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**Approaches for Developing Work-based Learning (WBL) in Technical and Vocational
Education and Training (TVET) in Thailand - Case Studies of the School-in-Factory
(SiF) and the Tripartite Education System (TEdSys)**

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Abstract

Work-based learning (WBL) is recognized as an important approach to developing holistic competence in Technical and Vocational Education and Training (TVET), which serves the labour market's demands in developing a qualified workforce and supports individual learners in career development. Internationally, WBL is a concept mainly associated with the German Dual TVET (DTVET) system, as seen in Malaysia and Singapore. This system strongly relies on cooperation among learning venues: TVET colleges (or even technical universities), companies, and inter-company training centres.

Thailand has been trying to integrate the German DTVET system into its TVET system since the 1950s. This dissertation examines the implementation of two WBL projects, School-in-Factory (SiF) and the Tripartite Education System (TEdSys), focusing on their critical role in promoting collaboration among companies, TVET colleges, and Rajamangala University of Technology Lanna (RMUTL). The objective of the two projects is to solve the problems encountered while implementing and transferring WBL in Thailand and within the ASEAN region.

This dissertation explores how RMUTL facilitates cooperation among the learning venues and addresses implementation challenges. By examining these projects, the dissertation contributes to a better understanding of the Thai DTVET system and offers insights for improving WBL implementation and transferability.

The theoretical and methodological framework for this analysis is based on reform-oriented vocational education science. This approach focuses on developing vocational action competence in TVET by applying WBL as the main learning form. The research process was guided by principles of participatory action research (PAR), and a qualitative research methodology was employed for this dissertation.

Acknowledgments

The research presented in this dissertation is mainly the result of the author's active engagement in the TVET and higher education landscape in Thailand, specifically through the two joint international research projects between Thailand, Germany, and Malaysia.

The “Progressing Work-based Learning of the TVET System in Thailand” (ProWoThai) project and the “Tripartite Education System” project were jointly funded by the German Federal Ministry of Education and Research (BMBF) and the Thai Office of National Higher Education Science Research and Innovation Policy Council (NXPO) from 2019 to 2024.

By working as a research assistant and being actively involved in these two projects, the author has gained extensive experience in developing and implementing work-based learning (WBL) that is suitable for Thai cultural and educational contexts.

The author expresses sincere gratitude to Assistant Professor Dr. Niwat Moonpa for his kind support throughout the project years. She is also grateful for the constructive and collaborative teamwork with researchers of both research projects. Their kind cooperation is always a memorable experience for the author. Importantly, the author would like to extend her sincere thanks to Professor Dr. Dr. h.c. Thomas Schröder for his patience and dedicated mentorship.

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(June, 2025)

Siriphorn Schlattmann (formerly Phalason)

Preface

My involvement in the School-in-Factory (SiF) project initially came from my quest to improve my teaching methods and explore what I could contribute to the world of work, with a focus on practical knowledge transfer. This journey began in 2014, when I first started teaching English as part of the SiF project, alongside my senior colleagues and other team members in a team-teaching setting. This experience was shared with international researchers at a conference on education in Vietnam in 2015. Later in the same year, I began a more established and long-term commitment to teaching in collaboration with industrial partners, through the Doisaket model.

A few years before I began my doctoral research, I was actively involved in the SiF project, not only as an English teacher but also within the larger framework of this project. This closer connection with the SiF allows me to explore it more thoroughly, even from a critical viewpoint. This new perspective on the SiF has become my motivation for conducting this research, which aims to enhance students' learning outcomes and further develop the effectiveness of this project.

To enhance the quality of my writing, Grammarly.com has been used to check for spelling and grammar errors in this dissertation. Additionally, DeepL, a translation service, is also used in this research for translating from German to English.

Ultimately, I hope that my research will contribute to the ongoing development of Thailand's TVET system and also inspire further research in this field.

