadre and Desokar's study about the characteristic of digital transformation. Gadre and Desokar (2020) said the characteristic of digital transformation is transcending several human roles with advanced technologies (Artificial Intelligence, Internet of Things, Cloud Computing, Robots, and Big Data) (Gadre & Deoskar, 2020). Transcending several roles means some types of jobs will disappear. The authors use autonomous vehicles as an example to illustrate the impact brought by digital transformation. The autonomous vehicle is driven by Artificial Intelligence and no longer requires a real driver. Based on the example, there is an urge to retrain or relocate the drivers to ensure that technological modernisation does not lead to massive unemployment. Thus, it can be concluded that digital transformation is coming to define how human resource should be developed.

In short, vocational education primarily supports skilled labour; meanwhile, skills in the context of digital transformation are changing, as illustrated in the examples of Netflix, Spotify, and autonomous vehicles. Therefore, we should interrogate the implication of digital transformation for vocational education.

จุฬาลงกรณ์มหาวิทยาลัย
Chulalongkorn University

### 2.2.1 Digital Economy: Industry 4.0 or Smart Manufacturing in ASEAN Countries

There are many examples and opportunities generated by digital transformation, such as blockchain economy, e-commerce, and smart manufacturing, known as Industry 4.0. To narrow the scope, this research focus only on Industry 4.0 or Smart Manufacturing in the Southeast Asian region.

Based on a synthesis of sixteen definitions, the digital economy is defined as an economy based on digital technologies (Bukht & Heeks, 2019). The digital economy is a generic idea and covers multiple economic sectors; however, , agree that the digital economy has brought abrupt challenges to the demand for skills and competencies (Bukht & Heeks, 2019). As discussed in the first section of the literature review about vocational education characteristics, it is likely that digital economy will also have an impact on vocational education. Therefore, digital economy is potentially increasing the demand for the vocational education sector to develop their education, to support the digital economy idea as a new economic trend.

Out of many prospects that the digital economy has tried to bring to the table, Industry 4.0 has been hotly debated by the public and the education and business sectors. In general, Industry 4.0 is a system that can be applied in any type of industry, not merely manufacturing (Gadre and Desokar 2020; Jayaraman 2019; Achtenhagen 2019). However, this study will focus on Industry 4.0 in the context of the manufacturing industry.

จุฬาลงกรณ์มหาวิทยาลัย
Chulalongkorn University

Industry 4.0, or the Fourth Industrial Revolution, is a system that incorporates cyber-physical systems (CPS), the Internet of things (IoT), and Cloud computing to create an automated system and enable real-time data sharing (Fig 2.1). The Industry 4.0 system is known for its capability to replace several divisions of labour with machines and limited human work. The concept brought by Industry 4.0 not only connects machine to machine, yet machine, system, and human work. The goal of Industry 4.0 is to create a “digital connected world” and increase productivity with more efficient time and resources (Jayarman, 2019). From a development view, efficient productivity may raise the issue of unemployment since the system requires fewer humans to operate. Despite the fact that the system proposed by Industry 4.0 is complex and sophisticated, the Industry 4.0 system is portrayed as a ‘nirvana’ idea

for countries that are leading in technologies, such as Japan and Korea (Jayaraman 2019; Achtenhagen, 2018). Many developed and developing countries are still keen to welcome the opportunity from Industry 4.0 to support their country's economic development. Their interest has been reflected in their national agenda that places Industry 4.0 as the theme to revitalise their economic sector.

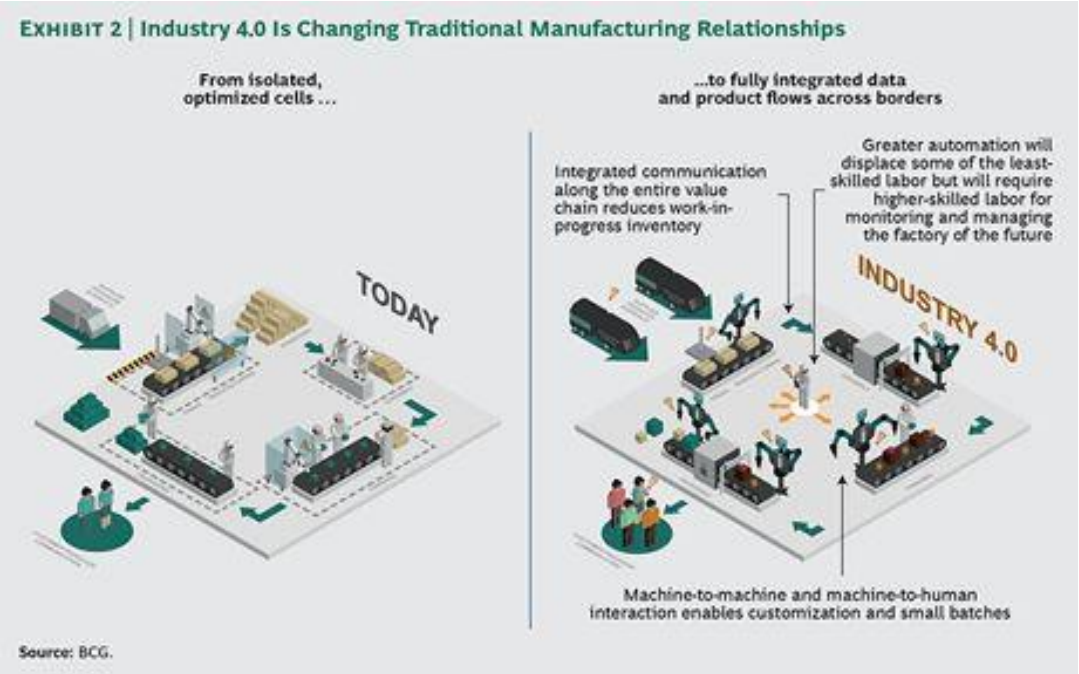



Figure 1 Industry 4.0 System in Manufacturing

*Source: Boston Consulting Group (BCG) (2015)*

Agenda on reinvigorating the manufacturing sector with the Industry 4.0 concept has become the most prevalent idea for developed and developing countries, including ASEAN nations (Arbulu et al., 2018; ADB, 2017; Li, 2020; Gennrich, 2020). Manufacturing is defined as an industry that focuses on transforming materials and information into goods to satisfy human needs. Since the emergence of the first industrial revolution, manufacturing has been familiar with disruptions brought by technology (Arbulu et al., 2018). The goal of disrupting manufacturing with the latest technology from time to time is to create a faster, more efficient, and effective production system and lower labour costs (Arbulu et al., 2018). It seems that the motive for using technology is heavily influenced by economic and production factors. On the other hand, the chances of creating massive unemployment are high as

well, confirmed by a study by Akst (2013) on technological anxiety and massive unemployment after the emergence of computer-based programming for some machines in the manufacturing industry in the middle of the 20th Century (Akst, 2013). Consequently, upgrading the manufacturing system requires resources beyond just funding and machines. There is a necessity in human resource development to upgrade the brainware of current employers to assist the adaption of technology and prepare the future workforce with up-to-date competencies and skills.

For ASEAN countries, Industry 4.0 has been seen as an opportunity to strengthen the regional economic integration and the ASEAN manufacturing hub 2030 (ADB 2017; ASEAN Brief 2019).

> "Manufacturing helps to support a high-productivity service sector, technical innovation, and agricultural modernization. It is a necessary component of the growth formula for Asian countries to get away from the middle-income trap." - (Chalamwong & Suebnusorn, 2018)

Based on the statement above, reinvigorating manufacturing with Industry 4.0 system is a conceptually good idea for ASEAN countries; however, Arbulu et al. (2018) mentioned that only 13% of ASEAN countries are ready in terms of technological infrastructure, policy, and human resource to welcome Industry 4.0 (Arbulu et al., 2018). The percentage of ASEAN countries' readiness for Industry 4.0 by Arbulu has indicated that there is a need for development in technology infrastructure, policy, and human resources. Furthermore, the diagram below portrays the level of ASEAN countries' readiness for Industry 4.0. Job shifting and new demand for competencies are two consequences that heavily influenced labour in the ASEAN region. The spectrum of labour by skill level in several Southeast Asian countries is dominated by medium skills, as shown in the diagram below (Chang and Huynh, 2016; Spöettel et al., 2021), meanwhile industry in the digitalisation age will increasingly look for labour with high skills.

จุฬาลงกรณ์มหาวิทยาลัย
Chulalongkorn University

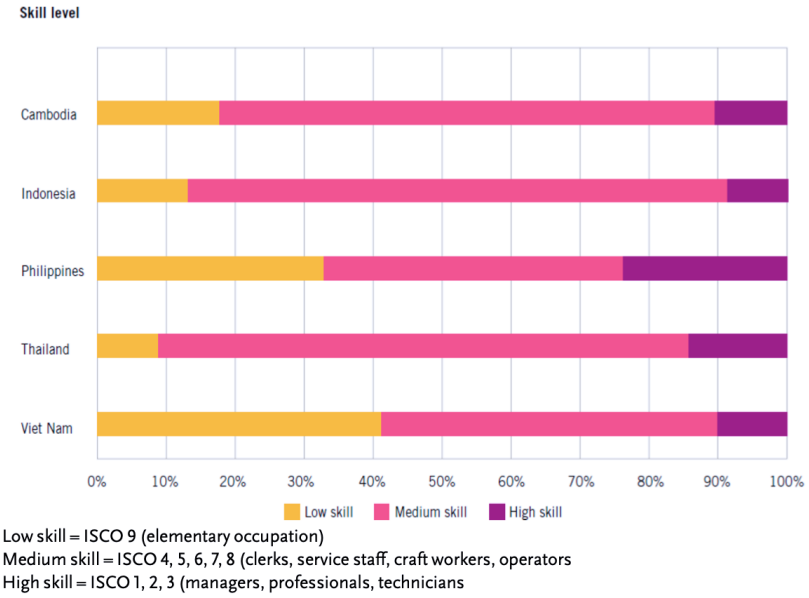



Figure 2 The spectrum of labor by skill level in several Southeast Asia countries

Additionally, Klaus Schwab explained that the impact of automation is not job loss, but automation would create job shifting (Schwab, 2016). However, to face the job shifting, upskilling and re-skilling are two essential aspects. The goal of upskilling and re-skilling are to assist people in building work harmony with the robot, system, and machine. Human resource development could be attained through formal and non-formal education and training programmes.

The literature review signifies that there is a need for development in the education sector as well to support the human resource part. In this light, the adoption of Industry 4.0 for ASEAN countries may require regional effort not merely in the context of the economy but also in education.

### 2.3 Digitalisation in Education

As the new work environment is heavily driven by digital technology, the idea of digitalising vocational education has become more intriguing to give a prior digital environment before entering the workplace. Nafea and Toplu (2019) have argued that digital literacy is essential for students who will be part of the future workforce (Nafea & Toplu, 2019). Digital literacy is defined as a set of skills that are related to the digital world, such as operating digital tools and understanding the digital system.

According to their argument, education has been considered a platform to introduce a prior digital environment before entering the workplace.

Digitalisation in education has been viewed as an alternative to prepare the education sector for facing challenges brought by technological advancement. Some scholars agree that digitalisation in education has been considered the solution to aligning the education sector and Industry 4.0 (Mourtzis et al., 2018; Muktiarni et al., 2019; Legg-Jack, 2021; Quereshi et al., 2021). The process of aligning the education sector and Industry 4.0 is known as building education 4.0. The goal of giving a digital experience at the education level is to assist changes in skills and competencies in the labour market. The process of digitalising education is a huge step and requires several stages. According to the framework developed by the European Union of Digital Competency of Educators (DigiCompEdu), there are six dimensions of digitalisation in education: (i) Professional engagement, (ii) Digital resources, (iii) Teaching and learning, (iv) Assessment, (v) Empowering learners, (vi) Facilitating learners' digital competence (Redecker, 2019). The diagram below implies that teacher sare crucial component in digitalising education and supporting learners' digital competencies.

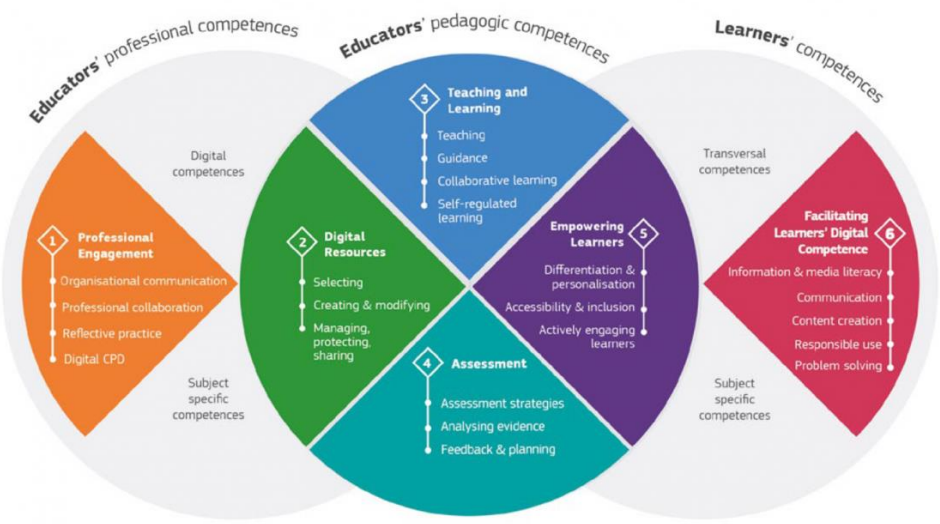



Figure 3 DigiCompEdu diagram

However, ADB (2021) has stated that curricula update is also crucial not merely teacher development(ADB, 2021). Based on the ADB finding and framework draw by DigiCompEdu, curricula should be integrating digital resource to support the digitalisation in

education. The other scholar Sharma (2019) said digitalisation in education should pay attention on Knowledge Management (KM) and try to bridge the overlapping gap (Sharma, 2019). What Sharma referring as overlapping gap is based on the fact that education institution still using old approach to student such as root memorisation and teacher-cantered learning(Sharma, 2019). Based on Sharma view, it is reflected that education needs to upgrade the way they teach and started to integrate the use of the technology. Additionally, Frick (2020) argue that teaching styles is important, however, building good interaction between teacher and student are essential to ensure the success of digitalisation in education(Frick, 2020). Frick argument has reflected one component of DigiCompEdu framework precisely number four on empowering learner.

As the literatures on digitalisation in education are generic concept, this study aims to apply the concept of digitalisation in education in the context of vocational education**.** First, the characteristic of vocational education is emphasizing more on practical skills, does upgrading the curricula and teacher skills are enough in supporting digitalisation in the context of vocational education? Second, based on the extensive literatures, curriculum update and teacher development are two key components in supporting digitalisation in education; however, digitalisation for vocational education seems require more assistance beyond curriculum and teacher development, such as partnership with other institution to improve the digital infrastructure and knowledge exchange for digital content creation. Thus, this study aim to look at the role of SEAMEO in facilitating its member countries for digitalisation in vocational education context.

จุฬาลงกรณ์มหาวิทยาลัย
Chulalongkorn University

## 2.4 Regional Cooperation in the Education

The concept of regional cooperation has emerged as a broad overarching field and is regularly discussed in relation to economic integration, education development, regional stability, regional security, and peace. In this section, the author will focus on regional cooperation in the context of education development and highlight regional cooperation in the Southeast Asia region.

Regional cooperation in education is an opportunity for the education sector to improve the three aspects that support or maintain education quality in general: (a) availability, (ii) access, and (iii) quality (Yap, 2012). According to Yap's argument, regional cooperation in education has offered five different ways to improve those three aspects through (i) People exchange, (ii) Information exchange, (iii) Transnational education, (iv) Regulatory reform, and (v) Development partnership.

Yap argues that SEAMEO Regional Centres are an example of the support for education development via Information Exchange (Yap, 2012). SEAMEO did information exchange by providing guidebook on how to measure participation and performance in Education, inviting expert to conduct a sharing or lecture, and collaborate with SEAMEO's partner to conduct project. However, this research would like to question whether regional cooperation in education tries to support education development via information or beyond information exchange.

A study by Sritongperng (2016) on one of the SEAMEO Regional Centre projects for the student exchange programme in Southeast Asia called ASEAN International Mobility for Student (AIMS) depicted that regional cooperation in education has tried to go beyond information exchange and facilitate resource exchange (Srithongperng, 2016). During the AIMS, students could experience different study environments and have learning experiences with teachers and curricula from different countries, which are considered resources rather than just information. Additionally, Anh (2016) confirmed that regional cooperation in education has tried to facilitate greater mobility for information and people and foster internationalisation in education at the regional level (Anh, 2016). In her view, regional cooperation is not merely doing information exchange. Anh used ASEAN University Network (AUN), SEAMEO Regional Centres, and University Mobility in Asia and the Pacific (UMAP) as examples of regional cooperation in education that have been trying to support internationalisation in education.

จุฬาลงกรณ์มหาวิทยาลัย
Chulalongkorn University

From another perspective, Sciff and Wineter (2002) argued that regional cooperation might facilitate countries within that region to create cooperative outcomes for common issues (Schiff & Winters, 2002). Therefore, regional cooperation is an arena to create or find the solution for education development issues in the region but does not specify the outcomes which will lead to actions, such as exchange, partnership, or regulatory reform (Schiff & Winters, 2002). Regional cooperation can be just a platform that merely gathers opinions and generates solution and option for member countries.

A study by Natalegawa (2018) argued that regional cooperation is often considered a form of balance of power strategy, and the motive of cooperation is heavily dominated by political interest, geoeconomics, and geopolitical dynamics

(Natalegawa, 2018). As a result, the cooperative outcome often directly addresses the development issues instead of focusing on generating many agreements to form alliances. His study primarily discusses ASEAN as a regional intergovernmental organisation; however, his findings have provided insights that there is a chance that the SEAMEO is perhaps just an instrument for international politics in the disguise of education. Despite the stigma of international organisations being a neutral platform for cooperation at the regional and international levels, international organisations are often considered as the stage to exercise political agenda (Crockett, 2012).

The thesis of the SEAMEO being a form of instrument for international politics on behalf of education development has been strengthened by two factors. Firstly, the SEAMEO's organisational structure that places eleven Ministers of Education from Southeast Asia, known as the SEAMEO Council, as the highest decision maker in the organisation has reflected that the agreements made might be based on each country's political interest rather than the awareness in developing education in the region. Secondly, research by Salamanca (1989) stated that although the SEAMEO was established during the Cold War period and received enormous funding from the United States government during the establishment process, the SEAMEO has had nothing to do with the effort to counterbalance the fear of Communism in Southeast Asia, unlike the Association of Southeast Asia Nations(Salamanca, 1989).

จุฬาลงกรณ์มหาวิทยาลัย
Chulalongkorn University

As this study takes a closer look at regional cooperation in education facilitated by international organisations, it will ask into whether the project purely focuses on supporting the education development in the region.

**2.5 Indonesia and Thailand**

There are five countries in the Southeast Asia region that belong to the group of medium level of education: Malaysia, Indonesia, Brunei Darussalam, Thailand, and the Philippines (Khalid et al., 2019). This research will only compare two countries which are Indonesia and Thailand. As illustrated in the table below, there are similarities and differences that make comparing these two countries interesting. The table below represents the differences and similarities between Indonesia and Thailand.