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List of Abbreviations

ADB	Asian Development Bank
AEC	ASEAN Economic Community
ALA	Arbeits- und Lernaufgaben
AQRF	ASEAN Qualifications Reference Framework
ASEAN	The Association of Southeast Asian Nations
AMS	ASEAN member states
ATC	ASEAN TVET Council
BBiG	Berufsbildungsgesetz (German Vocational Training Act)
BIBB	Bundesinstitut für Berufsbildung (German Federal Institute for Vocational Education and Training)
BMBF	Bundesministerium für Bildung und Forschung (German Federal Ministry of Education and Research)
CLM	Cambodia, Laos, and Myanmar
CoE	Center of Excellence
CoP	Community of Practice
DFG	Deutsche Forschungsgemeinschaft (German Research Foundation)
DIHK	Deutsche Industrie- und Handelskammer (German Chamber of Industry and Commerce)
DSD	Department of Skills Development
DTVET	Dual Technical and Vocational Education and Training
EEC	Eastern Economic Corridor
GDP	Gross Domestic Product per Capita
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH (German Society for International Cooperation)
GTAI	German Trade & Invest
GTCC	German-Thai Chamber of Commerce
GTDEE	German-Thai Excellence Initiative
IAG-TVET	The Interagency Group on Technical and Vocational Education and Training
IPOO	Input, Process, Output, and Outcome
KMK	Ständige Kultusministerkonferenz (Standing Conference of the Ministers of Education and Cultural Affairs of the States in the Federal Republic of Germany)
KRIVET	Korea Research Institute for Vocational Education and Training
LWTs	Learn-and-working tasks
MHESI	Ministry of Higher Education, Science, Research, and Innovation
MOE	Ministry of Education
MOU	Memorandum of Understanding
MyRIVET	Malaysian Research Institute for TVET
NQF	National Qualifications Framework
NSO	National Statistical Office

NXPO	Office of National Higher Education Science Research and Innovation Policy Council
ODA	Official Development Assistance
OEC	Office of the Education Council
OECD	Organisation for Economic Co-operation and Development
OVEC	Office of Vocational Education Commission
PAL	Prüfungsaufgaben- und Lehrmittelentwicklungsstelle (Examination Task and Teaching Material Development Agency)
PAR	Participatory Action Research
PMU-B	Program Management Unit for Human Resources & Institutional Development, Research and Innovation
PPP	Public-Private Partnerships
ProWoThai	Progressing Work-Based Learning of TVET System in Thailand
RAVTE	Regional Association of Vocational and Technical Education in Asia
RCTVET	Research Center for TVET
RMUTL	Rajamangala University of Technology Lanna
RMUTT	Rajamangala University of Technology Thanyaburi
SC	Scientific coaching
SDG	Sustainable Development Goals
SiF	School-in-Factory
STEM	Science, Technology, Engineering, and Mathematics
TCT	Teacher Council of Thailand
TedSys	Tripartite Education System
TGGS	Sirindhorn International Thai-German Graduate School of Engineering
TPQF	Thai Professional Qualification Framework
TPQI	Thai Professional Qualification Institute
TVET	Technical and Vocational Education and Training
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNESCO- UNEVOC	International Centre for Technical and Vocational Education and Training of the United Nations Educational, Scientific and Cultural Organization
UNICEF	United Nations International Children's Emergency Fund
ÜBZ	Überbetriebliches Ausbildungszentrum (Inter-Company Training Center)
VET	Vocational Education and Training
V-NET	Vocational National Educational Test
WBL	Work-based Learning
WCL	Work-connected Learning
WIL	Work-integrated Learning
WLTs	Work-and-learning tasks
WOL	Work-oriented Learning
WWG	WIL Working Group

Chapter 1: Technical and Vocational Education and Training (TVET), International Cooperation in TVET, and TVET Research

This dissertation examines the implementation of Dual Technical and Vocational Education and Training (DTVET) in Thailand based on two work-based learning (WBL) projects at the Rajamangala University of Technology Lanna (RMUTL),¹ Chiang Mai, located in northern Thailand. The central research interest concerns how the two projects successfully implemented these WBL models despite the lack of strong collaboration among the different learning venues (Section 1.1). Academically, the dissertation is situated within reform-oriented vocational education science, primarily focusing on developing comprehensive vocational action competence (Section 1.2). At the same time, it is also positioned within the context of international TVET cooperation, as outlined in the German Federal Ministry of Education and Research's strategy (BMBF, 2019a) and the guidelines for international cooperation in TVET research (BMBF, 2017; Section 1.3). The structure of this dissertation is outlined in the last section of this introductory chapter (Section 1.4).

1.1 Research Subject: Implementation of Dual TVET (DTVET) in Thailand

This dissertation focuses on developing, implementing, and expanding DTVET models within the framework of international TVET cooperation and exchange. It positions this research within the field of a reform-oriented vocational education science by examining two WBL models implemented at RMUTL based on the cultural context and the local demands. This work emphasizes that these WBL models are not seen as pure transfers of the German DTVET model to Thailand, but rather as a close TVET collaboration between the two countries since 1959. Therefore, this dissertation focuses on the sustainable implementation of these WBL models through the collaboration of different learning venues and explores how these models can form best practice examples in other ASEAN countries.

This work contributes to a reform-oriented vocational education science by analysing the DTVET models that address two central issues in TVET: (1) cooperation among learning venues as the foundation for implementing DTVET, and (2) implementation of a WBL program designed for holistic competence² development. The RMUTL's WBL projects, *School-in-Factory (SiF)* and *Tripartite Education System (TEdSys)*, explicitly illustrate these elements.

Although these two projects are not to be seen as mere “transfers” of Germany's DTVET model, their structure, organization, content, and methodology are connected to the German DTVET system. This similarity stems from a long-standing German–Thai

¹ RMUTL is one of the nine technical universities in Thailand that belong to the Rajamangala University of Technology Network. The Rajamangala universities are covering all regions in Thailand and operate TVET hubs that reach the entire regions with educational programs.

² The term "competence" is preferred over the Anglo-Saxon term "skills" due to its more human-centered and holistic approach, aligning with the German TVET system and vocational pedagogy context. This preference emphasizes the integration of knowledge, skills, and attitudes, reflecting a broader understanding of professional capability (or competence) (see Li et al., 2023).

partnership in education and cultural exchanges and also from Thailand's collaboration with international companies that are familiar with this training concept.

RMUTL's WBL projects are influenced by national and regional sociopolitical and economic factors, including the Thai government's initiatives such as Thailand 4.0 and the Eastern Economic Corridor (EEC)³ and the establishment of the ASEAN Economic Community (AEC).⁴ These initiatives are designed as development and investment programs to promote innovative human resource development, including TVET; connect individuals with the modern workforce; support labour force development that aligns with the demand in Thailand and ASEAN; and also increase external investment in the region. The SiF project, for example, has been supported by Michelin Siam – an international company that produces tires through its 123 production sites and 125,000 employees worldwide (Michelin, n.d.) – since SiF's inception in 2013.

The SiF and TEdSys projects were established to foster educational partnerships with industry through public–private partnerships (PPPs).⁵ Combined with a reform-oriented TVET approach, they can effectively produce a competent workforce. Therefore, this dissertation focuses on the implementation of these projects, which have been in operation for over 10 years and have received satisfactory acceptance among society, learners, and companies. In particular, it explores the extent to which these initiatives can contribute to a vocational and company pedagogy in developing holistic vocational action competence that balances the demands of production with the goals of a successful career life.⁶ One particular challenge in implementing WBL in the Thai TVET system is the lack of close collaboration between educational institutes and businesses (see Section 3.2.1).

Accordingly, this dissertation, which includes this cumulus text and six published articles, is guided by the following research question:

³ The German-Thai Chamber of Commerce, via its magazine called Update, provides very good information on both strategies. Thailand 4.0 in the issue on April 2016 and about EEC in January 2020.

⁴ Association of the Southeast Asian Nations (ASEAN) includes Brunei Darussalam, Indonesia, Cambodia, Laos, Malaysia, Myanmar, the Philippines, Singapore, Thailand and Vietnam.

⁵ Public-private partnership (PPP) is a broader framework for the projects implemented at RMUTL. Its' aim is to create a collaboration that allows educational institute to access the modern industrial technology from the private companies and promote joint research between them, mainly to solve the industrial production problems. This is the initial establishment for the Research Center for TVET at RMUTL.

⁶ This discussion adopts a classification of disciplines within vocational pedagogy commonly used in the German academic system, which is in charge for the education of TVET teachers and the conduct of research and development projects in the TVET system, reflecting the structure of Germany's TVET system. In this system, workplace learning is a significant component of vocational education, leading to a specialized field called "Betriebspädagogik" or "Arbeitspädagogik" (often translated as "company pedagogy" or "work pedagogy") within the broader field of vocational pedagogy (Schelten, 2010b, p. 12; Arnold, 1997). As Schröder (2009a, p. 24) explains, "Betriebspädagogik" or company pedagogy concerns itself with learning processes within the company context, or more broadly, with company-based educational work. Therefore, work-based learning is a central focus of this "company pedagogy" (see Section 1.2).

How do the SiF and TEdSys projects at RMUTL develop an effective WBL approach in Thai TVET, and what makes them potential best practices for the ASEAN region?