Table 1

| *Variable* | Indonesia | Thailand |
|---|---|---|
| Education System | Basic education of 9 years (6 years of elementary school and 3 years of junior secondary) (Nuffic, 2017) (Fig 1.3) | Basic education Mattayom 6 (6 years of elementary school and 3 years of junior secondary school) (Jandecha and Larpkesorn , 2018) (Fig 1.4) |
| National Agenda for Digital Economy | Making Indonesia 4.0 | Thailand 4.0 |
| Top 3 Economy Sector<br><br>Paryono (2017) | Agriculture, services, industry.<br><br>Major industries: oil & gas, textiles, automotive, electrical appliances, apparel, footwear, mining, cement, medical instruments and appliances, handicrafts, chemical fertilisers, plywood, rubber, processed food, jewellery, and tourism, maritime, and infrastructure. | Agriculture, services, industry.<br><br>Major industries: tourism, agricultural processing, beverages, textiles and garments, tobacco, cement, light manufacturing such as jewellery and electric appliances, computers and parts, furniture, plastics, automobiles and parts, and agricultural production. |
| Labour Force by Economic Sector CIA (2021) | Agriculture: 32%<br>**Services: 21%**<br>**Industry: 47%** | Agriculture: 31.8%<br>**Services: 51.5%**<br>**Industry: 16.7%** |
| Demography | **Population Surplus** (Triyono and Moses, 2018)<br>Number of populations: **271** million | **Aging Population** (Fry, 2018)<br>Number of populations: **69** million |
| Geographical Location | Maritime Southeast Asia | Mainland Southeast Asia |
| Language Kusmiatun and Liliani ( 2019) | English as a secondary language | English as a secondary language |

จุฬาลงกรณ์มหาวิทยาลัย
Chulalongkorn University

| | | |
|---|---|---|
| SEAMEO Priority Countries | Yes | Yes |
| Manufacture Hub for ASEAN (ASEAN Briefing, 2019) | Yes | Yes |

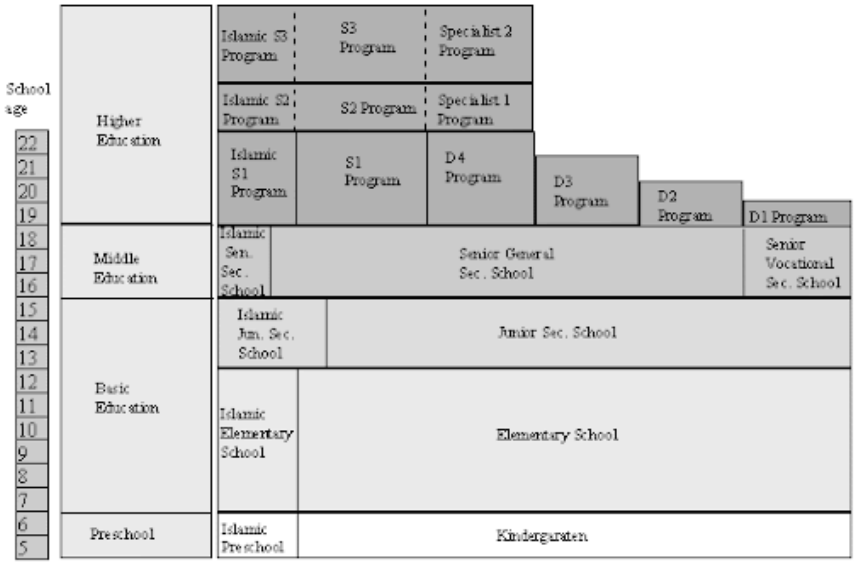



Figure 4 Indonesia Education System Chart
*Sources: UNESCO International Bureau of Education*

จุฬาลงกรณ์มหาวิทยาลัย

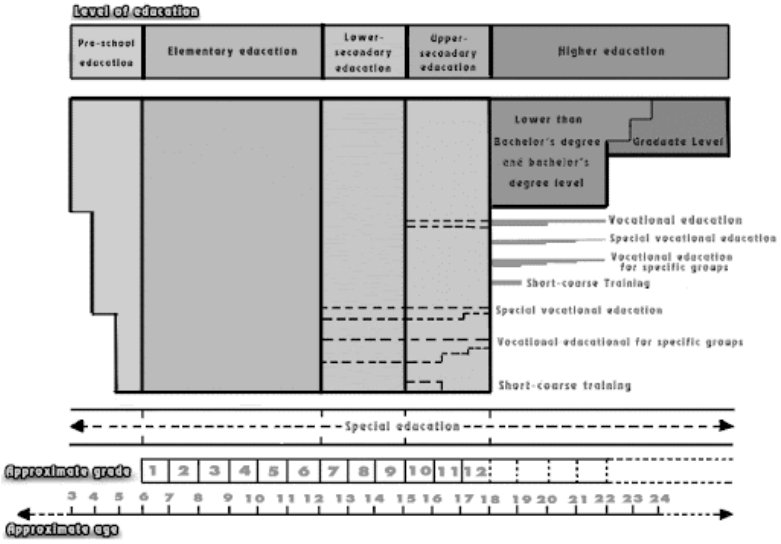



Figure 5 Thailand Education System Chart
*Sources: UNESCO International Bureau of Education*

Indonesia and Thailand are similar in terms of educational background systems and background, agenda on digital economy, top three economic sectors, status as ASEAN manufacture and SEAMEO member countries. However, the difference in geographical status, labour percentage based on the economic sector, and the number of the population have made it interesting to compare the two countries. Firstly, different geographical locations affect the diversity of economic sectors and the demand for practical skilled labour that the employees need. Secondly, the number of labour percentages based on the economic sector has indicated that reinvigorating manufacturing with Industry 4.0 is more relevant for Indonesia than Thailand. In that regard, a project that supports digitalisation in vocational education may receive more positive responses in Indonesia. Thirdly, the population may increase Thailand's urgency to adopt more technologies to substitute for the deficit of workforce that employees need and require more digital literate manpower to operate the technology. Lastly, different percentage of labour force in the market and population situation, have raised assumption if retrain worker in Indonesia is more urgent. Data from the CIA database reveals that 47% of the labour force in Indonesia goes to the industry sector, while only 16,7% of the labour force in Thailand goes to the Industry. Furthermore, Indonesia's and Thailand's education policy is slightly different. Thailand education policy is quite centralised, where Indonesia is on the opposite. Different situation between Indonesia and Thailand have made the two countries interesting to compare for this study.

จุฬาลงกรณ์มหาวิทยาลัย
Chulalongkorn University

**2.6 Vocational Education in Indonesia and Thailand**

This section will cover a general overview, the challenges of vocational education, and the position of vocational education on the national agenda in Indonesia and Thailand. To be specific, this research will focus on the national agenda related to the digital economy in Indonesia and Thailand.

### 2.6.1 General Overview of Vocational Education in Indonesia and Thailand

The general overview illustrated in the table below is based on gathered information from journals and reports about vocational education in Indonesia and Thailand. The structure of vocational education in Indonesia and Thailand are similar in terms of when the education is offered to students, legislative, types of institutions that offer vocational education and legislative. The difference is located in the degree offered at the higher education level for vocational education in Indonesia, which is not available in Thailand.

Table 2

| **Variable** | **Indonesia** | **Thailand** |
|---|---|---|
| **Age** | 16-24 | 17-24 |
| **Vocational Education starts to Offer** | Senior Secondary level | Senior Secondary level |
| **Where vocational education can be pursued** | **Formal Vocational Education**<br><br>**-Senior Secondary level**<br>Senior Secondary vocational college and Islamic Senior Secondary vocational college<br><br>**-Higher Education level**<br>Polytechnics, academy and vocational colleges, and Islamic vocational colleges. | **Formal Vocational Education and Dual Vocational Training (DVT)**<br>Technical colleges, Vocational colleges, Agricultural and technology colleges, Commercial colleges, Industrial and shipbuilding technology colleges, Fishery colleges, Administration and tourism colleges, Polytechnic colleges, Automotive industry colleges, Golden Jubilee Royal goldsmith colleges, and Arts and crafts colleges<br>(Chalamwong and Suebnusorn 2018) |

จุฬาลงกรณ์มหาวิทยาลัย
Chulalongkorn University

| | | |
|---|---|---|
| | (Triyono and Moses, 2017) | |
| | **Non-formal and Informal Vocational Education**<br><br>Commercial courses, vocational training centres, and community learning centres. | **Non-formal and Informal Vocational Education**<br><br>Commercial courses, vocational training centres, and community learning centres. |
| **Subject** | Information and communication technology; technology and engineering; health; arts, crafts, tourism, agro-business technology; and business and management. | Trade and industry, arts and crafts, home economics, commerce and business administration, Tourism industry, Agriculture, Fishery, Textile Industry, Information and Communications Technology (ICT). |
| **Number of Vocational Schools and Colleges** | 14,064 schools and 172 colleges (UNESCO-UNEVOC, 2020) | 412 schools and 106 colleges (Pasawano, 2017) |
| **Legislative** | Vocational education is governed by the Directorate of Vocational Education under the Ministry of Education and Culture (MoEC).<br><br>(Kemendikbud, 2020) | Vocational education in Thailand is governed by the Office of Vocational Education (OVEC) under the Ministry of Education (MoE).<br>(Pasawano, 2017) |
| **Degree offered** | **Senior Secondary level**<br>Certificate of Vocational Education<br>**Higher education level**<br>Bachelor level: Diploma of | **Senior Secondary level**<br>Certificate of Vocational Education<br>**Higher education level**<br>Bachelor level: Diploma of |

| | | |
|---|---|---|
| | Vocational Education Specialist 1 Programme: Master Specialist 2 Programme: Doctoral | Vocational Education, Bachelor of Technology, Bachelor of Industry. |

### 2.6.2 Vocational Education in National Agenda for Digital Economy

As both Indonesia and Thailand have struggled to escape the middle-income trap, both countries are trying to catch the opportunity to transform their manufacturing into smart manufacturing offered by the digital economy. Indonesia and Thailand have a long history as countries that have benefited from the manufacturing sector. To support the adoption of the national agenda in the digital economy, vocational education has been considered as one of Indonesia and Thailand's efforts to welcome the digital economy.

*Indonesia*

For the role of vocational education in Indonesia, according to the Law No. 20 of 2003 on the National Education System, vocational education has been perceived as a strategy to prepare the students who are ready to work immediately after they have graduated and to promote the BMW principle (Bekerja, Melanjutkan, dan Wirausaha/Work, Continue to higher education and Entrepreneurship) (Triyono & Moses, 2017). It is reflected that the position of vocational education is not directly associated with the support of the economic pillar.

However, according to the Vocational Education Blueprint 2020-2024 published by the Ministry of Education, the Indonesian government has tried to integrate vocational education as a strategy to support the economic agenda in these five sectors below.

Vocational education has been seen as a pathway to revitalise the digital economy and attract more foreign companies to consider Indonesia a manufacturing hub. The Vocational Education Blueprint 2020-2024 states Indonesia's goal in integrating Industry 4.0 into the curriculum development and focuses that it should be highlighted by vocational institutions. The Indonesian government expects a 52%

workforce with minimum senior secondary education and 700 workers who meet the industry standard by 2024 (Kemendikbud, 2020, p25).

Therefore, the agenda for digitalising vocational education seems relevant for Indonesia, knowing that the Indonesian government has placed agenda on Industry 4.0 for vocational education. In sum, success in supporting digitalisation in vocational education will contribute to the success of the Making Indonesia 4.0 agenda.

*Thailand*

To drive Thailand out of the middle-income trap, the digital economy has been viewed by policy maker as an opportunity. Under the Thailand digital economy agenda called *"Thailand 4.0,"* vocational education is expected to strengthen the economic pillar by supplying relevant skilled labour to improve productivity, especially in industries and manufacturing. Burapharat and Chupradit (2009), asserted that the goal of vocational education for Thailand is indeed to support economic growth (Burapharat & Chupradit, 2009). Therefore, this section will discuss the role of vocational education in Thailand's national agenda in the context of the digital economy.

According to Moonpa et al. (2019), The Thailand 4.0 agenda intends to establish an innovation-driven economy, and one aspect that will support Thailand 4.0 is a competitive workforce (Moonpa et al., 2019). As a result, the Thai government has recognized the importance of vocational education in developing a competitive workforce. Therefore, strengthening the development of vocational education is desired for them to produce a more competitive workforce. Jones and Pimdee (2017) used the term 'knowledge worker' to explain the labour demand in Thailand 4.0 (Jones & Pimdee, 2017). The knowledge worker in this context is defined as a worker who not only relies on practical skills but also has basic knowledge of theory.

However, other than supporting an innovation-driven economy, a competitive workforce has been seen as a strategy to attract higher foreign investment that will support the development of Thailand 4.0 (TIR, 2019). As Thailand 4.0 tries to transform the industries using sophisticated technology, funding has become a crucial aspect, as confirmed by Llyod (Lloyd, 2020). In other words, the position of

จุฬาลงกรณ์มหาวิทยาลัย
Chulalongkorn University

vocational education is also seen as a strategy to attract investment by producing a competitive workforce.

In sum, improving the quality of vocational education will benefit the Thailand 4.0 agenda in the future. In the context of this research, the effectiveness of regional projects in developing vocational teachers will support improving the quality of vocational education and indirectly support the adoption of the national agenda in the digital age in Thailand.

### 2.6.3 Challenge for Vocational Education in Indonesia and Thailand

Vocational education both in Indonesia and Thailand has suffered from the stigma of a less prestigious type of education and become less preferred option for students. Factors that affect the stigma and status of vocational have come from multiple directions; nonetheless, uneven quality of vocational education has been considered as the main factor for the stigma and low status. Scholars believe that the roots of the problems that affect the quality of vocational education mainly come from these three aspects: human resource quality, policy, and funding (Kadir et al., 2016; Triyonono and Moses, 2017; Pasawano, 2017; Chalamwong & Suebnusorn, 2018; Suharno et al., 2020; Tarat &Sindecharak, 2020).

*Indonesia*

A study by Kadir et al. (2016) mentioned that historical background and capacity building among teachers in vocational education are two factors that influence stigma, status, and the quality of vocational education (Kadir et al., 2016). During the Dutch Colonial, vocational education was introduced to train people with specific skills that benefited the Dutch's economic agenda and was offered to the middle-class and lower-class people. As a result, there is a mindset legacy that vocational education is not prestigious. Notwithstanding the historical background during Dutch colonialism, the author argued that the lack of capacity building for educators is one factor that significantly affects the stigma, status, and the quality of vocational education nowadays rather than the colonial legacy mindset. There is a shortage of teachers with relevant knowledge in vocational schools or colleges due to the lack of capacity building by the school. The shortage number of vocational

teachers is worsened by the fast-growing number of vocational schools or colleges between 2005 (5,665) and 2012 (10,256) as well (Kadir et al., 2016).

The issue of teacher quality is not merely affected by the knowledge they have learned. Teachers' low salaries, competencies, and recognition strongly influence their performance (Suharno et al., 2020). Another factor is insufficient curriculum, which indirectly forces teachers to give the knowledge that is not relevant enough to students (Suharno et al., 2020). Their study has revealed some curriculums provided by vocational institution are no longer relevant with the current demanded knowledge. Thus, teachers often taught some materials that are not relevant. Additionally, as vocational education puts stress on practical skills, Triyono and Moses' study has found that teachers lack practical skills, although the Indonesian government has tried to provide some training for them (Triyono & Moses, 2017). Their lack of practical skills has affected their teaching quality and left a big room for development.

Nowadays, digital transformation has changed the types of practical skills and teaching landscape that vocational teachers need to master, which creates overlapping issues to handle. Since the concept of digitalisation encompasses many advanced technologies, vocational teachers are expected to understand the new concept offered by digitalisation before they transfer it to their students. The Indonesian government has supported digitalisation in education, including vocational education (Kemendikbud, 2020). However, digitalising education is not a small step and remains challenging.

จุฬาลงกรณ์มหาวิทยาลัย
Chulalongkorn University

Digital divide and literacy among vocational teachers in Indonesia are also among the factors that hinder teachers' readiness for change (Kuputri, 2020). However, Kuputri's argument has reflected that other factors besides the digital divide and literacy exist. A study by Afrianto (2018) has revealed there is a chance that several teacher roles will be substituted by technology; however, the difficulty is not only the threat of teacher-replaceable positions but also how educators deal with new generations (Y genes and Z genes) that are tech savvy (Afrianto, 2018). His study has reflected that teachers' adaptation pace is also a challenge and key to ensuring vocational teacher readiness in Indonesia. Another research on vocational teacher readiness in Indonesia has revealed that teachers' perception and understanding of

how advanced technology transformed the work and how to integrate technology into their classroom remain shallow (Gunadi et al., 2020). Based on Gunadi's argument, challenges among teachers are affected by technology which may come from the lack of budget, not merely teachers' inability to integrate the technology into the classroom.

Vocational teachers have become more vulnerable to the rise of digitalisation. Based on the gathered literature, this research would like to know if external initiatives from regional cooperation have an impact or are effective in helping the development of vocational teachers in Indonesia.

*Thailand*

In the context of Thailand, a study by Chalamwong and Suebnusorn (2018) has found that the stigma and status of vocational education are a result of the failure of vocational education to promote graduates that meet the employer's expectations of semi-skilled workers (Chalamwong & Suebnusorn, 2018). As a result, the quality of vocational education is often considered not good. In their study, one of the factors that contribute to the failure of vocational education to generate graduates that meet employers' expectations is vocational teachers' lack of knowledge in the subject that they teach.

จุฬาลงกรณ์มหาวิทยาลัย
Chulalongkorn University

> "Unfortunately, there is a high turnover rate among vocational school teachers who have not yet received official government status, and many vocational school teachers are assigned to teach subjects outside their areas of expertise."- (*Tul Na Rachadamneon* 2011; Chalamwong and Suebnusorn 2018)

Chalamwong and Suebnusorn's findings have reflected that there is a skill mismatch among teachers in vocational education. However, another study by Tarat and Sindecharak (2020) has revealed different factors that determine the quality of vocational education, such as the vocational education management system, guidelines for vocational education development, vocational education curriculum, and teaching styles (Tarat & Sindecharak, 2020).

Pasawano (2017) argues there is a lack of teacher professional development programmes or training in medium-sized and small-sized vocational schools (Pasawano, 2017). Proffesional development encompasses pedagogical knowledge and teaching practices. As a result, rote memorization has dominated the spectrum of teaching and learning, especially in smaller schools, which weakly link employability skills to learning content. Pasawano's findings have also revealed that "framing" on vocational education as the second option done by the teachers from schools under OBEC to their students has exacerbated the stigma and status of vocational education.

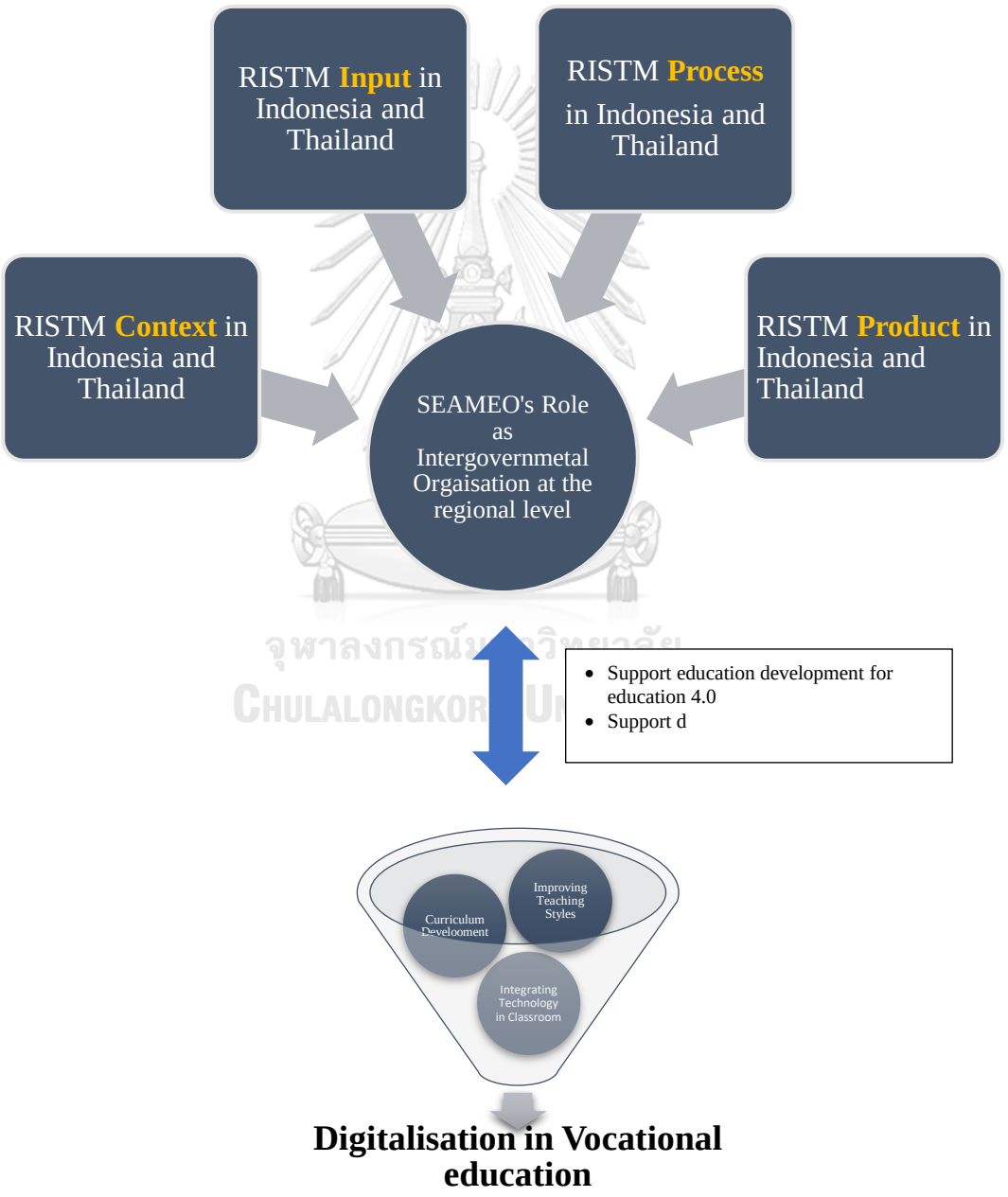
In the case of Thailand, studies have revealed that supporting teachers for digitalisation has been done before the Thailand 4.0 agenda. Research by Piriyasurawong and Nilsook (2010) on web-based training on knowledge management for teacher development has shown positive results based on pre-tests and post-tests (Piriyasurawong & Nilsook, 2010). Piriyasurawong and Nilsook have reflected that Thai vocational teachers adapt quite fast. The utilisation of web-based training has shown Thailand's effort in supporting digitalization for vocational education development. Based on the sample studies, the training only covered 30 teachers; therefore, it is too early to conclude that Thailand's vocational education is ready for digitalisation.