Essentially, this research examines how a public-private partnership (PPP) model integrating TVET, the SiF and the TEdSys at RMUTL successfully combines academic learning and school-based experience with practical industry training to create an effective WBL approach.

1.2 Vocational Education as an Academic Discipline

Vocational education science (Schröder et al., 2013) is not established in Thailand as an independent academic discipline that has an academic and research focus on the TVET system, despite regional calls for its development as articulated in the 2013 Thanyaburi Statement. The Thanyaburi Statement, signed by Thai universities actively engaged in regional TVET development, emphasizes the systemic need for such an academic discipline in order to continuously develop, adapt, and innovate the national TVET systems in the ASEAN region.

Thailand's lack of a distinct TVET academic discipline is not an isolated issue. Worldwide, there are ongoing discussions about the necessity of establishing TVET as a recognized academic field, which would support the continuous development of TVET systems (Huebler et al., 2025). This dissertation aligns with the scientific disciplines of vocational pedagogy⁷ (Berufspädagogik) and company pedagogy (Betriebspädagogik). In Germany and several other countries, these fields are recognized as sub-disciplines of educational science (Erziehungswissenschaft). They are institutionally established and staffed within higher education, where TVET is commonly integrated with business education as vocational and business education (Berufs- und Wirtschaftspädagogik). This latter primarily focuses on TVET teacher education for the formal TVET system at the college level,⁸ indicating that the TVET system includes more than just DTVET. Therefore, it is logical that these disciplines, responsible for training and researching TVET personnel, have contributed to the development of high-quality TVET systems in Germany.

The academic understanding of vocational pedagogy (Berufspädagogik) is focused on the scientific study of the prerequisites, conditions, goals, possibilities, and realities of qualification and competence development processes for meaningful employment and societal participation with social and ecological responsibility. As articulated by Lipsmeier (2018), who views TVET as deeply rooted in Germany's educational policy reforms of the 1970s and 1980s, TVET is "...the sub-discipline of educational science that deals scientifically with the prerequisites and conditions, goals, possibilities and realities of qualification and competence

⁷ The terms "vocational pedagogy" and "vocational education science" are used interchangeably in this thesis, reflecting the German academic context. "Vocational pedagogy" is a direct translation of the German term "Berufspädagogik," while "vocational education science" is a more contemporary equivalent, as suggested by Schröder, Schulte, and Spöttl (2013). The choice of "vocational pedagogy" here emphasizes the practical, pedagogical aspects of TVET development, aligning with the reform-oriented focus of this research.

⁸ Sommer (1995) proposed five research and practice fields in vocational and business education which include aspects such as conceptions of human beings, individual characteristics, social and organizational aspects of vocational teaching and learning systems, didactic-methodological considerations, and finally the historical and political dimensions.

development processes for humane gainful employment and a life in society in social and ecological responsibility” (ibid., p. 25). This definition extends beyond mere competence development, emphasizing the broader development of individuals within a societal context.

Emphasizing this holistic view, Lipsmeier (ibid., p. 33) quotes H. Schmidt, referring to the 1995 memorandum of the German Research Foundation (DFG) Senate Commission, who argued that within TVET, “...the development of the personality and personal maturity of democratic citizens in the learning and working process is more important than economic calculations”. This quotation is particularly significant, as it highlights that the core understanding of TVET within the scientific discipline considers its practical contribution to the economy and to individuals' personal and societal development, which constitutes vocational action competence (see Section 2.1.1).

Complementing vocational pedagogy is company pedagogy (Betriebspädagogik), which focuses specifically on the in-company aspects of TVET from a reform-oriented standpoint. While “work pedagogy” (Arbeitspädagogik) might pragmatically encompass all forms of initial and continuing TVET, company pedagogy is often preferred as a distinct sub-discipline of vocational pedagogy. Its primary focus lies in the training and learning processes within the workplace context, which is usually required for work-based learning.⁹ Additionally, Schelten (2010a, p. 57) locates the core idea of company pedagogy in the connection between work and learning, adopting the perspective of a learning organization's personnel requirements, implementation processes, and outcomes.

The Vocational Training Act (Berufsbildungsgesetz; BBiG)¹⁰ in Germany provides a legal framework that informs vocational pedagogy (BIBB, 2019b). Section 1, paragraph 3 of this act defines the subject area of TVET as vocational training preparation (Berufsausbildungsvorbereitung), advanced vocational training (Fortbildung), and vocational retraining (berufliche Umschulung). In addition, paragraph 6 of this act introduces an important dimension:

In accordance with this Act and the Crafts and Trades Regulation Code (Handwerksordnung; HwO), an individual's vocational competence shall be determined on the basis of a recognized training occupation. The assessment shall be carried out irrespective of whether the vocational competence was acquired through vocational training. If the vocational competence is largely or fully comparable with the professional competence required for exercising the recognized training occupation, this shall be certified.

Furthermore, paragraph 3 emphasizes that

Vocational education and training shall impart the vocational skills, knowledge and abilities (vocational action competence) required to perform a qualified occupational

⁹ In a broader term, this is also called “company-based educational work” (Betriebliche Bildungsarbeit; see Dehnbostel 2022).

¹⁰ The Vocational Training Act (Berufsbildungsgesetz; BBiG) is originally written in the German language and was translated by the author into English using the DeepL Translator, with minor modifications. It can be accessed from the website of the Bundesministerium der Justiz.

activity in a changing world of work in a structured training course. It must also enable the acquisition of the necessary professional experience.

These quotes highlight the central focus on holistic vocational action competence as a core principle of vocational and company pedagogy. As mentioned above, paragraph 6 of the BBiG also clarifies that this competence is assessed based on defined vocational skills and abilities, irrespective of the acquisition mode. This view presents a key opportunity for vocational pedagogy to identify and validate the diverse pathways that lead to the development of vocational action competence. Thus, the goal is to achieve this competence rather than stick to formal training modalities.

The initiative implemented at the RMUTL, with its projects aiming to reform the TVET system through the integration of work-based learning via DTVET, aligns with the principles of vocational and company pedagogy. The emphasis on DTVET requires effective cooperation between TVET institutes and companies, making the collaboration between learning and training venues a central research and development topic. Hence, it aligns with the aims of reform-oriented vocational pedagogy and company pedagogy, which seek to develop relevant vocational action competences that respond to the demands of the labour market. The RMUTL projects' implementation of in-company, work-based learning falls within the concept of company pedagogy. This approach relates to Dehnbostel and Schröder's (see Sections 2.1 and 2.2) view of WBL as experience-based and self-directed learning within and through authentic work processes, ultimately leading to competence development. While vocational training preparation and advanced vocational training are relevant to the broader TVET landscape, RMUTL's current prioritization of DTVET and WBL situates its work mainly within the scope of company pedagogy. This framework provides a critical analytical tool for understanding and progressing effective TVET models in the Thai context.

Based on these discussions, this dissertation concentrates on vocational training and learning at different learning venues, with a particular emphasis on the cooperation among these learning venues. This focus is related to the reform efforts undertaken by the RMUTL in Thailand, which aim to strengthen the connection between academia and the world of work through effective WBL models.

Overall, although Thailand currently lacks a formally recognized independent academic discipline of vocational education like in Germany, the principles and frameworks of vocational pedagogy (Berufspädagogik) and company pedagogy (Betriebspädagogik) can offer valuable theoretical and practical foundations for its TVET system development. The emphasis on holistic vocational action competence, as articulated in the German Vocational Training Act and understood within vocational pedagogy, provides a broad understanding of the goals and processes of effective TVET. The focus of company pedagogy on WBL and cooperation among learning venues are related to the reform efforts implemented by the RMUTL. Recognizing this, Thailand can refer to the experiences and established knowledge of countries like Germany to improve its TVET system.¹¹

¹¹ This effort should extend beyond simply translating the Vocational Training Act into the Thai language.

1.3 International Cooperation in TVET and TVET Research

This section examines international collaboration within TVET, focusing on TVET research that goes beyond pedagogical topics such as learning-venue cooperation and WBL advancement. This research was conducted in collaboration with international TVET researchers. The involvement of the School-in-Factory (SiF) project with international companies like Micheline Siam Company Limited demonstrates international engagement. Furthermore, collaboration with the ProWoThai project, which focuses on enhancing WBL in Thailand and is a significant component of the Tripartite Education System (TEdSys) funded by the Thai government (Office of National Higher Education, Science, Research and Innovation Policy Council, NXPO), further emphasizes the importance of international partnerships in conducting TVET research. International cooperation in TVET and TVET research is crucial for achieving RMUTL's goal of aligning its curriculum with labour market needs. Challenged by disruptions and travel restrictions, the ongoing exchanges and certain research activities were conducted online and, importantly, through international platforms like the Regional Association of Vocational and Technical Education in Asia (RAVTE).¹²