A study by Thongkam et al. (2019) has found that vocational teachers still struggle to find learning resources outside the classroom, indicating that some vocational teachers have not utilized a web-based platform yet (Thongkam et al., 2019). Thus, they have highlighted the importance of developing Information Communication Technology (ICT) Competency among teachers. ICT competency presented by Thongkam et al. encompasses learning management systems, social media platforms, smartphones, Internet broadband, search engine tools, and classroom software. Research by Pipattanasuk and Songsriwittaya (2020) on the use of *Augmented Reality (AR)* technology for the instructional model has positive results and responses for vocational education from students. Firstly, integrating technology has potentially improved the quality of the graduates. Secondly, as a consequence, teachers should understand how to utilize and integrate technology into the classroom to elevate the learning experience.

จุฬาลงกรณ์มหาวิทยาลัย
Chulalongkorn University

Literatures suggests that quality of vocational graduates that it still does not meet employers' expectations. In that regard, there is still room for development in vocational education. Therefore, this research would like to see how regional cooperation helps vocational education development in the digital transformation age through teacher development.

## 2.7 Conceptual Framework



The conceptual framework for this research was drawn based on the concept of regional cooperation in education and digitalisation in education. This research aims to identify the role of the SEAMEO as an intergovernmental organisation that supports the digitalisation of vocational education through Regional In-Service Training Modules.

According to the concept of regional cooperation in education (Yap, 2012), one out of five ways to facilitate cooperation is through information exchange (McKinsey, 2008; Yap, 2012). The SEAMEO has tried to facilitate information exchange through training as a form of regional cooperation in education, namely the Regional In-Service Training Modules project. Information exchange in this research was perceived as an activity where the SEAMEO provided experts to share relevant information about the impact of digital innovation on vocational education with the participants. Secondly, information exchange was delivered to the participants by providing modules and short-term training to face the changes brought by digital innovation. The term 'digital innovation' denotes the adoption of advanced technologies in Smart Manufacturing (Industry 4.0).

Based on digitalisation in education concept, developing curriculum, integrating technology into the classroom, and teaching approaches are three factors that help the education sector face the effect of digital innovation. Thus, I will assessed the relevance of Regional In-Service Training Modules in assisting vocational teachers in developing their teaching strategy in the context of digital learning and developing learning content. Developing teaching strategies and content has been defined as utilizing digital technology to teach and create learning content using software, application, and other digital tools. At the school level, the expected outcome is curriculum development. Curriculum development in this research is adding the digital competency needed from the labour market into the curriculum. The success of elevating teachers' teaching strategies and adding digital competency to the curriculum will contribute to the digitalization process in vocational education.

Digitalisation in vocational education has been defined as adopting digital technology for learning activities in the vocational classroom and elevating classroom activities. However, digitalisation has not merely been interpreted as the process of adoption of technology, yet, this research included the problem of how to assist

จุฬาลงกรณ์มหาวิทยาลัย
Chulalongkorn University

behaviour changes for vocational educators, curriculum changes, and changes in learning culture for digital learning as components to achieve digitalisation in vocational education.

I used Stufflebeam's CIPP (Context, Input, Process, Product) Evaluation Model to assess the Regional In-Service Training Modules project. The Context, Input, and Process stages are the areas to compare differences in the project design and implementation for Indonesia and Thailand. The Product stage was the outcome from both Indonesia and Thailand, which was used to determine whether the Regional In-Service Training Modules' final outcome supported the digitalisation in the education process by elevating teaching methods and contributing to curriculum changes. The table below illustrates each stage's detail from Stufflebeam's CIPP (Context, Input, Process, Product) Evaluation Model with context explanation for this study.

| | **Definition** | **Stufflebeam's Key Questions** | **Context** |
|---|---|---|---|
| **Context** | *Objective*<br><br>The Context stage aims to identify the backgrounds or issues that should be tackled and set the project's objective. The Context stage includes assessing economic, cultural, and geographical factors that possibly affect the implementation of the project. | What needs to be done? | This stage focuses on exploring the problems that become underlying factors for both the SEAMEO and the GIZ in conducting Regional In-Service Training Modules.<br><br>The word "problems" in context refers to the problems of vocational education in Industry 4.0 and challenges for the SEAMEO and the GIZ in conducting the project. |

จุฬาลงกรณ์มหาวิทยาลัย
Chulalongkorn University

| | | | |
|---|---|---|---|
| **Input** | *Resource*<br><br>The Input stage is the second evaluation step that focuses on identifying allocated resources. | How should it be done? | In this stage, the allocated budget, research, stakeholders, and other resources for Indonesia and Thailand in Regional In-Service Training Modules will be compared |
| **Process** | *Actions*<br><br>Process is the stage to examine whether the training has been appropriately executed as planned. The Process stage includes monitoring and gathering feedback from participants and stakeholders. | Is it being done? | To analyse the factors contributing to the outcome of the Regional In-Service Training for Indonesia and Thailand, the author will compare the implementation process training in Indonesia and Thailand. |
| **Product** | *Outcomes*<br><br>The last stage is product evaluation which focuses on the impact, measuring the effectiveness and sustainability of the project. The aim of the Product stage includes providing the solution for the upcoming project. | Did it succeed? | The Product stage will evaluate what kinds of results have been produced by Indonesia and Thailand after each country has sent the participants to join the Regional In-Service Training Modules. Furthermore, in the Product stage, factors that affect the outcome in Indonesia and Thailand will be analysed. |

*Source: Stuffle Beam's CIPP Evaluation (Aziz et al., 2018)*

จุฬาลงกรณ์มหาวิทยาลัย
Chulalongkorn University

# CHAPTER III
# RESEARCH DESIGN

This section will be divided into three main sections: (i) Research design, (ii) Data collection, and (iii) Data analysis. The aim of Chapter 3 is to provide the rationale of this study and how this study will answer the research questions.

## 3.1 Research Design

This study employs a qualitative method and a case study approach to examine the role of the SEAMEO in the Southeast Asia region. Perecman & Curran (2006) argue that qualitative research is often mistaken to be less significant than quantitative research. However, the objective of qualitative research is to explore causal reasons and relevant themes through interviews with key informants rather than to explain causal interferences like quantitative research. This study aims to answer how important the SEAMEO's is in Indonesia's and Thailand's digitalisation for vocational education

Firstly, as the scope of Southeast Asia is huge, this study took two countries as samples. The samples for this study included Thailand representing mainland Southeast Asia and Indonesia from maritime Southeast Asia. The foundation for choosing Indonesia and Thailand was based on the Most Similar Systems Design (MSSD) approach. MSDD is defined as an approach when we select countries that are nearly identical in every way except for the factors or variables on which we want to investigate their effect (Lor, 2011). There are some reasons why Indonesia and Thailand are of particular interest to this research. Based on an extensive literature review about Indonesia and Thailand, there number of similarities which make both countries comparable. The similarity factor, Indonesia and Thailand are two countries that have similarities in terms of the national agenda for the digital economy, education system, and the economic sector, as presented in the literature review section.

This research is a comparative analysis of the implementation of the Regional In-Service Training Modules as a case study in Indonesia and Thailand. The reason for choosing the Regional In-Service Training Modules was because it aims to improve level of dogitalisation in vocational education. The objective of doing the

จุฬาลงกรณ์มหาวิทยาลัย
Chulalongkorn University

comparative analysis based on Starfford (2013) is to reduce biased perceptions and enrich the recommendations for future research or project, as the comparative analysis does not focus on a single country or subject (Stafford, 2013). In addition, Pennings and Kemans (2020) said that the key to comparative research is to determine the list of variables on '*what'* to compare (Pennings & Keman, 2020). In the context of this study, the author used four variables from Stufflebeam's CIPP Evaluation Model (Context, Input, Process, Product) as the guideline for *'what'* to compare for Regional In-Service Training Modules in Indonesia and Thailand. The detail of Stufflebeam's CIPP Evaluation Model will be discussed in the research concept section.

### 3.1.1 A Case Study: Regional In-Service Training Modules

The Regional In-Service Training Modules project is the most relevant case study since the project specifically highlighted the topics of vocational education and Industry 4.0, compared to other projects that the SEAMEO had. Starting in August 2019 the first module of Regional In-Service Training Modules was kickstarted, following by the second on September and third module later on October. This study only concentrated on one project as it would be beyond the scope of this thesis to examine all SEAMEO projects related to digitalisation. The table below has presented a brief picture of Regional In-Service Training Modules derived from its concept note.

จุฬาลงกรณ์มหาวิทยาลัย
Chulalongkorn University

Table 3

| | |
|---|---|
| Project | Regional In-Service Training (Collaborative Project with RECOTVET)<br>• RECOTVET: Cooperative programme created by the GIZ to develop TVET to enhance human resource quality and institution capacity in the ASEAN region. Started in 2018 to develop Regional In-Service training modules to help vocational education meet the industry 4.0 requirements<br>• Training is a prioritized initiative from the SEAMEO based on the decision from the meeting between 11 |

| | |
|---|---|
| | Ministers of Education at the SEAMEO 3rd High Official Meeting (HOM) |
| Scope | Regional (Southeast Asia) |
| Background | • Growing demand from the digital transformation (Industry 4.0)<br>• Rapid changes brought by digital transformation<br>• The growing number of skills shortages in the ASEAN region<br>• New demands for the vocational institutions to shape skills that meet the requirements in the era of digital transformation |
| Stakeholders | GIZ-RECOTVET, SEAMEO VOCTECH |
| Funding | The German Government via GIZ |
| Length of the training | 5-14 days<br><br>Module 1: August 5-16, 2019, in Bangkok<br>Module 2: September 19-27, 2019, in Kuala Lumpur<br>Module 3: October 7-15, 2019, in Bangkok |
| Target for Training | TVET teachers/Educators, private sectors, TVET managers |

จุฬาลงกรณ์มหาวิทยาลัย
CHULALONGKORN UNIVERSITY

*Source: Regional In-Service Training Concept Note*

### 3.2 Data Collection

This thesis employed primary and secondary data to answer the research questions about the role of the SEAMEO as reflected in the Regional In-Service Training Modules and different outcomes produced by Indonesia and Thailand after the project implementation.

The goal of using primary data was to gather authentic perspectives from the key informants. The method used to gather the primary data was semi-structured interviews to open an opportunity for key informants to share their arguments that were not included in the interview list and would provide more explanations and add new insights that had not been discussed in the literature review. However, due to the COVID-19 situation, the interviews were conducted via online platforms and teleconferences.

The secondary data were used to support the arguments from the key informants and add more information and details to the findings. The types of secondary data were not limited to informants' original presentation slides, reports, the information retrieved from the organisation’s website, and written document by SEAMEO, GIZ and key informants.

#### 3.2.1 Key Informants

This research focused on the role of the SEAMEO in the Regional In-Service Training Modules; thus, the informants ranged from project organisers, module developers, facilitators, instructors, and participants. As this study examined the role of the SEAMEO, the author included the SEAMEO Secretariat representatives as an interview sample as well. The goal of adding the SEAMEO Secretariat representative was to provide a clear understanding and more insights into how the SEAMEO worked as an organisation. There are total 11 respondents for this study that divided into: project organiser, participants, SEAMEO Secretariat representative, instructor and module developer. To clarify, some key informants in this study had a double role in the Regional In-Service Training Modules.

This study employs snowballing sampling to collect the key informants, and the interview process is conducted remotely via online platform (Zoom or Google Meeting). Snowballing sampling is defined as a sampling technique where current

research participants assist in finding and recommending new participants. The snowballing sampling was started by interviewing project organisers and finding the contact for the other informants. The author contacted all respondents through email and confirmed the interview process by circulating Google Calendar.

### 3.3 Data Analysis

I employ thematic analysis technique. Mouthner & Doucet (1998) said that the goal of qualitative data analysis was to ensure that the respondent and informant shared their authentic view, while the researcher's role was to shape the research product based on the informant's response. The goal of thematic analysis was to categorise the answers provided by informants into four main themes: Context, Input, Process, and Product. The final step of this qualitative study was to draw a conclusion and provide recommendations based on the findings. The table below shows the data analysis steps with thematic analysis divided into five main steps.

| **Step** | **Description** |
|---|---|
| 1 Familiarisation | Familiarisation is the first step for thematic analysis to read and understand the data. The process of familiarisation in the context of this research includes two things: (i)Transcribing audio recordings into texts and (ii) Creating a small note for the jargon or local languages used by the informants to ensure the author does not miss the points and contexts. The goal of transcribing and creating a small note is to help the author understand the data. |
| 2 Coding | The second step is to create a small label known as the code to group the arguments given by the informants. In the context of this research, the author used a total of 35 different codes to mark the raw data.<br>The process of coding includes highlighting each code with different font colours and highlighters. |
| 3 Generating Sub Themes | The third step is combining several codes and creating tags or sub-themes to group the arguments or ideas. |

จุฬาลงกรณ์มหาวิทยาลัย
Chulalongkorn University

| | |
|---|---|
| 4 Defining and naming themes | The fourth step is determining the bigger umbrella based on the sub-themes to group the discussions. In the context of this research, the four main umbrellas include Context, Input, Process, and Product. |
| 5 Writing Up | The final step is writing the discussions based on the four main umbrellas and discussing the details using the coded text. The diagram below illustrates the matrix for data analysis. |

**3.4 Data Analysis Matrix**

| **1. Code** | **2.Tag/Sub-theme** | **3. Main Theme** |
|---|---|---|
| Digitalisation / Industry 4.0 | Background | Context |
| National Agenda: Digital Economy | | |
| Digitalisation challenge | | |
| Southeast Asian Countries' nature | | |
| Teacher | | |
| Different contexts of vocational education | | |
| GIZ Agenda | Collaboration motive | |
| SEAMEO Agenda | | |
| Organisation's Limitation | | |
| Money / Funding | Material resource | Input |
| Access | Non-material resource | |
| Recommendation | | |
| Research | | |
| Project Perception | Project Implementation | Process |
| Level of satisfaction | | |
| Feedback | | |
| Inclusive Approach | Project Design | |

จุฬาลงกรณ์มหาวิทยาลัย
Chulalongkorn University

| | | |
|---|---|---|
| Addressing Teacher's need | | |
| Module Contributor | | |
| Module objective | | |
| Decision Making | | |
| Intended competency related to Industry 4,0 | | |
| Address other problems to support digitalisation | | |
| Stakeholders/Project Partner | | |
| GIZ intended result | Expected Outcome | Product |
| SEAMEO intended result | | |
| Thailand | Produces Outcome | |
| Indonesia | | |
| Multiply strategy | | |
| Number of trainings conducted | | |
| Changes in vocational institutions | | |
| Policy | Obstacles to bigger outcomes | |
| Funding | | |
| Other challenges | | |
| Teacher quality | | |

จุฬาลงกรณ์มหาวิทยาลัย
Chulalongkorn University

### 3.5 Significance of Research

Firstly, based on an extensive literature review, there are only few studies that discuss about SEAMEO despite the fact of them have been operating for over fifty years. Thus, this research will discover SEAMEO role and how significant they are for education development in Southeast Asia. This study outcome will contribute as recommendation for SEAMEO as regional cooperation to improve their upcoming

work, mechanism and improve their significance for education development in Southeast Asia region.

Secondly, both Indonesia and Thailand have expressed interest in adopting Industry 4.0 system to leverage the manufacture industry with advanced digital technology6 and support country's economic development. Since education regarded as an important pillar to support the industry 4.0 agenda, thus education sector has expected to adjust accordingly with demand by going digital. Due to the limitation and time constraint, this study will discuss about the digitalisation in the vocational education. Based on the gathered literature, the concept of digitalisation in education is often discussed in the context of general education. However, as type of education that supply practical skilled labor, digitalisation in vocational education is also important. Thus, finding of this research will give a picture about digitalisation in the context of vocational education.

Thirdly, the outcome of this study will contribute as recommendation for education sector, policy maker and Ministry of Education in Indonesia and Thailand to develop vocational education in the future.

จุฬาลงกรณ์มหาวิทยาลัย
Chulalongkorn University

# CHAPTER IV

## FINDINGS AND ANALYSIS

This chapter aims to answer the research questions based on the data gathered from the interviews with informants. This chapter will be divided into three main sections: (i) Project overview, (ii) CIPP Analysis for Indonesia and Thailand, and (iii) Conclusion. The author used the CIPP evaluation Model as the guideline to compare the implementation of the Regional In-Service Training Modules in Indonesia and Thailand.

### 4.1 Project Overview: Regional In-Service Training Modules

The Regional In-Service Training Modules (RISTM) is a collaboration project instigated by the SEAMEO VOCTECH and the GIZ in 2018 due to their concern about the impact of Industry 4.0 revolution on vocational education landscape. An interview with Giorgio Schäf, Professor from the University of Bremen, Germany who was a module developer as well as instructor for Module 1 for the RISTM, indicates that there was an impact on the vocational education landscape caused by the advancement of digital technologies.

> "TVET people or graduates have a closer link to the industry, and they are deeply confronted with digitalisation. As the Industry started to revitalise the system with digitalisation, TVET people should develop a deeper understanding of how to run the latest system." - *(Giorgio Schäf, RISTM instructor and module developer, Lecture at University of Bremen, 8 December 2021).*

The project coordinators for RISTM, agreed on the matter that vocational education should adapt, in order to produce graduates that have relevant knowledge on the latest industry trends. Industry 4.0 encompasses a number of advanced technologies (Artificial Intelligence, Internet of Things, Cloud Computing, Big Data, and smart robots) that require a different set of digital skills for the workers and different levels of understanding of how the advanced technologies will transform the working flow in the industry. As the changes brought by Industry 4.0 is massive, Plate (GIZ Project coordinator) and Pasaribu (VOCTECH Project coordinator) said that

transforming the education for industry 4.0 requires time and several steps. Their statement reflected that transforming education require effort beyond training too.

> "Even a private sector cannot transform and adopt the Industry 4.0 from today to tomorrow" – (Sylvia Plate, RISTM Project coordinators GIZ, Programme Manager for GIZ-RECOTVET, 24 November 2021)

The statement above has implied that it is even more challenging for the education sector to change, assuming that the private sector has more funding and remain struggling keep up. In the literature review, some scholars expressed similar idea which strengthen above argument.

In total there were five sets of modules for the Regional In-Service Training Modules. Each module was designed based on the Southeast Asian countries' demand for what they expected to learn about transforming vocational education for Industry 4.0. Plate (GIZ Project coordinator) said that the goal of dividing the materials into five modules was to ensure that the participants would learn and understand the changes brought by Industry 4.0 step by step.