When discussing international TVET cooperation, it is crucial to differentiate between its practical applications and TVET research. The practical applications include initiatives such as establishing DTVET models in collaborative projects, whereas TVET research transcends national borders. Differences across national systems become evident in international comparisons within the practical application of TVET (see Frommberger & Baumann, 2020; Lauterbach, 2018). Accordingly, Frommberger and Baumann (2020) have identified three key aspects related to the challenges and topics of discussion within the “internationalization of TVET”, which could be outlined as follows:

a) Globalization of work: The globalization of work can lead to shifts in required competence. Vocational and company pedagogy must respond to these changes by developing locally and regionally specific competence profiles.

b) Structural differences among national TVET systems: Significant variations exist among national TVET systems. These variations can create challenges for both companies and individuals operating internationally.¹³ Bridging these differences in practice requires factual competence and reflection on each TVET system.

c) Sociocultural differences: International collaborations encounter variations in sociocultural settings beyond structural differences. Projects in Thailand, for instance, may be inspired by the German DTVET model, but are implemented within a distinctly different social and cultural context. This is particularly important when actors from diverse backgrounds interact within cooperation projects. In such cases, “intercultural competence” –

¹² Established in 2014 with the aim to create a strong collaboration for the TVET network in Asia. More information: <http://www.ravte-asia.rmutt.ac.th/strategy/>

¹³ For instance, the "German" phenomenon of a strict separation between general and TVET contrasts with other systems in distinguishing between "general" and "vocational" in secondary education. This could be exemplified by the English term "student," which is differentiated in the German language as "pupil" and "trainee."

the ability to communicate respectfully and effectively with individuals from other cultures, acknowledging and respecting cultural differences – is essential.

International cooperation in TVET and TVET research address this aspect of the transfer of knowledge and practices under the “VET transfer” (Stockmann, 2019; Euler, 2023).¹⁴ This aligns with the German Federal Ministry of Education and Research's strategy for international cooperation in TVET (BMBF, 2019a), which aims to provide partner countries with sustainable and needs-based support to effectively integrate context-specific elements of practice-oriented TVET into their respective systems. This guideline promotes DTVET based on the German model, which can be summarized under six core principles or quality characteristics (see Dehnbostel & Lindemann, 2016):

1. Joint responsibility of the state, business, and social partners;
2. Learning in the work process;
3. Establishment of national standards;
4. Qualified training personnel in companies and TVET colleges;
5. Independent, institutionalized TVET and labour market research according to local and regional conditions; and
6. (recently added) Attractive professional career paths (permeability).

Therefore, establishing DTVET at both the national and international levels requires TVET research and learning within the work process, also known as WBL. Some of the fundamentals of this discipline should be mentioned here before presenting the research strategy and methodology, as they are relevant aspects to this thesis (see Section 2.3). As identified by Spöttl (2020), two fields of TVET research are relevant to the present context:

1. Analysis, design, and evaluation of learning and educational processes and forms of work conducive to learning. This aspect deals with methods, tools, organization, work, education, and quality.
2. Analysis and design of TVET courses and systems, including training courses, permeability, equipment, learning venues, quality of learning, and didactics of learning.

Primarily, TVET research is aimed at determining sector-specific competence required for work and production processes, from which curricula and methodological-didactic concepts emerge (Spöttl et al., 2020; Pahl, 2018; see also Schröder et al., 2023). Moreover, it also includes the institutional and personal aspects that influence competence development. Thus, it is closely linked to the concept of competence (see Section 2.1.1). Effective job and workplace analyses, crucial for identifying training content, rely on cooperation with companies. As highlighted by Rauner and Maclean (2009), this collaboration allows TVET research to bridge the gap between educational practices and labour market demands, which is done through analysing regional labour markets, production conditions, and the required competence to develop tailored TVET programs.

¹⁴ This concept is revisited in Section 2.3, which discusses appropriate research strategies and methods for cooperation projects focused on transferring elements of dual TVET which require a dialogical approach and cultural sensitivity.

Furthermore, competence development requires a precise definition of skills and capabilities. A crucial element of TVET research entails analysing production processes and designing training processes that mirror authentic work situations. These steps ensure the relevance and adaptability of TVET programs. Hence, the required competence for the development of Industry 4.0 needs to be redefined and also integrated into the curricula. As Spöttl et al. (2020, p. 15–16) point out, these work-process-based curricula can be effective in driving the shift from “regulation-guided know-that” to “work-process-based know-how”. Research in TVET ensures that TVET systems adapt to changing challenges through knowledge exchange between the TVET sector and companies, allowing programs to respond to global trends and specific workforce needs (Schulte et al., 2020).