RISTM has been exclusively designed for Southeast Asia and vocational majors that supply the future workforce for the manufacturing sector. Pasaribu (VOCTECH Project coordinator) said that Industry 4.0 is most likely adopted by the manufacturing sector. However, the criteria for the participants for RISTM were generated by the GIZ, and the SEAMEO VOCTECH's role was to help the GIZ recommend candidates from the Southeast Asia region that had the potential for the training. The previous argument has reflected GIZ's more dominant role by fully have control in setting the criteria for participant.

| **Module** | **Criteria/ Prerequisite** | **Objective** |
|---|---|---|
| Module 1: Innovative teaching and learning for industry changes due to Industry | • TVET educators/teachers/instructors/trainers, as well as managers with relevant technical backgrounds, are the expected target group;<br>• Background in mechanical, processing and electrical fields is preferred;<br>• At least 2 years of working experience in | The module focuses on the awareness of the impact of technological changes on teaching and learning. The innovative teaching and learning for industrial changes |

| | | |
|---|---|---|
| 4.0 | vocational education and training or at least 2 years of relevant industrial experience;<br>• Good command of English (good or excellent). | will be initiated and integrated into the entire training deliveries. |
| Module 2: Professional development training for TVET teachers on Industry 4.0 | • TVET teachers with at least 3 years of working experience in technical & vocational education and training or industry;<br>• Attendance of Module 1 is preferred;<br>• Having a background in industrial automation with specific technical knowledge and skills as stipulated in the Learn and Work Assignment (LWA) requirements, such as knowledge and skills in Sensors and Actuators, Programmable Logic Controllers (PLC), Human-Machine Interface (HMI), BUS technologies, Supervisory Control, Data Acquisition (SCADA), Radio Frequency Identification (RFID) and Near Field Communication (NFC);<br>• Good command of English (good or excellent). | Industry 4.0 is integrating a variety of different technologies into a complete system. The most important features of this system are the intelligence of the individual components and the way these components network with smart factories. The module also strengthens the capacity of TVET teachers to manage and successfully implement the teaching procedures required to dynamically adjust and improve the teaching process in line with changing demands. |
| Module 3: Curriculum design for Industry 4.0 work-process | • Attendance of Modules 1 and 2 is preferred;<br>• TVET educators/teachers/instructors/trainers as well as managers with relevant technical backgrounds;<br>• At least 2 – 3 years of teaching experience in TVET with pedagogical background (in view of the duration of the course);<br>• Good command of English (good or excellent). | This module intensifies the TVET teacher's abilities to carry through work-process analyses for curriculum development and apply the self-reliant learning model in developing competencies that will respond to labour market needs. |

*Sources: Regional In-Service Training Modules Concept Note*

จุฬาลงกรณ์มหาวิทยาลัย
CHULALONGKORN UNIVERSITY

The three modules in the table above illustrate SEAMEO and GIZ's effort in supporting digitalisation by providing fundamental knowledge in the first module, nature and changes brought by Industry. The interview with project coordinators revealed that Module 1 is fundamental for Southeast Asia, as some vocational teachers should be aware of the changes. The modules are relevant enough to support digitalisation, as SEAMEO and GIZ ensure that teachers understand Industry 4.0 before training them about curriculum change and professional development. A solid understanding of the changes is fundamental; otherwise, teachers need to know what they should add to their classrooms and the new skills they should learn. Furthermore, as stated in DigiCompEdu on stages for digitalisation education, the framework emphasised more on teacher readiness which is reflected in the RISTM project from Module 1-3.

According to the report and additional information about the project detail, RISTM was kicked off in 2019, starting with Module 1. The table below illustrates the time, venue, and the number of participants that joined the training.

| **Module** | **Date** | **Location** | **Gender** | | **Total Participant** |
|---|---|---|---|---|---|
| | | | Male | Female | |
| Module 1: Innovative teaching and learning for industry changes due to Industry 4.0 | 5-16 August 2019 | **Bangkok**<br><br>Training at OVEC premises Workshop at Thai-German Institute (TGI) | 18 | 2 | 20 |
| Module 2: Professional development training for TVET teachers on Industry 4.0 | 19-27 September 2019 | **Kuala Lumpur**<br><br>Training and Workshop at German-Malaysia | 24 | 0 | 24 |

จุฬาลงกรณ์มหาวิทยาลัย
Chulalongkorn University

| | | | | | |
|---|---|---|---|---|---|
| | | Institute (GMI) premises | | | |
| Module 3: Curriculum design for Industry 4.0 work-process | 7-15 October 2019 | **Bangkok**<br><br>Training at OVEC premises<br><br>Workshop at Wang Noi Beverages Company Bangkok | 20 | 6 | 26 |
| Module 4: Quality Assurance and Quality Development in TVET institutions | 17-24 January 2020 | | | | |
| Module 5: Industry and TVET Institution Linkages | 2-13 March 2020 | | | | |

*Sources: SEAMEO VOCTECH Annual report 2020 and Interview with Project Coordinators*

จุฬาลงกรณ์มหาวิทยาลัย
Chulalongkorn University

The uniqueness of RISTM compared to other training was that the project adopted a “participant strategy “and had a maximum of 25 participants from eleven Southeast Asian countries for each Module. The “participant strategy” mean to select a few people that have relevant backgrounds and expect them to conduct training in their local languages to multiply the impact of the Regional In-Service Training Modules. This statement was confirmed by both project coordinators during the interview. As of today, there are a total of 650 people from Southeast Asian countries that the participants had trained. However, there was no specific post-test after the completion of the training.

## 4.2 Comparative Analysis Indonesia and Thailand: Stufflebeams's Evaluation Model

As stated in the introduction, the author has been interested in finding whether the regional project works better in a country with a medium level of education, compared to countries with low level of education. This section aims to draw a comparative analysis of the Regional-In Service Training Modules for Indonesia and Thailand. The author has used Stufflebeam's CIPP evaluation Model as the guideline to analyse the implementation of the Regional In-Service Training Modules starting from its project design until the outcome after the project implementation for Indonesia and Thailand. There are four domains in the Stufflebeam CIPP Evaluation Model: (i) Context, (ii) Input, (iii) Process, and (iv) Product. Thus, this section will be mainly divided into four sections based on Stufflebeam's criteria.

### 4.2.1 Context Analysis

*Context* evaluation is defined as the process of identifying the backgrounds or issues that should be tackled to determine the project's objective and assess economic, cultural, and geographical factors that possibly affect the implementation of the project. This section will present the differences and similarities for the context part based on the interview results with key informants.

According to the interviews of a number of key informants, they all agreed on the matter that digitalisation for vocational education had gained momentum in Southeast Asian countries, not only Indonesia and Thailand. All informants mentioned the importance of revitalizing the teachers to support the vocational education development for Industry 4.0.

> "Digitalisation is important for TVET. However, to support students, teachers should understand the concept and how to practice digitalisation in education." – *(Piriya Savana, SEAMEO Secretariat Representative I, Knowledge Management Manager (KMM) Ex Programme Officer for TVET, 12 November 2021)*

The statement of Savana (SEAMEO Secretariat Representative I) has signified that digitalisation in vocational education is important as she has handled a number of projects for vocational education between 2015-2019. Furthermore, Savana has

provided information that the SEAMEO Secretariat agreed on about the importance of digitalisation for vocational education in Southeast Asia.

> "One of the challenges for digitising education in Southeast Asia is each country has different capability in transforming the education due to the budget, infrastructure, and manpower." – *(Antony Schön, SEAMEO Secretariat Representative II, Integrated TVET Expert SEAMEO-GIZ, 12 November 2021)*

The above view has indicated there is a great lock in transforming vocational education due to the three factors: budget, infrastructure, and manpower. Furthermore, each country in Southeast Asia has different levels of readiness for digitalising education, which provide room for development agencies such as the SEAMEO and the GIZ to intervene and provide support. The same view among all informants has reflected that they have the same context regarding the problems that need to be solved for vocational education in the Industry 4.0 era. All informants have shown that regional cooperation is trying to fill the gap through their project and support development agenda. Furthermore the interviews with participants from , Indonesia and Thailand, have revealed similar issues for vocational educators. However, participant views reflect more on vocational education vulnerable position and indicate they need support for the development, especially to support teachers' development.

จุฬาลงกรณ์มหาวิทยาลัย
CHULALONGKORN UNIVERSITY

> "TVET education is *"rentan"* (vulnerable) to the changes such as Industry 4.0, unlike general education. However, the dilemma in revitalising TVET has come from multiple directions." - *( Putra Sudiro, Participant II Lecture at Mechatronic Department in Yogyakarta State University, 19 January 2022)*

For Indonesia, the dilemma in revitalising TVET has come from multiple directions as the gap between teacher's speed for adopting the knowledge through the training, places to practice knowledge, and the fast changes brought by technology which require teachers to adapt as fast as possible.

> *"Teachers do not always understand the concept, are resistant to change, and do not see the relevance of integrating technology or software into their subject"* - *(Beam Santichai, Thailand's Participant I, the Deputy Director of Thai-German Dual Education and e-Learning Development Institute (TGDE), King Mongkut's University of Technology North Bangkok / Lecturer, 31 January 2022).*

On the other note, for Thailand Santichai (Participant I) said from that the fundamental problem in creating changes was the gap between understanding and the teacher's idealism in using their strategy. Idealism in this context refers to teacher behaviour that resist in integrating technology, as they do not fully understand what should be done to prepare student for the industry 4.0 changes.

His argument has shown that teacher development is essential since teacher considered as frontline of education. However, vocational institution is lacking for resources for information on what teacher should be done, not only digital infrastructure to support practical training for teacher. Sutiyono (Participant from Indonesia) also mentioned similar issue for Indonesia in term of infrastructure. However, he asserts in Indonesia vocational teacher are open on integrating technology, unfortunately many vocational teachers are lack of understanding on how far and disruptive change brought by Industry 4.0. In conclusion, both Indonesia and Thailand have reflected the importance of teacher development to support Industry 4.0 agenda. However different issue may affect how teacher response about RISTM and made the project impact less significant.

GIZ and the SEAMEO VOCTECH were fully aware of the language barrier, how big the Southeast Asia region and the limited time for training, which became the baseline for using the participant strategy for educators. Both the SEAMEO VOCTECH and the GIZ expected participants to be able to conduct training in their national languages and reach more educators, as confirmed by Plate (GIZ Project coordinator) and DP (VOCTECH Project coordinator).

> "We are trying to give our best to support them (vocational educators) in the limited time"- *(Sylvia Plate, RISTM Project Coordinator, GIZ, Programme Manager for GIZ-RECOTVET, 24 November 2021)*

Additionally, Pasaribu added the different contexts of vocational education in Indonesia and Thailand lie in the number of vocational institutions. Indonesia has approximately 15,000 vocational institutions, while Thailand has fewer. Furthermore, a higher diploma in Thailand has been popular in the last two years, while a higher diploma level for vocational education in Indonesia is longer than in Thailand. However, Indonesia and Thailand have similar problems of unequal quality between vocational schools and colleges in one area and another area. Therefore, the participant strategy

The objectives of the RISTM, in brief, are to assist vocational educators in understanding the changes and challenges and to show the actual implementation of Industry 4.0.

> "TVET personnel need to understand the kind of transformation that happened in the industry; therefore, teachers are able to propose machine or other things they need to upgrade, in order to give relevant knowledge to the student and transform vocational education." - *(Sylvia Plate, RISTM Project Coordinator, GIZ, Programme Manager for GIZ-RECOTVET, 24 November 2021)*

> "Providing training that is relevant to the regional development agenda in the context of TVET in Industry 4.0 era." - *(Darto Pasaribu, RISTM Project Coordinator VOCTECH, Deputy Director of Professional Affairs, SEAMEO VOCTECH, 17 November 2021)*

จุฬาลงกรณ์มหาวิทยาลัย
Chulalongkorn University

Both project coordinators have expressed an argument on why the RISTM is designed for teachers as the main target based on the problems of teachers, which strengthens the idea of placing "educators" as the target to support digitalisation in vocational educational development. Educator has been clarified as a teacher, coordinator of any training programmes, management staff for training programmes, TVET government unit representative, and instructor for laboratories in the TVET within the vocational institution based on the RISTM guidebook. The RISTM have addressed problem or challenged expressed by informants for Indonesia and Thailand

Secondly, the RISTM project aims to support the adoption of the didactic teacher approach for vocational education. Several vocational institutions had

received sponsors for the simulator machine; unfortunately, some vocational teachers could not operate it, which hindered adopting the didactic teaching style said Plate. Pasaribu (VOCTECH Project coordinator) confirmed that teachers' ability to handle the machine had slowed down technology adoption. Although both project organizers shared similar answers, the interview result showed different motives for collaborating on this project of the SEAMEO VOCTECH and the GIZ. The different motives reveaalos about the nature of cooperation between two agencies.

According to Plate (GIZ Project coordinator), GIZ needed to collaborate with the SEAMEO VOCTECH to ensure project sustainability. In 2018, based on the GIZ research on the challenges for TVET in the Southeast Asian region, the GIZ found that from the start of 2018, TVET personnel and teachers struggled to cope with technological advancement brought by Industry 4.0, said Plate (GIZ Project coordinator*).* Therefore, GIZ came up with the idea of creating training to support vocational education development to face Industry 4.0 challenges and delivering a proposal to receive funding from the German government. However, to ensure project sustainability in the Southeast Asian region, GIZ needs partners that understand the Southeast Asian region and drive the collaboration with the SEAMEO VOCTECH (Plate, GIZ Project coordinator).

Plate (GIZ Project coordinator) clarified that the RISTM is a project at the regional level; therefore, the GIZ decided to collaborate with the SEAMEO VOCTECH since the SEAMEO generally covers the regional scope. Usually, the GIZ works on behalf of the German Federal Ministry for Economic Cooperation and Development (BMZ) and approaches the country bilaterally. For bilateral projects, GIZ usually collaborates with national companies, associations, colleges, and government agencies. According to Plate's (GIZ Project coordinator) explanation, the SEAMEO has bridged the GIZ and become the solution for the GIZ challenges in executing their projects at the regional level.

Meanwhile, Pasaribu (VOCTECH Project coordinator) mentioned that although the Regional In-Service Training Modules is a collaboration project between the SEAMEO VOCTECH and the GIZ, the project is part of the SEAMEO VOCTECH's bigger scheme in creating relevant training for vocational educators. Pasaribu (VOCTECH Project coordinator) explained that the theme for the SEAMEO

จุฬาลงกรณ์มหาวิทยาลัย
Chulalongkorn University

VOCTECH strategic goal for 2018-2023 is *"Preparing TVET for Industry 4.0."* Thus, the SEAMEO VOCTECH focuses on projects that highlight the topic of Industry 4.0.

> "When talking about Industry 4.0, we need technology, experts, resources, and the SEAMEO VOCTECH has limited resources" *(Darto Pasaribu, RISTM Project Coordinator, VOCTECH, Deputy Director of Professional Affairs, SEAMEO VOCTECH, 17 November 2021)*

Pasaribu's statement above explained the baseline for the cooperation with the GIZ and different motives in cooperating in the RISTM from the view of the SEAMEO VOCTECH.

Based on the different motives for the collaboration between the SEAMEO VOCTECH and the GIZ, the SEAMEO VOCTECH's motives for the collaboration are driven by the demand for more resources to run their projects, while in the context of the GIZ, they need partners as their extension to ensure that the RISTM project runs well in Southeast Asia and target the right topics or the great lock in developing vocational education. Their cooperation motives have reflected less political motives, but more on supporting the education development.

In conclusion, all informants have shared similar contexts regarding the motive of conducting the RISTM to assist vocational education development for Industry 4.0. The contexts of Indonesia and Thailand are different due to the number of vocational institutions that Indonesia has more than Thailand. Another difference is Indonesia teacher are lacking of knowledge about what they should learn and integrate, while Thailand facing difficulty with some teachers mindset about technology. However, as the RISTM is a regional project for all Southeast Asian countries, it has not specifically addressed Indonesia or Thailand's special needs. Moreover, participant strategy that RISTM use has reflected both organization effort in making project fit with Southeast Asia context, which reflected SEAMEO role as they are the middleman for GIZ. Lastly, GIZ and the SEAMEO VOCTECH have different contexts for their collaboration motive, yet their different contexts have complemented each other's interests and needs.

### 4.2.2 Input Analysis

*Input* evaluation is defined as an evaluation step that focuses on identifying the budget allocation, a strategy for project execution, the project's foundation, and non-material resources allocation. The goal is to identify the total amount of material and non-material resource allocation for the project in Thailand and Indonesia.

Firstly, an interesting fact about RISTM lies in Indonesia and Thailand's status in the eye of the GIZ. According to the GIZ policy, Thailand, Brunei Darussalam, Singapore, and Malaysia are classified as non-recipient countries, while Indonesia, the Philippines, and CLMV (Cambodia, Lao PDR, Myanmar, and Vietnam) are categorised as recipient countries. A non-recipient country is defined as a country that does not receive financial support to conduct workshops at the national level. In contrast, a recipient country is defined as a country that receives financial support to conduct workshops at the national level.

Thailand is no longer a recipient country because its status has changed to become a donor instead of a beneficiary. The changing status of Thailand as a donor is based on Thailand's successful transition from a developing to an emerging market economy.

Meanwhile, Thailand and Indonesia's status is the same for the SEAMEO in general, and the SEAMEO VOCTECH does not provide funding for both countries to participate in the RISTM and conduct training at the national level. The difference in status between Thailand and Indonesia in the eye of the GIZ might potentially affect project sustainability, which would signify the GIZ's role more than the SEAMEO in supporting digitalisation for vocational education.

จุฬาลงกรณ์มหาวิทยาลัย
Chulalongkorn University

Wahyu (SEAMEO Secretariat Representative III) confirmed that the SEAMEO Secretariat had not provided funding for the RISTM. He explained that regional centres sometimes receive funding for their project from the host country. In the case of the SEAMEO VOCTEH, the host country was Brunei Darussalam. However, in the case of RISTM, the funding mainly came from the German government through the GIZ. The total amount of funding received from the German Government was 8 billion euros, covering from the project design until its implementation. Besides funding, the GIZ has contributed to manpower and research. The GIZ supported the manpower input by inviting experts from Germany for fresh

perspectives outside the Southeast Asia region. Moreover, the GIZ invited the Thai-German Institute (TGI), German-Malaysia Institute (GMI), and some companies which had implemented Industry 4.0 technology to become the facilitators for the workshop. The goal of inviting TGI, GMI, and some industries was to support practical workshops related to Industry 4.0 for the RISTM project, said Plate (GIZ Project coordinator). The dominance role showed by GIZ contribution for the input has shown SEAMEO VOCTECH's less significant for RISTM and may have less authority to stir the project direction.

The contribution of the SEAMEO VOCTECH for the input part was in the form of manpower by gathering a number of vocational educator experts from Southeast Asia to provide insights for module development and research to suggest what materials should be highlighted for the modules, according to the interview with Pasaribu (VOCTECH Project coordinator).

> "We (SEAMEO) usually provide political support from member countries through our regular meetings between the SEAMEO Secretariat and the SEAMEO Council (eleven Ministers of Education) and help to find partners for the SEAMEO's regional centres to support their projects."- (*Budianto Wahyu, the Deputy Director of Programme Development (DDPD), SEAMEO Secretariat Representative III, 16 November 2021)*

จุฬาลงกรณ์มหาวิทยาลัย
Chulalongkorn University

Wahyu's (SEAMES Representative III) clarification has portrayed the nature of the SEAMEO in assisting education development by facilitating and gathering support from eleven member countries. Moreover, Wahyu (SEAMES Representative III) reflected that at the SEAMEO Secretariat level, they provided non-material support. However, political support from eleven ministers of education and facilitating partnership should be considered as their input to support the project. Furthermore, Savana (SEAMES Representative I) shared that the SEAMEO had very limited manpower, and often the person in charge of the project had more than one role. In short, the SEAMEO had numerous limitations, not merely in terms of funding. Evidence previous statement is Pasaribu (VOCTECH Project coordinator), who had

triple roles in the RISTM, including a project coordinator, module developer, and instructor.

In sum, the amount of resources allocated in the cases of both Indonesia and Thailand similar. GIZ played a significant role in providing input for the RISTM, from manpower to funding. However, the input provided by the SEAMEO was also considered important to ensure what the GIZ had invested in the project. Although the GIZ's role was quite dominant in the RISTM project since it was the main donor, The SEAMEO's role supported in assisting the GIZ in facing the challenges of doing the project at the regional level. In other words, GIZ needed partners to help it reach all Southeast Asia countries, such as the SEAMEO VOCTECH, to bridge them in executing the project at the regional level. The statement given by Plate (GIZ Project coordinator) reflected that the SEAMEO had provided input by allowing the GIZ to access their multilateral relations with eleven countries in Southeast Asia. By collaborating with the SEAMEO VOCTECH, the GIZ could reach eleven Southeast Asia countries to join the RISTM simultaneously, which would speed up the training process for vocational educators regionally instead of doing the training bilaterally.

### 4.2.3 Process Analysis

*Process* is the stage to examine whether the training has been appropriately executed, and it is the stage that the project implementation part is more discussed. This section will discuss the process, starting from the project design until the project implementation, to find out if the training is appropriately executed and meets the expectations of both participants and stakeholders.

#### Project Design

According to the interview with Plate (Project coordinator from GIZ), there are five main steps for the process in RISTM project design before the project implementation: (i) Research and meeting with experts to determine project direction, (ii) Developing the workshop, (iii) Developing the Modules, (iv) The GIZ and the SEAMEO VOCTECH's discussion on the best approach to offer the training to the Southeast Asian region, and (v) Creating the criteria for the participants who are eligible to join the training.