1.4 Structure of the Dissertation

The theoretical framework of this dissertation is based on a reform-oriented approach to vocational and company pedagogy within the DTVET model. This framework considers several related dimensions, including organizational structures, methodological-didactic conceptualizations, and international TVET cooperation. The organizational dimension includes cooperation among industry, TVET colleges, and governmental or subsidiary bodies. This emphasizes the critical importance of cooperation and coordination among these stakeholders in an effective TVET system. For methodological-didactic purposes, this dissertation highlights WBL approaches. These approaches promote active and self-directed learning that usually integrates work and learning tasks (WLT). It emphasizes practical application and the development of learners' competence through workplace learning.

Moreover, this dissertation also examines international TVET cooperation through the partnerships among companies (e.g. Michelin Siam), universities (e.g. TU Dortmund and University Tun Hussein Onn Malaysia), and governmental agencies (e.g. OVEC and NXPO in Thailand). These collaborations allow the exchange of best practices, the development of joint training programs, and the adaptation of the TVET system to meet specific national or regional needs. Furthermore, the analysis includes independent research projects, such as the *SiF* and the *TEdSys*, where collaboration with industry is strongly present. These projects mainly focus on competence development that responds to ever-changing industry demands.

The concept of cooperation and knowledge transfer, which is supported by scientific coaching as represented in the “ProWoThai” project, is also a key element for the framework of this dissertation. Lastly, the role of the university in fostering innovation within the TVET system and facilitating collaboration between TVET colleges and companies is a key innovative aspect explored within the DTVET models. This unique role and the multiple functions of university support the continuous improvement and adaptation of training to meet ever-changing industry demands and technological advancement. This multidimensional approach offers a comprehensive perspective through which to analyse and understand the dynamics of contemporary TVET.

The remainder of this dissertation is structured as follows:

Chapter 2 establishes the theoretical framework of WBL in a reform-oriented TVET system. It focuses on developing vocational action competence through experiential learning

settings, exploring the concepts and types of WBL based on the German DTVET model. Furthermore, it introduces participatory action research (PAR) as a crucial research approach for the innovative TVET system's development.

Chapter 3 provides context on the TVET and DTVET systems within Thailand. This chapter aims to contextualize the development of RMUTL's WBL projects by outlining their historical background. It also addresses the growth of the SiF initiative and the TEdSys, referencing key documents like the Thanyaburi Statement (2013) and the RAVTE foundation, including the TVET@Asia journal established in 2014 to demonstrate the broader context of the SiF's growth.

Chapter 4 presents the six articles that form the central part of this dissertation and also contribute individually to the topics outlined in Chapter 2. Their original formats are attached in the appendices. Each presented article provides insights and updates on the SiF and the TEdSys from 2017. Moreover, it also details the current status of the two projects, which is not included in the published articles. The overview of each article allows the readers to understand the contribution of these projects to the larger TVET system without having to read each individual article. Chapter 4 critically analyses these articles and suggests several recommendations based on the framework of reform-oriented vocational education science as outlined in Chapter 2.

Chapter 5 provides more holistic and systematic perspectives on the six articles, including insights and future directions. It highlights the contribution of the articles to the research topics presented in Chapter 2, systematically discusses the overall findings, and interprets them through the lens of the theoretical framework. It focuses on key topics for international cooperation in TVET and TVET research, which include the development of competence profiles, collaboration among learning venues, curriculum design, and joint efforts to build autonomous TVET competencies and capacities. Moreover, Chapter 5 reflects on the innovative role of a technical university within the DTVET model for further development in the field. Lastly, it discusses WBL beyond RMUTL, in a broader national context.

Finally, **Chapter 6** provides some concluding remarks and offers recommendations for the enhancement of the Thai TVET system.

Chapter 2: Theoretical Positions of Work-Based Learning in a Reform-Oriented TVET System

This chapter explores the theoretical position of work-based learning (WBL) in a reform-oriented vocational and company pedagogy to provide a theoretical foundation for the following chapters. It is structured under four main sections. First, Section 2.1 examines the conceptual foundation of TVET by focusing on the development of vocational action competence in experiential learning settings. Subsequently, Section 2.2 explores the concepts and types of WBL based on the German Dual TVET (DTVET) system and examines the work and learning task (WLT) and learning and work task (LWT) as the methodological and didactic design elements of WBL. Section 2.3 then analyses participatory action research (PAR) as a research strategy and the significant role of qualitative research methodologies for the reform-oriented TVET system. Finally, Section 2.4 synthesizes the key points discussed in this chapter.