The RISTM project design started in June 2018 by gathering several vocational experts from Southeast Asia and Germany in a small workshop to make the project impactful and relevant, said Plate (GIZ Project coordinator). The insights gathered from experts soon become the data for the GIZ and the SEAMEO VOCTECH to shape the modules and design practical workshops. Plate (GIZ Project coordinator) said that RISTM was exclusively for Southeast Asia. The RISTM was expected to fulfil the expectation of the Southeast Asian participants, as confirmed by Pasaribu (VOCTECH Project coordinator). Thus, Pasaribu (VOCTECH Project coordinator) mentioned during the interview that the RISTM modules were not accessible for non-participants and other countries outside Southeast Asia. However, all modules were uploaded at SEAVET.NET, a knowledge platform managed by the SEAMEO VOCTECH. Only Southeast Asia regional participants could access it. Both project coordinators confirmed the exclusivity of the RISTM because materials were designed for Southeast Asia's needs. They added that TVET in Southeast Asia was not as advanced as TVET in Europe. Thus, the GIZ and the SEAMEO VOCTECH could not adopt the strategy or materials used by European countries. From the explanation regarding the project exclusivity, the RISTM project tried to support the Southeast Asian region's development. As the SEAMEO VOCTECH had been part of the RISTM and represented the SEAMEO, it was highlighted that the SEAMEO tried to support education development for Southeast Asia through this collaboration project.

จุฬาลงกรณ์มหาวิทยาลัย
Chulalongkorn University

Schön (SEAMEO-GIZ Integrated Expert) has shared a different view that European and Southeast Asia countries have different characteristics, which made the strategy for education development adopted by European countries may not be suitable for Southeast Asia. Schön (SEAMEO-GIZ Integrated Expert) emphasized more on the different characteristics of the region instead of the TVET quality between Europe and Southeast Asia. How the SEAMEO worked in the context of the RISTM project was knowledge exchange facilitation by allowing eleven countries to have the same rights in participating in RISTM; however, the SEAMEO seemed to have an implicit role. The SEAMEO's implicit role lies in their deep understanding of the region's characteristics, which help them provide insights that reflect Southeast Asia's characteristics. The importance of reflecting Southeast Asia characteristics was

to provide ideas that help determine how to approach participants for the RISTM and support the project's success at the regional level that strengthened by the statement below.

> "Even though the GIZ provide funding, we need to gather national perspectives to make the project *impactful and attractive* for them to join" *(Sylvia Plate, RISTM Project Coordinators GIZ, Programme Manager for GIZ-RECOTVET, 24 November 2021)*

The word "attractive" has echoed that the GIZ wanted to ensure RISTM would be accepted in the Southeast Asian region. As the SEAMEO member countries are eleven Southeast Asian countries, their insights would surely reflect Southeast Asia characteristics that help to provide ideas on making the RISTM more attractive for Southeast Asia.

The next step was developing the workshop. Schäf (Module Developer and Instructor) said that practical skills are the **"**heart" of vocational education, and unlike general education, in the context of digitalisation in education, TVET people need to understand how to operate the digitalised machine instead of shifting their learning activity in the digital media. Thus, RISTM consisted of two activities: workshop and training. Additionally, the modules were developed after the GIZ and the SEAMEO VOCTECH talked with workshop facilitators to get insights on what kind of knowledge the participant should understand theoretically before they participate in the workshop.

Sylvio Bath, the Director of Thai-German Institute (TGI) as one of the RISTM workshop facilitators and participant II for Thailand, he shared his perspective on the crucial role of having relevant training with the most up-to-date technologies. Bath's (Facilitator and Thailand's Participant II) argues that the RISTM tried to offer a great package to support vocational teacher development by highlighting both theoretical and practical parts. Speaking from the German vocational expert's point of view, in Germany, the government had provided funding to develop training centers in 16 states in Germany to support vocational education facing the Industry 4.0 changes and the idea that hands-on experience matters for vocational education development.

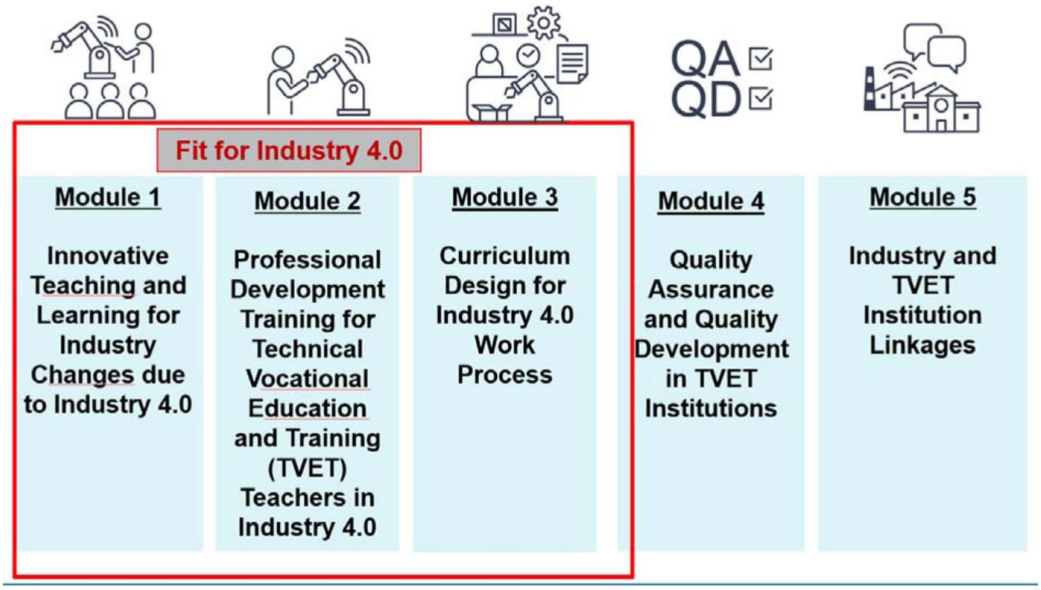
Unfortunately, Southeast Asia countries still lack training centers that have adequate equipment due to the funding. Furthermore, not every country in Southeast Asia has the industry that has already adopted Industry 4.0 technology. Therefore, through the collaboration with the GIZ for the RISTM, the SEAMEO aimed to provide equal opportunities for Southeast Asian participants to experience a hands-on experience with the latest machine that will help them understand changes brought by Industry 4.0. After participants have had the idea on what vocational institution in their home countries are lacking, the SEAMEO VOCTECH and the GIZ expect they would create recommendations for developing vocational education related to Industry 4.0 in their countries, respectively.

> "We (TGI) welcome collaboration with other countries in Southeast Asia to give vocational teachers and students hands-on experience with the advanced technologies used in Industry 4.0. They (vocational students and teachers) can come to TGI for training." – *(Bath, Facilitator and Thai Participant II, Director of Thai-German Institute (TGI), 10 December 2021)*

As not every country in the Southeast Asia region had a training center with the latest industrial technology, thus SEAMEO has indirectly giving networks for vocational institution to find training centre with latest technology.There's chance for the RISTM participants to collaborate with TGI bilaterally after the completion of the RISTM training to support teaching and learning experience at their school or college. In that case, we can argue that the SEAMEO has an indirect role in facilitating network exchange for Southeast Asia countries. Although TGI was not invited by the SEAMEO VOCTECH, by collaborating with the GIZ for the RISTM, all participants that represented Southeast Asia had the chance to connect with the TGI to support the development of vocational education in the future. Moreover, since the RISTM was not only collaborating with TGI, there was also a chance that the RISTM participants may propose collaboration with the German-Malaysia Institute (GMI) for practical training in the future.

After discussing with facilitators, the next step was to summarize the input from vocational experts and conduct desk research. The GIZ and the SEAMEO VOCTECH started to develop the five modules. The objective of Modules 1-3 or referred to as 'Fit for Industry 4.0,' was to provide a basic understanding and

knowledge of Industry 4.0 for the participants, while Modules 4 – 5 have been designed to assist development in the teaching process and cooperation with the Industry (Fig 4.1).




GIZ and the SEAMEO VOCTECH invited representatives from each Southeast Asia countries to join their module developer team. The representatives from each country had different backgrounds ranging from educators and ministry representatives. Pasaribu (VOCTECH Project coordinator) explained that some people who had a position in the ministry did not have a clear picture of what aspects should be improved for vocational education in the country; therefore, some representatives for module developers are educators.

An interview with an expert from Germany revealed that the teacher's ability to operate digital media (Zoom, WebEx, Ms Team) was not adequate for vocational teachers, unlike general education teachers. Meanwhile, the most important part for vocational teachers was that they understood what knowledge they must share with the vocational students to help them deal with industry demand rather than focusing on shifting to digital media to carry the knowledge in the classroom. In fact, theoretical and practical parts were inseparable for vocational education. Therefore, the module should cover more theoretical background that would help the participants to understand when they joined the workshop.

Dr. Sutiyono, a representative from Indonesia's Ministry of Education, and Lecturer, he was a module developer but also joined the RISTM as a participant. Sutiyono (Module Developer and Indonesia's Participant I) said on behalf of Indonesia's situation that he expected that the RISTM would highlight basic or introduction knowledge on Industry 4.0 because the gap in teacher capacity in Indonesia remained high and would provide a platform for practical training. During the meeting, he expressed that idea and added as input in developing the RISTM project.

In the case of Thailand, the input for module development came from Bath (Facilitator and Thai participant). He said on behalf of Thailand's situation that he expected the modules would provide insights and related knowledge on Industry 4.0 for curriculum development to support the students' understanding of some sophisticated technologies. Additionally, the Thai government has tried to provide relevant training to support the adoption of Industry 4.0. TGI is one of the institution that has been asked to provide the venue for the training. However, Bath (Facilitator and Thai Participant) clarified that the training they conducted on behalf of the Thai government was not only for teachers but also for manufacturing workers.

The interview with the module developers, it is reflected that Indonesian government expected that RISTM would provide both activities on training and knowledge exchange. Meanwhile, Thailand expected more knowledge exchange since the Thai government had been initiating training to develop the practical skills for vocational teachers outside the RISTM project. Therefore, it can be argued that the SEAMEO has had a bigger role in vocational education development in Indonesia than in Thailand. The difference is affected by availability of venue for vocational teachers or students to do their practical part and government initiatives by providing funding and training for Thai teachers via OVEC.

Based on information provided by module developers across Southeast Asia, the GIZ set the criteria for participants who would be able to join the training. Since each module had different topics, the GIZ established different criteria that can be seen from the project detail in the project overview section. In all modules, GIZ expected participants to have relevant backgrounds, with the expectation that their backgrounds would help the participant understand the training faster. "In the case of

จุฬาลงกรณ์มหาวิทยาลัย
Chulalongkorn University

vocational education, language is not the main barrier because machine language is similar everywhere just like coding language," said Plate (GIZ Project coordinator) to clarify why participants' previous background matters. Pasaribu (VOCTECH Project coordinator) explained that the prerequisite for the participant was decided by the GIZ. The decision-making for the criteria showed that the GIZ had more significant autonomy for the project's direction compared to the SEAMEO. The role of the SEAMEO VOCTECH was to recommend several names that meet the GIZ criteria, as the SEAMEO had more access to and understanding of the circumstance of eleven countries in Southeast Asia, said (Plate, GIZ Project coordinator).

In September 2019, Modules 1-3 (Fit for Industry 4.0) received official approval from the SEAMEO VOCTEH through their 30th Governing Board Meeting of the SEAMEO VOCTECH in Brunei Darussalam. Governing Board Meeting is an annual event of the SEAMEO VOCTECH, attended by eleven senior education officials from eleven SEAMEO Member countries and Brunei Ministers of Education to review the centre's operations, set policy and programmes, and discuss on centre's funding. Each SEAMEO regional centre has its own Governing Board member. In the context of this research, approval from the SEAMEO VOCTECH Governing Board has proved that (i) the RISTM module is accepted by the government of Southeast Asia and (ii) the SEAMEO has a role in providing access to gained support from eleven Southeast Asia government to support GIZ effort in RISTM.

จุฬาลงกรณ์มหาวิทยาลัย
Chulalongkorn University

In sum, the GIZ and the SEAMEO VOCTECH took a year to design the project from defining the problem throughout to the project implementation. The project design process has revealed that the GIZ has had the dominant role in the decision-making, as reflected in the process of setting up the criteria. However, the SEAMEO also hold a significant role in supporting the project legitimacy and providing access for GIZ to reach Southeast Asia country simultaneously, rather than bilaterally. Other findings from the module development process revealed several different expectations between Thailand and Indonesia regarding the RISTM project, for example Thailand expects more on learning from other country's practice through RISTM, while Indonesia is getting guideline about changes to help vocational education find component they should add and improve. Furthermore, the SEAMEO's contribution was reflected during the project design process in shaping

the RISTM by giving access to invite experts from Southeast Asia to provide baseline for RISTM project. SEAMEO's role considered essential their role fasten the process for data collection that become baseline in developing RISTM, to ensure the project is fit for Southeast Asia context.

**Project Implementation**

This section will discuss the project implementation from the perspectives of the organisers, instructors, module developers, facilitators, and participants (participants from Indonesia and Thailand) to draw a clear picture of how the RISTM was conducted and whether it achieved its goals.

This section will start with the similarity of project implementation for Indonesia and Thailand. As stated in the section of project design part, all module developers expected that the RISTM would provide a basic understanding of Industry 4.0. However, the interview with instructors revealed challenges in transferring the knowledge to the participants during the training. Although language was not the main concern for TVET, as machine language was similar. However, the language barrier among participants affected the knowledge transfer process. Schäf (Module Developer and Instructor) shared his opinion based on his interaction with participants from both Indonesia and Thailand. The questions they asked were not critical, and Schäf viewed this a result of the language barrier

Another point that Schäf as instructor highlighted that participants were motivated but did not raise critical questions due to their lack of understanding of the materials. Another view was expressed by Pasaribu, who became one of the instructors for the RISTM as well. He was satisfied with the implementation; however, he thought that participants' different capacity to absorb knowledge might affect their level of understanding. Overall, their comments for Indonesia and Thailand's participants are almost similar; they did well during the training.

However, both instructors understood that since the RISTM was a short-term training, they were satisfied enough and agreed on the idea that long-term training should be done in the future to help participants to have stronger knowledge foundation. Participants from Indonesia and Thailand have delivered similar statement

regarding training length. The insight from instructor and participant view on the process stage has reflected that digitalisation process in vocational education require effort beyond just a short project, as there are many aspects that should be covered. Additionally, participants expect on more hands-on experience such as training in centre.

According to interviews with key informants, there were differences in project implementation for Indonesia and Thailand. The difference lies in the participant selection process.

Beam Santichai, the Deputy Director of Thai-German Dual Education and e-Learning Development Institute (TGDE) and a lecturer at King Mongkut's University of Technology (KMUT) as Thailand's participant I, the GIZ and the SEAMEO VOCTECH made a *"strategic move"* by inviting the Office of Vocational Education Commission (OVEC) under the Ministry of Education (MoE) to join the RISTM and asking the OVEC to choose participants to represent Thailand. In other words, the GIZ and the SEAMEO VOCTECH did not approach the participants themselves for Thailand; instead, they asked the OVEC to select Thai participants for the RISTM. In other words the GIZ and the SEAMEO VOCTECH invited the participants via the Thai government. Meanwhile, in the case of Indonesia, the participants were not selected by the Indonesia Ministry of Education and Culture (MoEC) but by the recommendation from the SEAMEO VOCTECH networks and Sutiyono (Module Developer and Indonesia's Participant) as a representative from MoEC. The different process of selecting the participant did not affect their rights or give Thai and Indonesian participants different treatment during the training process.

จุฬาลงกรณ์มหาวิทยาลัย
Chulalongkorn University

Another difference during the implementation is Indonesia participant are actively engaged rather than Thai. Their level of engagement may determine how far participant absorb the knowledge.

Overall, Schäf (Module Developer and Instructor) and Pasaribu (VOCTECH Project coordinator) considered that the RISTM implementation did not go far from what they expected based on the project design. However, due to the limitation of time and resources, the RISTM was only supporting a small part of digitalisation, such as basic understanding on Industry 4.0 terminology, showed the participant

Industry 4.0 technology and knowledge on how to reshape the curriculum to go toward Education 4.0.

In conclusion, the project implementation of the RISTM has received positive responses from Indonesia and Thai. SEAMEO through the SEAMEO VOCTECH successfully accommodated Southeast Asia's needs and expectations. However, how significant their success in supporting vocational education development through educator training will be revealed in the product analysis. Looking at participant engagement and their less critical question to the instructor, they might have not fully understood about the material, which will impact on how they will transfer knowledge to RISTM to another vocational teacher. The comments from instructors revealed that the SEAMEO's effort in providing the opportunity for Indonesia and Thailand vocational educators to expand their knowledge might or might not be significant since the participant's level of understanding and background are not their fields to intervene.

### 4.2.4 Product Analysis

This section will discuss Indonesia and Thailand's delivered products after the participants participated in the training. The discussion in the product analysis will start with the project organisers' expected outcome and link it with the findings for Indonesia and Thailand to tell if the outcome has met the project organisers' expectations. Next, there will be a discussion on the obstacles faced by Indonesia and Thailand in achieving the desired outcome. By discussing the obstacles, this analysis will help the author to understand how far the SEAMEO could intervene and create changes.

#### Expected Outcomes

Digitalisation in the context of vocational was not going fully digital but leaning toward blended learning since practical is the core. Schäf clarified the meaning of blended learning in the context of vocational education as using digital media to support the theoretical part and using technologies, such as Virtual Reality (VR), Augmented Reality, and simulator machines for the practical part. Schäf (Module Developer and Instructor) further explained and emphasised that the use of

technology is not to substitute but to give prior digital environment to the students as practical skills in the context of Industry 4.0 deal with a number of digital technologies. Thus, expected outcome of RISTM, in brief, supported the adoption of blended learning with a didactical approach in all Southeast Asia countries including Indonesia and Thailand.

However, expecting massive change was unrealistic and that digitalising vocational education would take years. Going to blended learning is not realistic outcome.

> "Even Denso (private company) needs more time to up-skill their workers" - *(Sylvia Plate, RISTM Project Coordinators GIZ, Programme Manager for GIZ-RECOTVET, 24 November 2021)*

Plate's statement emphasised the difficulty of retraining the workers who already had experience and foundation still takes time. Her statement gives the assumption that training teachers which have less experience in practical part will take even longer. Thus, RISTM's the primary goal was not reskilling but to raise teachers' awareness of changes brought by Industry 4.0. Reskilling has been defined as a process of learning new essential skills to be able to perform an entirely different role. The goal of raising awareness is to support teachers to find the type of digital skills they need to learn to enrich their current teaching skills. SEAMEO and GIZ expect that rasiing awareness is the early step on going to blended learning.

จุฬาลงกรณ์มหาวิทยาลัย
Chulalongkorn University

Based on the interview, it revealed that SEAMEO and GIZ have slightly different expeted outcome, although both organisation are in the same boat for many aspects of the project. GIZ had three expected outcomes they would like to see. The first is 'networking' between participants. Plate explained that the goal of networking is to provide greater chances for participants to build a partnership to support what their institution needs. The second point is that the 'participant has a clear understanding of the changes.' Therefore, they can make suggestions and help vocational institutions in their respective country to adapt to the changes brought by Industry 4.0. Last is 'transfer the knowledge about Industry 4.0' in the local language and support vocational education development at the national level.

According to the interview with Pasaribu (VOCTECH Project Coordinator), the SEAMEO VOCTECH expected that 'the RISTM will have multiple effects and reach out to more vocational teachers.' Pasaribu further explained that the current gap of understating regarding Industry 4.0 among Southeast Asia vocational teachers is still high. Thus, the SEAMEO VOCTECH expects to use multiple strategies to narrow the gap in understanding Industry 4.0 first.

> "We cannot expect pedagogical change if vocational teachers do not understand what is going on." – (*Darto Pasaribu, RISTM Project Coordinator VOCTECH, Deputy Director of Professional Affairs, SEAMEO VOCTECH, 17 November 2021)*

Based on Pasaribu's (VOCTECH Project coordinator) statement above, enhancing vocational teachers' understanding has been considered as mandatory and the first step in supporting digitalisation for vocational education before expecting bigger outcomes. Secondly, after assisting more vocational to understand changes brought by Industry 4.0, the SEAMEO VOCTECH expected that teachers would start to introduce the use of technology to the classroom. However, in the long run, Pasaribu said that the SEAMEO VOCTECH expected that the participants would be able to develop what they have learned from the RISTM and gain more confidence to integrate technology into the classroom and provide relevant suggestions to the government. Overall, in the interviews with both project organisers, they expressed their expected outcomes for the RISTM in the short term and long term.

The outcomes generated by Indonesia and Thailand based on the interviews and relevant documents given by the informants to support the statements they delivered. The flow of discussion for the outcome part will be divided into two: (i) The outcome as of now (end-product that participants have delivered) and (ii) the challenge in achieving a bigger outcome.

**Indonesia and Thailand's Outcomes**

Based on the interview with Indonesian participants, there are three efforts that have been achieved by participants. Firstly, Sudiro (Participant II) confirmed he had published a book, *"Paradigma Baru Pembelajaran Vokasional Era Revolusi Industri*

*4.0,"* to multiply his knowledge of national language besides conducting training at the national level for vocational teachers. Sudiro (Participant II) said the content of his 50-page book is based on the Regional In-Service Training Modules and has been used by his institution, schools, and diploma to master's students in these cities: Bandung, Jakarta, Yogyakarta, Semarang, Malang, Surabaya, Makassar, and Manado. Based on Sudiro's statement, the multiplier effect generated from his book most likely covers the Java Island area (Bandung, Jakarta, Yogyakarta, Semarang, Malang, and Surabaya) and two cities in Sulawesi Island (Makassar and Manado). Meanwhile, Indonesia has a total of seven main islands and 93 cities, according to Statistics Indonesia (BPS). Thus, the multiplier effect has not reached half of the Indonesia area, which supports Pasaribu's (VOCTECH Project coordinator) statement that the RISTM only covers a small part.

> "Teachers in Indonesia do not have equal access, and books are most likely suitable to bridge the unequal chance to access technology for Indonesia." - *( Putra Sudiro, Participant II Lecturer at Mechatronic Department in Yogyakarta State University, 19 January 2022)*

Sudiro's (Participant II) opinion above has become his baseline and decision to write a book, reflecting that the digitalisation challenges for vocational education are not merely teachers but also infrastructure and access. Secondly, DS (Module Developer and Participant II) shared that he has proposed suggestions to the Indonesian Ministry of Education for curriculum change. However, he added that proposing curriculum change will take a long time to see the results. Thirdly, both Sudiro (Participant II) and Sutiyono (Module Developer and Participant II) have confirmed that they conducted training and seminars at the national level in an effort to multiply the knowledge they have gained from the RISTM. Sutiyono (Module Developer and Participant II) said there were approximately 50 pieces of training he had conducted, but he confirmed that they were one-time training instead of a set. At the same time, Sudiro (Participant II) conducted five national pieces of training.

The interviews with Indonesian participants revealed three main obstacles to achieving bigger outcomes or changes. Firstly, government funding to conduct

training and unholistic policy between the Ministry of Education and the Ministry of Industry, as said by Sutiyono (Module Developer and Participant II). Learning from Germany success story in developing vocational education, cooperation between the Ministry of Education and the Ministry of Industry would be important to ensure that the education sector would produce graduates that fit with the world of work. Furthermore, collaboration with the industry becomes the key to providing a clear direction for vocational education, which he proposed in his recommendation for curriculum change for a 'college-industry' partnership. He clarified that 'college-industry' partnership should be covered in mandatory student apprenticeship in industries. These industries should send their workers to help vocational teachers teach the practical part for vocational education. However, on top of that, a clear government policy still becomes the key to supporting the partnership. Secondly, inadequate digital infrastructure and platform for the practical part were mentioned by both informants Sudiro (Participant II) and Sutiyono (Module Developer and Participant II). Lastly, Sudiro (Participant II) shared about Indonesian teacher culture in general and awareness of the changes in the industry. He referred to such culture as their old school approach, which lacks technology awareness, literacy, capacity, and innovation.

> "There is still a knowledge gap among vocational teachers about Industry 2.0 and Industry 4.0 Mbak" - *( Putra Sudiro, Participant II Lecturer at Mechatronic Department in Yogyakarta State University, 19 January 2022)*

Sudiro's (Participant II) concern about the teachers' knowledge gap has become another motive for him to use a manual way (book) to multiply the knowledge.

Unfortunately, due to the different chances to practice the materials that have been trained and the large scope of Industry 4.0, short-term training may not be adequate to help vocational educators catch the idea of what kind of knowledge they should transfer to the students. In other words, there is a great lock in transferring knowledge to the teachers, which surely affects the process of transferring knowledge to students.

> "The RISTM has mapped the changes brought by Industry 4.0, which gives the participants a clear picture of what is happening and how Industry 4.0 disrupt the vocational education landscape. RISTM is eye-opening for me personally" - *( Putra Sudiro, Participant II Lecturer at Mechatronic Department in Yogyakarta State University, 19 January 2022)*

However, he strongly argued that the GIZ and the SEAMEO VOCTECH had done a good job for the RISTM, as reflected in the statement above. At the end of the interview, Sudiro (Indonesia's Participant II) expected that the training duration would be longer and there would be follow-up projects in the future, as Industry 4.0 has gained more attention compared to 4 years ago (2018).

Another view from Indonesian participants came from Sutiyono (Module Developer and Indonesia's Participant I), that participated in Modules 1-3. His background is slightly different from Sudiro (Indonesia's Participant II), as he is a lecturer and representative for the Ministry of Education and Culture. Sutiyono (Module Developer and Indonesia's Participant I) said that RISTM has addressed what Indonesia expects, as he was in charge as a module developer as well.

> "The RISTM has opened more networks for Indonesia institutions to collaborate with other institutions in Southeast Asia." – *(Dr. Sutiyono, Module Developer and Indonesia's Participant I, Representative from Ministry of Education and Lecturer, 20 January 2022*

จุฬาลงกรณ์มหาวิทยาลัย
Chulalongkorn University

While in Thailand, based on the interviews with participants, there are two outcomes that they have delivered.

> "Thailand is facing an aging population now. The machine is fixed cost and faster than human labour. Therefore, Thailand is investing in the machine and pushing Industry 4.0 for the manufacturing sector to support economic growth. However, we need to make sure the workers can operate it" – *(Beam Santichai, Thailand's Participant I, the Deputy Director of Thai-German Dual Education and e-Learning Development Institute (TGDE), King Mongkut's University of Technology North Bangkok / Lecturer, 31 January 2022).*

Santichai's (Thailand's Participant I) statement revealed that the RISTM is strongly relevant to supporting vocational education in Thailand to produce a future workforce. Furthermore, his explanation has confirmed that demographic factors matter, as presented in the literature review for this study.

Thailand has conducted training for 120 vocational colleges with a total of 400 participants as each vocational college was asked to send 3-4 participants. The national level training was conducted 80% online and 20% onsite. The onsite training was conducted at the premise of the Thai German Institute (TGI), Chonburi. As one of the trainers in the national training, Santichai (Participant I) clarified that there was no specific post-test after the completion of training for the participants. Santichai (Participant I) said the training was organised with OVEC assistance and funded by the OVEC. Therefore, the national training was able to reach many participants simultaneously. In the case of Thailand, the OVEC has a major role in multiplying the training. Bath shared that TGI has received a number of requests to create training and funded by the OVEC. At the same time, Thai government has annual agenda to support vocational teacher training. An interview with Savana (SEAMES Representative 1) has added more explanation based on her previous experience in conducting exchange projects for vocational students under the umbrella of 'SEA-TVET Exchange.' In the case of Thailand, everything should go through via the Ministry of Education.

จุฬาลงกรณ์มหาวิทยาลัย
Chulalongkorn University

The above accounts have revealed that the management system of vocational education in Thailand is more centralised than in Indonesia. Thus, Santichai (Participant I) earlier, a "*strategic move"* in the Process stage regarding the GIZ's decision to invite the OVEC, indeed by inviting OVEC to the RISTM GIZ able to reach out more participants. However, an interview with Savana (SEAMES Representative 1) has explained that the GIZ decision to invite OVEC cannot be considered as a strategy; instead, it is a characteristic of the education system in Thailand.

For the second outcome, in a smaller scope, Santichai (Participant I) shared that he has started to teach new software features to lectures at his institution and helped teachers to enhance the classroom. Santichai confirmed that some teachers

have started to use TIA Portal Programming. Besides, Santichai (Participant I) shared that he has conducted 50 pieces of training which could be categorized into teacher training and company training. However, his training has been conducted under the flag of King Mongkut's University of Technology (KMUT). Santichai (Participant I) argued that company training is one-way to multiply the knowledge from the GIZ to support workers in re-skilling and up-skilling, besides focusing on vocational teachers and educators.

The participants have expressed that in the case of Thailand, there are two obstacles to achieving a bigger change.

Firstly, similar to Indonesia, in Thailand achieving curriculum change would take at least five years, and the area of curriculum change was not their level of intervention. Secondly, Bath (Facilitator and Participant II) shared three main points based on his view from a business perspective: (i) Lack of budget for vocational institutions to keep up with high technology, (ii) Weak cooperation between vocational institutions and industries, and (iii) Education is not enough to shape graduates qualification. Ideally, building future worker qualifications in the context of vocational education should be attained with three steps: education, practical training, and job training. Thus, to complete the three steps mentioned earlier, cooperation between schools or colleges, training centres, and industries or companies is essential. Problems in supporting digitalisation for vocational education are not merely from vocational teachers but other factors that influence each other. Additionally, teacher culture in Thailand has been considered a hindrance in supporting digitalisation in vocational education as well. Teacher culture in this context is defined as their habits that are not used to the technology and prefer to use a more traditional approach. Teacher culture has often made them resistant to change in how they teach in the classroom. However, he argued that teacher culture problem is mainly affected by teacher's confidence in operating online platforms or digital tools.

จุฬาลงกรณ์มหาวิทยาลัย
Chulalongkorn University

One of the interesting findings from this research is a point shared by the TGI Director, Bath (facilitator and participant II) in early November 2021, TGI started to build cooperation with PIDI 4.0 (*Pusat Inovasi Digital Industry 4.0*/Industry 4.0 Digital Center) to support their development as Industry 4.0 center in Indonesia as another result from the RISTM. The PIDI 4.0 is a government institution under

Indonesia's Ministry of Industry to support and accelerate the adoption of Industry 4.0 based on the information shared on its website. The structure of PIDI 4.0 is slightly similar to TGI, which aims to support the Ministry of Industry's agenda. Based on the interview with Bath (facilitator and participant II), TGI would like to share the latest Japanese technology for lean manufacturing and the Internet of Things with PIDI 4.0 in the future. However, the partnership between PIDI 4.0 and TGI is still in the early stage, but it has indicated that the RISTM is leading to another result besides training the educators.

In sum, the product analysis has revealed that participants from Indonesia and Thailand have been able to continue training at the national level, which is considered to multiply the effect of the RISTM and help to transfer the knowledge to other educators. Another result from the RISTM is future cooperation between TGI and PIDI 4.0, which reflects that there is networking as a result of the project. The outcomes revealed by participants in Thailand and Indonesia have shown effort in supporting the adoption of blended learning with a didactical approach to support the digitalisation in vocational education. However, there are a number of limitations that comes from the domestic factors that slow down the digitalisation process in vocational education, such as infrastructure, the gap in teacher knowledge, and funding.

As this thesis is interrogate SEAMEO's role, the product have proved that they are matter. The product from Thailand and Indonesia are covering the expectation from SEAMEO VOCTECH on multiplying knowledge. However, how far the knowledges from RISTM have been multiplied is a different story. The product analysis from both Indonesia and Thailand has revealed that the problem of creating changes, such as national policy is beyond the SEAMEO area. Furthermore, the problem related to funding in advancing vocational school infrastructure has gone beyond the SEAMEO's capacity and the SEAMEO has a limited amount of resources to conduct their own projects. Lastly, as the participants from Indonesia and Thailand mentioned teacher problems, such as their knowledge gap and resistance to integrating technology, those problems are also beyond the SEAMEO's limit since changing teacher culture will take a longer time and require other assistance besides short-term training.

จุฬาลงกรณ์มหาวิทยาลัย
Chulalongkorn University

### 4.3 Conclusion

Based on Stufflebeam's CIPP Evaluation model, each step from context, input, process, and product has revealed the SEAMEO and the GIZ's different and similar contributions and roles.

The context analysis has first revealed that the GIZ and the SEAMEO VOCTECH have had a mutual relationship in collaborating for the RISTM and shared a common interest in assisting digitalisation for vocational education. Secondly, it has been confirmed that the GIZ and the SEAMEO VOCTECH have seen similar problems with teacher struggles in adapting to the latest technology, which has become the baseline for conducting the RISTM.

However, the input analysis has provided evidence of the GIZ's significant role in providing material and non-material resources for conducting the RISTM project. The input findings have become the first indicator that shows the SEAMEO's insignificant role in the context of the RISTM. However, the input findings have revealed that the SEAMEO's non-material support has a crucial role in the RISTM project as well. Secondly, the input has shown the difference in Indonesia and Thailand's statuses as recipient and non-recipient countries from the GIZ that potentially affect the project implementation.

Next, the process analysis in this study is divided into two sub-discussions: project design and project implementation. The project design stage has revealed that the GIZ has played a significant role in the decision-making process for the module design and in establishing the participant's criteria. The project design stage has depicted the submissive role of the SEAMEO VOCTECH compared to the GIZ. The project implementation stage has reflected Indonesia and Thailand's differences in how the SEAMEO and the GIZ selected the participants for the RISTM.

Overall, the product analysis has shown that both Indonesia and Thailand have produced good outcomes to multiply the knowledge. A similar outcome produced by Indonesia and Thailand is that both countries have conducted training at the national level. However, Indonesia and Thailand produced outcomes have not been exactly the same.

In the case of Indonesia, how Sudiro ( Participant I) multiplied the knowledge through a book can be considered a 'smart strategy' to reach out to more people and

จุฬาลงกรณ์มหาวิทยาลัย
Chulalongkorn University

help to provide a basic understating of Industry 4.0 for more vocational teachers. However, as Schäf (Module Developer and Instructor) said that practical skills are the centre of vocational education. How Sudiro (Multiplier I) has multiplied the knowledge is considered as highlighting the theoretical part only. However, Sudiro's strategy is considered smart since people have different speeds of absorbing knowledge, and books are considered a good solution to anticipate people's different learning speeds compared to one-time training.

Meanwhile, for Thailand, the findings have revealed how Julio (Participant I) has multiplied the knowledge of vocational teachers, and company training is interesting. Although his strategy may be considered as not in line with the goal of RISTM to train vocational teachers, Julio's initiative reflected his level of understanding of how to support Thailand in entering the digital economy, other than training vocational teachers. Furthermore, the findings revealed that the Thai government's support from OVEC has contributed to the sustainability of the RISTM for Thailand.

In sum, this research's findings have presented the GIZ's dominant role in the context of the RISTM project that is reflected in input, process, and product steps. Although the SEAMEO's role in terms of providing funding and decision-making is less dominant than that of the GIZ, the SEAMEO has another role in ensuring the project implementation and project acceptance that is also important. In sum, both the SEAMEO and the GIZ have their own strength. However, the findings have revealed that the SEAMEO has contributed to the project and its role in assisting the digitalisation of vocational education. However, SEAMEO characteristic is similar to ASEAN, non-binding and non-intervenes, as reflected from the argument about challenge in multiplying knowledge. The detail of the SEAMEO roles will be discussed in the next chapter.

จุฬาลงกรณ์มหาวิทยาลัย
Chulalongkorn University

# CHAPTER V

## CONCLUSION AND RECCOMENDATION

This chapter will be divided into two main sections: (i) Conclusion and (ii) Recommendations. The objective of Chapter 5 is to explain the SEAMEO's role as a form of regional cooperation. As earlier mentioned in the literature review section, there are a few types of roles offered by regional cooperation in education, and one of them is a facilitator. Based on the finding, this chapter will discuss whether the SEAMEO's role in the context of the RISTM is purely a facilitator or beyond a facilitator. Secondly, this chapter aims to answer the main research question: Does the SEAMEO matter in education development and support the development agenda through education development?

### 5.1 SEAMEO support in the context of digitalisation in education

Through the RISTM, this study confirmed that SEAMEO had supported education development in the context of assisting digitalisation in vocational education for Indonesia and Thailand. Firstly, according to the DigiCompEdu framework, assisting teacher development is one component of digitalisation in education. The SEAMEO, through the SEAMEO VOCTECH, has supported digitalisation in education by placing teachers as targets for the project that aligns with the DigiCompEdu framework. Secondly, the RISTM module content has provided guidance for vocational teachers, in line with the criteria for supporting teaching and learning proposed by DigiCompEdu. Overall, the modules from Regional-In Service Training Modules have highlighted several aspects that should be done to support "Teaching and Learning," according to DigiCompEdu.

However, based on the gathered data, the level of change at the college level remains in the grey area due to the lack of project assessment after learning. The interviews with participants have revealed that they have implemented the knowledge they learned from the RISTM at their institutions. However, there is no clear evidence about how far the teachers started to adopt the knowledge the participants have taught.

Through the RISTM, the SEAMEO through the SEAMEO VOCTECH has contributed to providing relevant knowledge that could support vocational education

development. Moreover, the participant strategy used for the RISTM has allowed the participants in Indonesia and Thailand to train more teachers that support education development as well. Unfortunately, due to the COVID-19 pandemic, Modules 4-5 were postponed, which might contribute to the significant impact of the RISTM.

However, this study finds that digitalisation in vocational education does not mean the activity is fully digital. Instead, going to adopt blended learning since the practical part of vocational education cannot be entirely replaced by digital tools. Finding digitalisation in vocational education is essential for this debate to measure Regional In-Service Training Modules' success. Based on DigiCompEdu framework, successful in digitalisation is measured by the percentage of learning activity that is going digital. Suppose we measure digitalisation in vocational education with the same criteria as general education, in that case, the outcome will surely consider Regional In-Service Training Modules unsuccessful in digitalising vocational education, and SEAMEO does not contribute much.

In conclusion, the SEAMEO has contributed to education development through the RISTM project. However, due to limitations, the level of changes at the college level is still not visible. Furthermore, different context about digitalisation for vocational education has added more argument that SEAMEO role matter in digitalisation for vocational education.

### 5.2 SEAMEO's role as regional cooperation in education

Chulalongkorn University

Firstly, according to the Yap theory on regional cooperation in education, it is valid to say that the SEAMEO has gone beyond information exchange. Based on the findings from the interview, the SEAMEO has facilitated information and network exchanges. The information exchange is clearly highlighted in providing a platform for Indonesia and Thailand to access new knowledge of Industry 4.0 by participating in the RISTM. Furthermore, the word ‘information exchange’ in this study's context has also covered knowledge exchange. Based on the findings, it is reflected that the SEAMEO has facilitated knowledge between instructors and the RISTM participants as well.

Additionally, the finding reveals that modules for RISTM are uploaded to the website, which provides a platform for knowledge exchange. This study has shown

that the SEAMEO provides network exchange through collaboration with the GIZ for the RISTM. Based on the findings, the SEAMEO, through the SEAMEO VOCTECH, has provided access to reach eleven countries in Southeast Asia simultaneously for the GIZ. The network exchange has played a role in supporting the RISTM project's sustainability. At the same time, the SEAMEO has also facilitated eleven countries to connect with the GIZ.

Secondly, the SEAMEO has been regarded as a 'facilitator' or middleman according to this study. Specifically, based on the three dimensions of facilitator, the SEAMEO has covered three roles of facilitator: architect, pilot, and guide. An architect's fundamental role is to gather what the people need, propose the resource needed to support the agenda, and design the product based on the desired need. The role of the SEAMEO as an architect is reflected in the process of conducting the survey and gathering points of view from vocational experts across Southeast Asia before designing the modules. Furthermore, as confirmed by the project coordinator from SEAMEO VOCTECH, the goal of cooperating with the GIZ is to support the training about Industry 4,0, which reflects their role as an architect by collaborating with the GIZ to get the needed resource to support the agenda. The role of the SEAMEO as a facilitator in the pilot dimension is reflected during the project design of the RISTM. The SEAMEO has contributed to ensuring that the training structure has covered the theoretical part before participants go to the workshop. The pilot role's objective is to ensure learners understand and navigate the difficulties. By providing theoretical background about the system and characteristics of Industry 4.0, the SEAMEO has contributed to narrowing participants' confusion during the workshop or visit to the industry.

Last, the SEAMEO as a guide. The notion of a guide role is generating an adequate environment that facilitates students. In the context of the RISTM, the term 'student' was referred to as participant. In the context of this research, the SEAMEO's role as a guide was reflected by collaborating with the GIZ, which helped them provide room for practical training and an adequate environment to support the learning activity among participants. As discussed in the findings, the GIZ has contributed to inviting TGI, GMI, and other companies to provide room for participants to have a clear picture of Industry 4.0. Based on the three dimensions, the

จุฬาลงกรณ์มหาวิทยาลัย
Chulalongkorn University

architect is the strongest role of the SEAMEO compared to the other two dimensions: guide and pilot.

In sum, the SEAMEO's role as regional cooperation in Southeast Asia is to facilitate information and network exchange. Thus, this study concludes that the SEAMEO is a middleman or facilitator. There are three roles the SEAMEO carries as a facilitator, especially in the case of the RISTM: architect, pilot, and guide.

**5.3 SEAMEO's role in development agenda.**

"Does the SEAMEO matter?" is a question thrown earlier in this study's problem statement. Based on the findings, this study has confirmed that the SEAMEO's role matters for the development agenda through education development in Thailand and Indonesia as countries with medium education performance. The author would describe the SEAMEO's role as supporting the digitalisation process in vocational education for Indonesia and Thailand.

The argument about SEAMEO's role is based on studies that explain the nature of international organisation work and how they matter in the development agenda. Some scholars claim that international organisation has always been provided support from time to time. However, the definition of 'support' has evolved after globalisation. The trend of multilateralism cooperation started to emerge after World War II and getting popular during the Cold War era (Shajahanan 2012). Iye's study claimed that international organisations used to be a global community platform for countries to stand together and create a balance of power during the Cold War (Iye 2002).

จุฬาลงกรณ์มหาวิทยาลัย
Chulalongkorn University

Another point highlighted in Shahjahanan, and Crocket's studies said the international organisation is a platform to bring attention to specific issues in the international community, especially for developing countries. Based on the three scholars' argument, it reflects that international organisation nature is providing support rather than intervening. In the context of Southeast Asia, the history of ASEAN has explained more about the position of the international organisation at the regional level as a platform for Southeast Asia countries to stand together in preventing the fall of communism during the Cold War. The goal of ASEAN in the beginning was to gather support among countries in the Southeast Asia region to face the spread of Communism.

Nowadays, the support provide by the international organisation for countries is no longer preventing communism but assisting countries in facing challenges brought by globalisation. Shajahanan confirmed that the International Organisation support countries by offering access to transnational networking and becoming a connector between countries.

Shajahanan has explained that SEAMEO's nature in providing transnational networking access for their member countries becomes the connector for the GIZ to support vocational education development and face the demand brought by Industry 4.0 as one of the globalisation challenges. In this research, the SEAMEO, through the SEAMEO VOCTECH, wants vocational education to successfully adapt to the demand generated by Industry 4.0 to support the adoption of the national agenda on the digital economy in Indonesia and Thailand through education platforms.

Nonetheless, this study has found that the SEAMEO's role in supporting the development agenda is less significant than that of the GIZ. Firstly, the SEAMEO's limited role is affected by their limited material and non-material resources in the case of RISTM. Secondly, the SEAMEO's nature as an intergovernmental organisation is similar to ASEAN's, which does not intervene with the national policy. Therefore, their role has limitations in creating changes. The previous statement is proven through the findings from this study that the problem of changes in Indonesia and Thailand has come from national policy. In that sense, this study has concluded that the SEAMEO is unable to intervene at the national level. The non-intervention nature of the SEAMEO has reflected similar nature to ASEAN, revealing the nature of intergovernmental organisations in the Southeast Asian region. Furthermore, the SEAMEO's non-binding nature that does not force all member countries to join the project reflects similar characteristics to ASEAN.

จุฬาลงกรณ์มหาวิทยาลัย
Chulalongkorn University

Another result is that, as the GIZ's nature is working on behalf of the BMZ (German Ministry of Finance), it is reflected that the GIZ has become the platform for Germany to deliver its aid and carry its interests to developing countries. In this study, it is reflected that the SEAMEO has a similar role as ASEAN, to become the bridge for developed countries in delivering their interests to Southeast Asia. The SEAMEO has reflected a similar role as ASEAN to ensure that they provide an equal chance for

Southeast Asia countries to benefit from the cooperation with developed countries and promote development for education in the region.

In conclusion, the SEAMEO matters in the development agenda. However, similar to ASEAN, their level of intervention is not significant due to the non-binding and non-intervention principles. This study has revealed that the characteristic of the SEAMEO as an intergovernmental organisation is similar to that of ASEAN. However, this study also found that SEAMEO still have potential and can work more efficiently.

## 5.4 Recommendation

Based on the finding and discussion above, this study has come up with few recommendations for SEAMEO, Indonesia, Thailand, and future research. This section will be divided into three sub-sections as follows.

### 1. Recommendation for SEAMEO and SEAMEO VOCTECH

SEAMEO emerges as a facilitator or middleman organisation and has access to reach eleven Southeast Asia countries simultaneously. This regional intergovernmental organisation could take advantage of this unique position to improve their level of significance in education development by:

Firstly, working with more private sector and industry to help SEAMEO projects, especially SEAMEO VOCTECH provide better pictures of the demand for vocational graduates. Furthermore, as confirmed in the interview that funding is one of the obstacles for SEAMEO in creating a project, collaborating with the private sector or industry could be considered an option. Another point, collaborating with private sector and industry will add new perspective that could be integrated in the project and sharpen the project's direction. This recommendation made based on the fact that the majority of SEAMEO's partner are from an education and development agency. SEAMEO needs to work with parties from diverse backgrounds to improve education in the digital age.

Secondly, provide vocational training for students, not only teacher. The goal of providing training for students is to fasten multiply the effect, as the young generation tends to have higher digital literacy compared to the older generation.

จุฬาลงกรณ์มหาวิทยาลัย
Chulalongkorn University

Furthermore, SEAMEO could expect the young generation to become the bridge for the older generation during the transition process for digitalisation in education.

Thirdly, as the nature of ASEAN countries that believe in the principle of non-interference, SEAMEO could not interfere at the national level area. Thus, this study suggests that SEAMEO focus on internal matters such as improving their internal funding mechanism, joint activities between countries and improving the platform for information exchange. The suggestion is made based on the argument improving SEAMEO's internal matter will have an impact on the quality of their project and bring a bigger impact.

**2. Recommendation for Indonesia and Thailand**

As this study does a comparative analysis between Indonesia and Thailand, both countries could learn from each other best practices in order to improve education quality in the Southeast Asia region by:

Firstly, for policy maker and the government in Indonesia could learn about Thailand's centralised system that gives access to better coordination and approaching schools via the Ministry of Education. Secondly, government support in terms of funding matters in multiplying the project faster and speeding up digitalisation in vocational education. Furthermore, Indonesia could learn from Thailand's effort by allocating funding for teacher training to support digitalisation in education.

จุฬาลงกรณ์มหาวิทยาลัย
Chulalongkorn University

Meanwhile, Thailand could learn from Indonesia to use a manual strategy such as publishing books to multiply the impact of the training. The goal of using a manual approach is to reach areas or schools that do not have adequate technology infrastructure. Secondly, policy maker and the Thai government could learn to be slightly more flexible by allowing vocational schools to create a bilateral agreement with a development agency or private sector directly.

There are two recommendations that could be applicable to both Indonesian and Thai. First, for policymakers and governments to design an education policy that regulates collaboration between the private sector, industry, and vocational education. Based on the finding and discussion, many vocational educations in Indonesia and Thailand struggle to grasp pictures of the graduate profile that the industry or business sector expected. Greater collaboration between industry and vocational education will

help to narrow the gap between industry expectations of vocational education. Thus, using policy to bridge the gap that exists between vocational education and industry is recommended.

Second, this study found that digitalisation in vocational education does not mean going fully digital. Therefore, the school or college should consider collaborating with the local massive open online (MOOC) course platform to digitalise the learning material, especially the theoretical part. Collaboration with local MOOC platforms will speed up the process of digitalising the material.

The two recommendations for Indonesia and Thailand focus on speeding up the digitalisation process for vocational education. This study strongly believes that the government and schools should prioritise building a better digital learning environment for vocational education rather than focusing on improving machines and relevant tools for vocational institutions.

### 3. Research limitation and recommendation for future study

Due to the time constraint and COVID-19 pandemic, which make travel and access more limited, this research only covers the small scope of vocational education and the role of regional cooperation. The limitations listed below give chances for upcoming study.

First, even though a sizable number of key informants' interviews support the study's findings, there were only small samples for Regional In-Service Training Modules participants. A greater number of interviews with Regional In-Service Training Modules participants will add more spectrum and more validation to the discussion. Second, interview samples were selected using the snowballing method from previous participants, in which most of the participants came from the same circle and background. Using another sample interview technique may lead to new findings for upcoming research. Third, the language barrier has become a limitation in digging into a more profound argument.

Last, after extensive literature review, the scope of the study had to be narrowed down. This research aims to fill in the gap about the significance and effectiveness of SEAMEO as regional cooperation in education development by researching the SEAMEO collaboration project with GIZ related to digitalisation in education from

its project design and implementation. This thesis focuses only on vocational education in Industry 4.0 era and on digitalising vocational education through teacher training. It is suggested for the upcoming research to discuss different dimensions of digitalising vocational education besides via teacher training. Furthermore, it is suggested that the upcoming research to use a different methodology and analysis technique that may lead to new findings.



จุฬาลงกรณ์มหาวิทยาลัย
CHULALONGKORN UNIVERSITY

# REFERENCES


Achtenhagen, C., & Achtenhagen, L. (2019). The impact of digital technologies on vocational education and training needs: An exploratory study in the German food industry. *Education and Training*, 61(2), 222-233. https://doi.org/10.1108/ET-05-2018-0119

Adb. (2017). *ASEAN* 4.0: *What does the Fourth Industrial Revolution mean for regional economic integration?*

Afrianto. (2018). Being a professional teacher in the era of industrial revolution 4.0: opportunities, challenges and strategies for innovative classroom practices. *English Language Teaching and Research*, 2(1), 3-3. http://ejournal.unp.ac.id/index.php/eltar/article/view/102675

Akst, D. (2016). Automation Anxiety. , *Where Have All the Jobs Gone? (Summer* 2013), 37(3).

Almamalik, L. (2020). The Development of the Maturity Model to Assess the Smart Indonesia Manufacturing Companies 4.0 Readiness. 123(Icamer 2019), 103-107. https://doi.org/10.2991/aebmr.k.200305.026

Andriole, S. J. (2018). Skills and Competencies for Digital Transformation. *IT Professional*, 20(6), 78-81. https://doi.org/10.1109/MITP.2018.2876926

Anh, N. T. (2016). The role of regional organizations in East Asian regional cooperation and integration in the field of higher education. *Asian Regional Integration Review*, 1(October), 69-82. http://kms1.isn.ethz.ch/serviceengine/Files/ISN/138243/ichaptersection_singledocument/b1bbf25f-10e6-4f87-b9dc-3a70fadf4127/en/Vol_1_Article_5.pdf

Arbulu, I., Lath, V., Mancini, M., Patel, A., & Tonby, O. Reinvigorating ASEAN Manufacturing for the Future.

Arbulu, I., Lath, V., Mancini, M., Patel, A., & Tonby, O. (2018). *Reinvigorating ASEAN Manufacturing for the Future*. https://www.mckinsey.com/~/media/mckinsey/business functions/operations/our insights/industry 4 0 reinvigorating asean manufacturing for the future/industry-4-0-reinvigorating-asean-manufacturing-for-the-future.ashx

Asian Development, B. (2019). *Policies to Support The Development of indonesia's Manufacturing Sector During* 2020–2024.

Asian Development, B. (2021). *Reaping the Benefits of Industry. Through Skills Development in High Growth Industries in Southeast Asia*.

Author, C., Makhkamova, A., Spilski, J., Berg, M., Pietschmann, M., Exner, J.-p., Rugel, D., Lachmann, T., Editor, B., Seifried, J., Niegemann, H., & Barbara, V. (2020). Verlag Barbara Budrich Crafts Sector Book Title : Vocational Education

and Training in the Age of Digitization Book Subtitle : Challenges and Opportunities 3 Competence Development with Digital Learning Stations in VET in the Crafts Sector. 38-62.

Aziz, S., Mahmood, M., & Rehman, Z. (2018). Implementation of CIPP Model for Quality Evaluation at School Level: A Case Study. *Journal of Education and Educational Development*, 5(1), 189-189. https://doi.org/10.22555/joeed.v5i1.1553

Bai, B., & Paryono. (2019). *Vocational Education and Training in ASEAN Member States*.

Baraki, A. H., & Van Kemenade, E. (2013). Effectiveness of technical and vocational education and training (TVET) insights from Ethiopia's reform. *TQM Journal*, 25(5), 492-506. https://doi.org/10.1108/TQM-11-2012-0099

Bartlett, W. (2009). The effectiveness of vocational education in promoting equity and occupational mobility amongst young people. *Economic Annals*, 54(180), 7-39. https://doi.org/10.2298/EKA0980007B

Bashir, S., & Miyamoto, K. (2020). Digital Skills: Frameworks and Programs. *World Bank*(April), 1-43. https://documents.worldbank.org/en/publication/documents-reports/documentdetail/562351611824219616/digital-skills-frameworks-and-programs

BizhanovaYakovenko, I., Kulumbetova, L., Subbotina, I., Zhanibekova, G., & Bizhanova, K. (2019). THE BLOCKCHAIN TECHNOLOGY AS A CATALYST FOR DIGITAL TRANSFORMATION OF EDUCATION. *International Journal of Mechanical Engineering and Technology (IJMET)*, 10(Scopus), 866-897.

Bukht, R., & Heeks, R. (2019). Defining, conceptualising and measuring the digital economy. *International Organisations Research Journal*, 13(2), 143-172. https://doi.org/10.17323/1996-7845-2018-02-07

Burapharat, C. (2020). Chapter 3. Vocational and cooperative education in Thailand. In (pp. 57-7414).

Catch-up, E. (2019). *Industrialization and economic development*. https://doi.org/10.18356/15075f0b-en

Chalamwong, Y., & Suebnusorn, W. (2018). Vocational Education in Thailand: Its Evolution, Strengths, Limitations, and Blueprint for the Future. In (pp. 163-187). https://doi.org/10.1097/01.jbi.0000393282.48591.0d

Chryssolouris, G., Mavrikios, D., & Mourtzis, D. (2013). Manufacturing systems: Skills & competencies for the future. *Procedia CIRP*, 7, 17-24. https://doi.org/10.1016/j.procir.2013.05.004

Crockett, S. (2012). The Role of International Organisations in Global Development. 1-4.

จุฬาลงกรณ์มหาวิทยาลัย
CHULALONGKORN UNIVERSITY

Cuyvers, L. (2019). The 'ASEAN Way' and ASEAN's development gap with Cambodia, Laos, Myanmar and Vietnam: a critical view. *Asia Pacific Business Review*, 25(5), 683-704. https://doi.org/10.1080/13602381.2019.1652980

Dirjen, P. (2020). Rencana Strategis Direktorat Jenderal Pendidikan Vokasi Tahun 2020-2024. *Direktorat Jenderal Pendidikan Vokasi*, 141-141.

Dobrica, S. (2019). From Digitization. (April).

Dovey, M. (2015). *International collaboration and the changing digital world - opportunities and constraints*. Elsevier Ltd. https://doi.org/10.1016/B978-0-08-100384-8.00006-6

Eichhorst, W., Rodríguez-Planas, N., Schmidl, R., & Zimermann, K. F. (2015). A road map to vocational education and training in industrialized countries. *Industrial and Labor Relations Review*, 68(2), 314-337. https://doi.org/10.1177/0019793914564963

Frick, T. W. (2020). Education Systems and Technology in 1990, 2020, and Beyond. *TechTrends*, 64(5), 693-703. https://doi.org/10.1007/s11528-020-00527-y

Gadre, M. (2020). Industry 4 . 0 – Digital Transformation , Challenges and Benefits. (October).

Gebhardt, J., Grimm, A., & Neugebauer, L. M. (2015). Developments 4.0 Prospects on future requirements and impacts on work and vocational education JOTED. 3, 117-133. http://www.journal-of-technical-education.de

Gennrich, R. (2020). *TVET: Towards Industrial Revolution* 4.0.

Gunadi, Sofyan, H., Nurtanto, M., Arifin, Z., & Sudira, P. (2020). Vocational teachers readiness in face of the industrial revolution 4.0: Vocational teachers perceptions in Yogyakarta-Indonesia. *Journal of Physics: Conference Series*, 1700(1), 0-6. https://doi.org/10.1088/1742-6596/1700/1/012082

Hadi, S., & Murti, H. W. (2019). Kajian Industri 4.0 Untuk Penerapannya Di Indonesia. *Jurnal Manajemen Industri dan Logistik*, 3(1), 01-13. https://doi.org/10.30988/jmil.v3i1.59

Ilo. (2011). TVET Centres in Indonesia : Pathway to Revitalization.

Ilo, U. (2020). *The digitization of TVET and skills systems*. https://www.ilo.org/wcmsp5/groups/public/---ed_emp/---emp_ent/documents/publication/wcms_752213.pdf

Institute, D. Q. (2019). *DQ Global Standards Report* 2019. https://www.dqinstitute.org/dq-framework%0Ahttps://www.dqinstitute.org/dq-framework%0Ahttps://www.dqinstitute.org/wp-content/uploads/2019/03/DQGlobalStandardsReport2019.pdf

Investment, T. B. o. (2019). THAILAND INVESTMENT REVIEW THAILAND ADVANCED MANUFACTURING Projects. 29(October).

Jayarman, R. (2019). *Industry* 4.0, *The New IndustrIal RevolutIon* (0112306101).

Jitsuchon, S. (2012). Thailand in a Middle-income Trap. *TDRI Quarterly Review*(June), 13-21.

Kadir, S., Nirwansyah, & Ayasha Bachrul, B. (2016). Technical and Vocational Education and Training in Indonesia: challenges and opportunities for the future lee Kuan Yew School of public Policy. 1-36. https://lkyspp.nus.edu.sg/docs/default-source/case-studies/lkysppms_case_study__technical_and_vocational_education_and_training_in_indonesia.pdf?sfvrsn=e5c5960b_2

Khalid, J., Ali, A. J., Nordin, N. M., & Shah, S. F. H. (2019). Regional cooperation in higher education: Can it lead ASEAN toward harmonization? *Southeast Asian Studies*, 8(1), 81-98. https://doi.org/10.20495/seas.8.1_81

Khan, N., Khan, S., Tan, B. C., & Loon, C. H. (2021). Driving Digital Competency Model towards IR 4.0 in Malaysia. *Journal of Physics: Conference Series*, 1793(1), 0-10. https://doi.org/10.1088/1742-6596/1793/1/012049

Khitskov, E. A., Veretekhina, S. V., Medvedeva, A. V., Mnatsakanyan, O. L., Shmakova, E. G., & Kotenev, A. (2017). Digital transformation of society: Problems entering in the digital economy. *Eurasian Journal of Analytical Chemistry*, 12(5), 855-873. https://doi.org/10.12973/ejac.2017.00216a

Kinshuk, Suhonen, J., Sutinen, E., & Goh, T. (2003). Asian Journal of Distance Education. *Asian Journal of Distance Learning*, 1(1), 60-68. http://www.ycmou.ac.in/pluginfile.php/136/mod_data/content/18366/2009-AJDE.pdf

Kovalchuk, V., & Soroka, V. (2021). Developing Digital Competency in Future Masters of Vocational Training. *Professional Pedagogics*, 1(20), 96-103. https://doi.org/10.32835/2707-3092.2020.20.96-103.CITATIONS

Kuputri, N. M. (2020). Digital Divide: A Critical Approach to Digital Literacy in 'Making Indonesia 4.0'. (December), 0-6. https://doi.org/10.2991/assehr.k.201209.001

Lee, S. W. Y., Hsu, Y. T., & Cheng, K. H. (2022). Do curious students learn more science in an immersive virtual reality environment? Exploring the impact of advance organizers and epistemic curiosity. *Computers and Education*, 182, 104456-104456. https://doi.org/10.1016/j.compedu.2022.104456

Li, F. (2020). Leading digital transformation: three emerging approaches for managing the transition. *International Journal of Operations and Production Management*, 40(6), 809-817. https://doi.org/10.1108/IJOPM-04-2020-0202

สถาบันวิทยบริการ
CHULALONGKORN UNIVERSITY

Lloyd, W. (0202). Can ASEAN expand vocational training to help workers survive automation.

Making Indonesia. (2019). *Making Indonesia*, 1-8. https://doi.org/10.7591/9781501719370

Maros, H., & Juniar, S. (2016). 済無No Title No Title No Title. 17, 1-23.

Moenjak, T., & Worswick, C. (2003). Vocational education in Thailand: A study of choice and returns. *Economics of Education Review*, 22(1), 99-107. https://doi.org/10.1016/S0272-7757(01)00059-0

Moonpa, N., Phalasoon, S., Gulich, J., & Beecker, P. (2019). Approaches and Structures of Work-related Learning in TVET in Thailand. *Tvet-Online .Asia*(13), 1-19.

Nafea, R. M. E. D., & Toplu, E. K. (2019). Future of Education in Industry 4.0. (February), 267-287. https://doi.org/10.4018/978-1-5225-9416-1.ch015

Nurhaeni, I. D. A., & Kurniawan, Y. (2018). Gender-Mainstreaming in Technical and Vocational Education and Training. *IOP Conference Series: Materials Science and Engineering*, 306(1). https://doi.org/10.1088/1757-899X/306/1/012057

Organisation for Economic, C., & Development. (2021). *Vocational Education and Training in Thailand*.

Paryono. (2011). TVET initiatives in Southeast Asian countries in response to increasing labour mobility within the region and beyond. *International Journal of Training Research*, 37(2). https://doi.org/10.5172/ijtr.9.1-2.123

Paryono. (2017). The importance of TVET and its contribution to sustainable development. *AIP Conference Proceedings*, 1887(September). https://doi.org/10.1063/1.5003559

Pennings, P., & Keman, H. (2020). Comparative Research Methods. In (4th ed., pp. 50-65). Oxford University Press.

Pipattanasuk, T., & Songsriwittaya, A. (2020). Development of an instructional model with augmented reality technology for vocational certificate students. *International Journal of Instruction*, 13(3), 539-554. https://doi.org/10.29333/iji.2020.13337a

Policies, N. (2015). *Basic education in Indonesia*. https://doi.org/10.1787/9789264230750-7-en

Redecker, C. (2019). *European Framework for the Digital Competence of Educators*. https://ec.europa.eu/jrc/en/digcompedu

Saifudin, A., & Wijanarka, B. S. (2019). Minimize the competence gap between ferrous foundry small firms and vocational high school in Indonesia readiness industry 4.0. *Journal of Physics: Conference Series*, 1273(1), 0-7. https://doi.org/10.1088/1742-6596/1273/1/012051

Samani, M. (2018). Vocational Education in the Era of Industry 4.0: An Indonesia Case. 201(Aptekindo), 45-47. https://doi.org/10.2991/aptekindo-18.2018.10

จุฬาลงกรณ์มหาวิทยาลัย
Chulalongkorn University

Schiff, M., & Winters, L. A. (2002). REGIONAL COOPERATION, AND THE ROLE OF INTERNATIONAL ORGANIZATIONS AND REGIONAL INTEGRATION. http://econ.worldbank.org.

Schröder, T. (2019). A regional approach for the development of TVET systems in the light of the 4th industrial revolution: the regional association of vocational and technical education in Asia. *International Journal of Training Research*, 17(sup1), 83-95. https://doi.org/10.1080/14480220.2019.1629728

Schwab, K. (2016). *The Fourth Industrial Revolution: what it means and how to respond*. https://doi.org/10.1038/nnano.2015.286

Seameo, V. (1996). *VTE - Industry Cooperation*.

Sebihi, A. (2019). Digital Knowledge Sharing in TVET. 242(Icovet 2018), 2019-2021. https://doi.org/10.2991/icovet-18.2019.7

Sharma, P. (2019). Digital Revolution of Education 4.0. *International Journal of Engineering and Advanced Technology*, 9(2), 3558-3564. https://doi.org/10.35940/ijeat.a1293.129219

Spöettel, G., Parvikam, S., & Paryono, P. (2021). *Fit for Industry 4 . 0 Innovative Learning and Teaching for Digitalization and Automation*.

Srithongperng, N. (2016). *THE POTENTIALITY OF THE ASEAN INTERNATIONAL MOBILITY FOR STUDENTS (AIMS) PROGRAMME*

Stafford, A. (2013). Comparative Analysis Within Political Science. *E-International Relations*, 1-4.

Suharno, Pambudi, N. A., & Harjanto, B. (2020). Vocational education in Indonesia: History, development, opportunities, and challenges. *Children and Youth Services Review*, 115(May), 105092-105092. https://doi.org/10.1016/j.childyouth.2020.105092

Suksatan, S., Tungkunanan, P., & Choomnoom, S. (2018). Thai vocational college education monitoring and evaluation: A confirmatory factor analysis. *Asia-Pacific Social Science Review*, 18(1), 157-167.

Suto, I., & Eccles, H. (2014). The Cambridge approach to 21st century skills: Definitions, development and dilemmas for assessment. *IAEA Conference*, 1-10. http://www.cambridgeassessment.org.uk/Images/461811-the-cambridge-approach-to-21st-century-skills-definitions-development-and-dilemmas-for-assessment-.pdf

Tarat, S., & Sindecharak, T. (2020). The Vocational Education System in Thailand and Singapore : A Sociological Perspective. 23(2), 192-211. https://doi.org/10.14456/tureview.2020.16

Thongkam, K., Suwanjan, P., & Pupat, P. (2019). Thai vocational college instructor

teaching competency: A second order confirmatory factor analysis. *Asia-Pacific Social Science Review*, 19(1), 224-232.

Tilak, J. B. G. (2003). Vocational Education and Training in Asia. *International Handbook of Educational Research in the Asia-Pacific Region*, 673-686. https://doi.org/10.1007/978-94-017-3368-7_46

Trends, N., Analysis, R., Frolova, E. V., Rogach, O. V., Ryabova, T. M., & Federation, R. (2020). Digitalization of Education in Modern Scientific Discourse: New Trends and Risks Analysis. *European Journal of Contemporary Education*, 9(2), 313-336. https://doi.org/10.13187/ejced.2020.2.313

Triyono, M. B. (2015). The Indicators of Instructional Design for E- learning in Indonesian Vocational High Schools. *Procedia - Social and Behavioral Sciences*, 204(November 2014), 54-61. https://doi.org/10.1016/j.sbspro.2015.08.109

Udovita. (2020). Conceptual Review on Dimensions of Digital Transformation in Modern Era. *International Journal of Scientific and Research Publications (IJSRP)*, 10(2), p9873-p9873. https://doi.org/10.29322/ijsrp.10.02.2020.p9873

Wang, C. (2016). A Comparative Analysis of Environmental Courts in Sweden and China. *Fudan Journal of the Humanities and Social Sciences*, 9(4), 607-626. https://doi.org/10.1007/S40647-016-0136-9

Wang, O. Y. (2016). Rethinking the Role of Technical and Vocational Education and Training ( TVET ) in Southeast Asia : A Human Development Approach.

Yap, J. T. (2012). Regional Cooperation in Education : Issues for Developing Countries in the Asia-Pacific. (June).

Zhong, R. Y., Xu, X., Klotz, E., & Newman, S. T. (2017). Intelligent Manufacturing in the Context of Industry 4.0: A Review. *Engineering*, 3(5), 616-630. https://doi.org/10.1016/J.ENG.2017.05.015

จุฬาลงกรณ์มหาวิทยาลัย
Chulalongkorn University

# ABBREVIATION

| | |
|---|---|
| ADB | Asian Development Bank |
| AI | Artificial Intelligence |
| AIMS | Association of Southeast Asian Nations (ASEAN) International Mobility for Student |
| ASEAN | Association of Southeast Asian Nations |
| AUN | Association of Southeast Asian Nations (ASEAN) University Network |
| CIPP | Context Input Process Product |
| DigiCompEdu | Digital Competency Education |
| GIZ | *Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH* |
| GMI | German Malaysia Institute |
| ILO | International Labour Organisation |
| Industry 4.0 | Fourth Industrial Revolution |
| IoT | Internet of Things |
| KM | Knowledge Management |
| MSSD | Most Similar Systems Design |
| MOOC | Massive Open Online Course |
| OECD | Organisation for Economic Co-operation and Development |
| OVEC | Office Vocational Education Commission |
| RISTM | Regional In-Service Training Modules |
| SEAMEO | Southeast Asian Ministers of Education Organization |
| SEAMES | Southeast Asian Ministers of Education Organization Secretariat |
| SEAMEO VOCTECH | Southeast Asian Ministers of Education Organization Vocational and Technical Education and Training |
| TGI | Thai German Institute |
| TVET | Technical Vocational Education Training |
| UMAP | University Mobility in Asia and the Pacific |
| UNESCO | The United Nations Educational, Scientific and Cultural Organization |
| WEC | World Economic Forum |

จุฬาลงกรณ์มหาวิทยาลัย
Chulalongkorn University

# APPENDIX

## A1. Interview Questionnaire

### A. Project overview

1. Can you tell me about the origin of Regional In-Service Training Modules?
2. Can you tell me about the overview of Regional In-Service Training Modules? What are the components of the project? How many phases were there to implement the project?
3. Was the project designed for any particular SEA country? Which SEA countries were the targeted of this project? Why?
4. Was the project designed for any particular economic sector? (e.g. tourism, agriculture)
5. How many countries had the project been implemented?
6. What was the expected outcome of the project?
    a. What was the project's KPI? (number of modules/number of teachers completing the modules/number of teachers passing the post-test?)
    b. Was it the same for every country?
    c. How did the expected outcome relate to digitization in SEA countries?

### B. Context

1. Was the project part of a bigger scheme? If yes, what was the scheme? And how did you expect the project to contribute to the scheme's goal?
2. Was Regional In-Service Training Modules the first of such initiative by SEAMEO?
    a. If not, what was the preceding initiative, and how had it been received by member countries?
3. Can you explain the uniqueness of this project, compared to other similar SEAMEO projects?
4. How does the context of vocational schools in Indonesia differ from that in Thailand?
5. How would you compare the challenge of vocational schools in digital economy between Indonesia and Thailand before implementing the project?
6. How would you describe the level of digital literacy among vocational teachers in Indonesia and Thailand before implementing the project?

### C. Input

1. Could you explain the funding mechanism of this project?
2. Can you tell me about the resources required to run this project?
    a. SEAMEO's resources (Man, Money, Machine)
    b. Other partners' resources e.g. GIZ (Man, Money, Machine)
    c. Ministry's resources (Man, Money, Machine)
    d. School's resources (Man, Money, Machine)
3. What was the total budget? (for the period of ?)
4. Can you describe the process of designing the Modules?
    a. What were the challenges in designing the project, especially for Indonesia and Thailand?
5. Who were most influential in designing the content of the Modules?
6. Can you compare the level of input contributed to designing the Modules by Indonesian government and the Thai government?
7. Were you happy with the module designs and overall training contents? Why?
8. How did the module designers expect the modules to be used by schools and vocational teachers?
    a. Was there a time limit of access to module content?
    b. Were there pre/post tests or evaluation scheme for the participating teachers?

**D. Process**

1. Can you tell me how the Regional In-Service Training Modules got implemented in Indonesia?
    - **a.** Who in the Ministry do you work most closely with?
    - **b.** How did the training occur? (When, how, where?)
    - **c.** Were the modules available publicly? If not, why?
2. Can you tell me how the Regional In-Service Training Modules got implemented in Thailand?
    - **a.** Who in the Ministry do you work most closely with?
    - **b.** How did the training occur? (When, how, where?)
    - **c.** Were the modules available publicly? If not, why?
3. Was there any difference in the overall process of implementing the project in the two countries?
4. Who were the instructors? Did the participating teachers interact with the instructors during the training?
5. How did the modules actually used by Thai vocational teachers?
    a. What was the problem?
6. How did the modules actually used by Indonesian vocational teachers?
    - **a.** What was the problem?

**E. Product**

1. What was the number of participants (schools/teachers) in Indonesia and Thailand? Can you explain the differences?
2. How satisfy was the participating teachers about the module content?
    a. Indonesia
    b. Thailand
3. How satisfy was the instructors about the training program?
    a. Indonesia
    b. Thailand
4. How satisfy was the ministry-level officer who oversees vocational education?
    a. Indonesia
    b. Thailand
5. Was there any scheme to assess the change in the level of digital literacy of the participating teachers? If yes, how was the assessment after the training?
    a. Indonesia
    b. Thailand
6. How has the training modules impact the curriculum of the participating schools? Is there any showcase example after the program implementation?
    a. Indonesia
    b. Thailand
7. In your opinion, how could have the Regional In-Service Training Modules been more successfully implemented?
8. Compare to other similar schemes to improve digital skills of vocational teachers and students, how significant is this SEAMEO's programme?

จุฬาลงกรณ์มหาวิทยาลัย
Chulalongkorn University

## A2. List of Informants

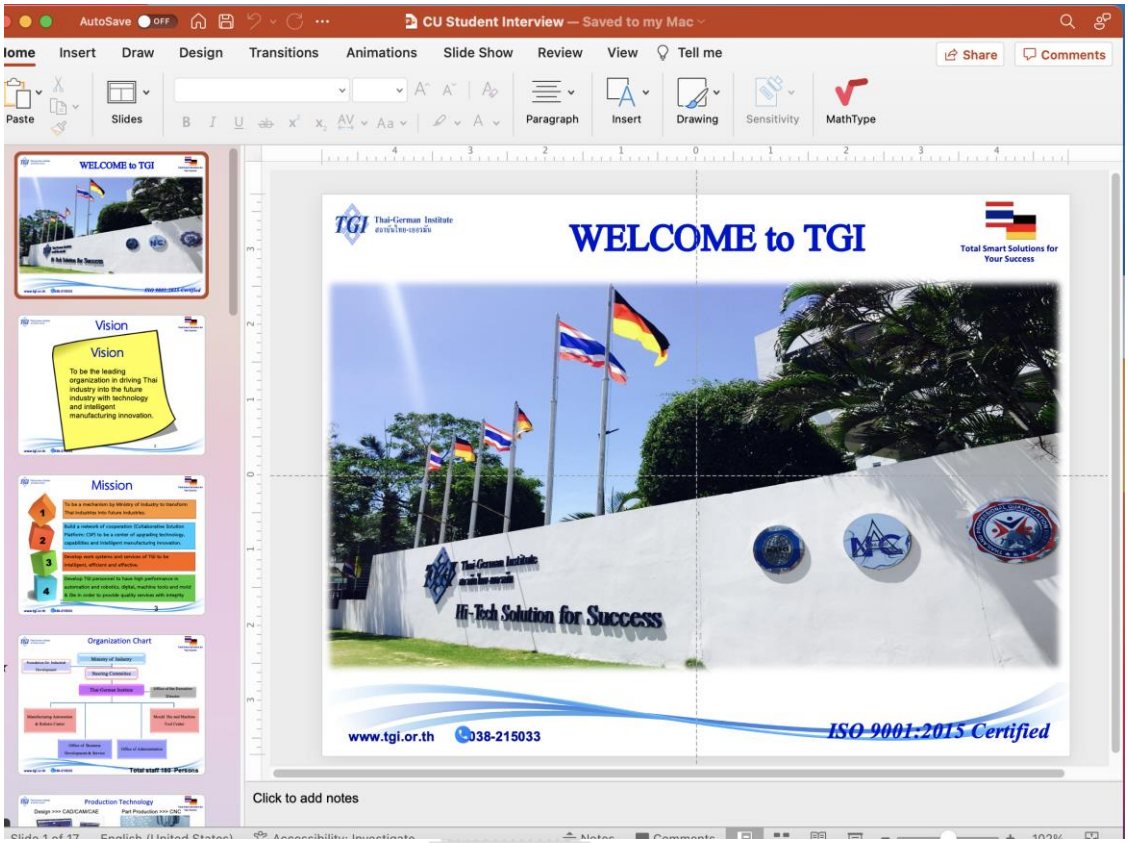
| **Informant** ***(Pseudonym)*** | **Position** | **Role** | **Summary Participant Based on Role** |
|---|---|---|---|
| Budianto Wahyu | Deputy Director Programme Development (DDPD) | SEAMEO Secretariat (SEAMES) Representative | • Project Coordinator: 2<br>• SEAMEO Secretariat Representative: 4<br>• Module Developer: 4<br>• Instructor: 2<br>• Facilitator: 2<br>• Participant: 4 |
| Piriya Savana | Knowledge Management Manager (Former Programme Officer 1 for TVET) | | |
| Antony Schön | SEAMEO and GIZ Integrated TVET Experts | | |
| Anjas Putra | Former Project Special Coordinator TVET SEAMEO Secretariat / Electronic Engineering | | |
| Sylvia Plate | Programme Component Manager for TVET Personnel of "Regional Cooperation Programme for TVET in ASEAN (RECOTVET)" of GIZ | Regional In-Service Training Modules Project Coordinator<br><br>Note: | |
| Darto Pasaribu | Deputy Director of Professional Affairs, SEAMEO VOCTECH | Dr. Paryono is also an instructor, developer, and | |

จุฬาลงกรณ์มหาวิทยาลัย
Chulalongkorn University

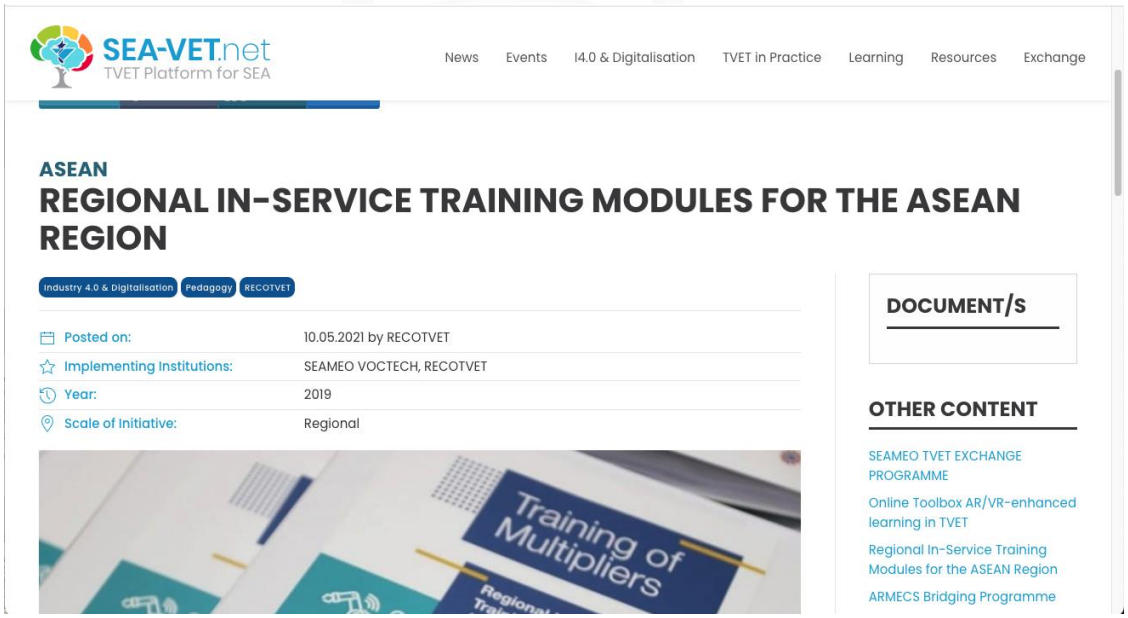
| | | | |
|---|---|---|---|
| | | project coordinator from SEAMEO for Module 1 | |
| Suthep Bath | Director of Thai-German Institute | Facilitator and Module Developer, and Participant | |
| Giorgio Schäf | Lecturer at the University of Bremen | Developer and Instructor | |
| Beam Santichai | Deputy Director of Thai-German Dual Education and e-Learning Development Institute (TGDE), King Mongkut's University of Technology North Bangkok / Lecturer | Participant | |
| Putra Sudiro | Lecturer at Yogyakarta State University | Participant | |
| Dr. Sutiyono | Representative from the Ministry of Education and Lecturer | Developer and Participant | |

จุฬาลงกรณ์มหาวิทยาลัย
Chulalongkorn University

## A3. Sample Slides from Key Informant




## A4. Regional In-Service Training Webpages and Concept Note



# VITA

| | |
|---|---|
| **NAME** | Anastasia Sylvia Wurningsihputri Pongoh |
| **DATE OF BIRTH** | 18 February 1997 |
| **PLACE OF BIRTH** | Indonesia |
| **INSTITUTIONS ATTENDED** | Universitas Pelita Harapan - Bachelor's Degree<br>Chulalongkorn University - Master's Degree |
| **HOME ADDRESS** | Perumahan Tata Bumi Permai A16, Banyuraden, Gamping, Sleman, Yogyakarta 55293 |
| **PUBLICATION** | THE ROLE OF SEAMEO IN DIGITIZING VOCATIONAL EDUCATION IN INDONESIA AND THAILAND |
| **AWARD RECEIVED** | Best Position Paper Jogja International Model United Nations 2017<br>Topic: Child Soldier \| Committee: UNICEF |

จุฬาลงกรณ์มหาวิทยาลัย
CHULALONGKORN UNIVERSITY