2.1 Development of Vocational Action Competences in Experiential Learning Settings

This section examines the foundational concepts of the TVET system. Section 2.1.1 focuses on the development of vocational action competence through formal, non-formal, and informal modalities; Section 2.1.2 examines the framework of active, self-directed, reflective, and socially integrated learning for experiential learning in TVET; and finally, Section 2.1.3 closely investigates the cooperation between TVET colleges and companies as a prerequisite for successful DTVET implementation.

2.1.1 Vocational Action Competences as the Overall Objective of TVET Provision

Vocational action competence is the overall objective of any TVET provision and, thus, a central subject of the scientific discipline of TVET in Germany. The concept of vocational action competence differs not only from the concept of competence in other scientific disciplines, but also from the Anglo-Saxon concept of competence used in English-speaking countries regarding TVET (Li et al., 2023).

The aim of developing vocational action competence is to train individuals to respond appropriately in professional, social, and personal contexts. The objective of professional (vocational) competence is outlined in Section 1 of the German Vocational Training Act (BMBF, 2019b). It applies to all TVET learning venues: the workplace, the TVET college, and the inter-company training centre. The reach of this law extends beyond TVET and includes the preparation, advanced training, and retraining of TVET (ibid.).

Vocational action competence combines an emancipatory educational claim with the demand of a constantly changing labour market.¹⁵ When the concept was introduced in the context of the Third Industrial Revolution, it was spoken of as a convergence of educational and economic interests (see Kutcha, 2011; OECD, 2022; IAG-TVET, 2017; UNESCO, 2022).

¹⁵ WBL, as a means for the development of vocational action competence, lies in the tension between its emancipatory potential and the demands of modern production. This result in the "emancipatory" versus "functional" debate in TVET, highlights that individual emancipation through WBL is often depending on mastering production processes.

In this sense, TVET as a system does not exclusively serve the economy's needs, but also considers the interests of individuals and society.

The concept of vocational action competence draws upon foundational work in related fields. Chomsky (1969) introduced a similar concept of competence within the context of early childhood language acquisition. Roth (1971), in his *Pädagogische Anthropologie*, provided a key framework by focusing on individuals' ability for action. He proposed a three-dimensional competence model that comprises subject competence, social competence, and self-competence. Although Roth focused primarily on general education, his model has been adopted and applied within TVET.

Further, the German Standing Conference of Ministers of Education and Cultural Affairs¹⁶ (KMK) has integrated the concept of *vocational action competence* into TVET. Since the mid-1990s, all TVET curricula designed for TVET colleges have been structured around the concept of vocational action competence as outlined by Roth in 1971 (Sekretariat der Kultusministerkonferenz, 2021, p. 15–16). The holistic concept of vocational action competence, according to the KMK, comprises three sub-dimensions, as explained below:

- **Subject competence** describes the capability and preparedness to analyze and solve tasks and problems, act in a goal-oriented, efficient and professional manner, and evaluate the work processes' quality and results.
- **Social competence** refers to the capability and preparedness to shape social contacts, to live responsively and socially among others, to communicate with people, and to solve conflicts together.
- **Human competence**¹⁷ describes the capability and preparedness to think about possibilities to shape your own life, family, and occupational biography, show self-confidence, self-organization, dutiful behaviour, and develop special moral issues for yourself (Sekretariat der Kultusministerkonferenz, 2021).¹⁸

The KMK sees methodological, communicative, and learning competences as prerequisites for developing the three competence dimensions.

¹⁶ The “Ständige Kultusministerkonferenz” (KMK), serves as an intermediary body. It creates a national standard for education because education in Germany is under the responsible of the Ministry of Education of different 16 “länder” (states), instead of the federal government.

¹⁷ It is “Selbstkompetenz” or “Personalkompetenz” in German language. While other sources, for examples Li et al, 2023 translated it as “Self-competence” and BIBB (Bahl & Dietzen, 2019, p., 14) refers to this as “Personal competence”. This dissertation opts the term “Human competence” because its focus on human-centered approach.

¹⁸ Translated into English with the help of the DeepL translator and modified to fit with the discussion by the author.

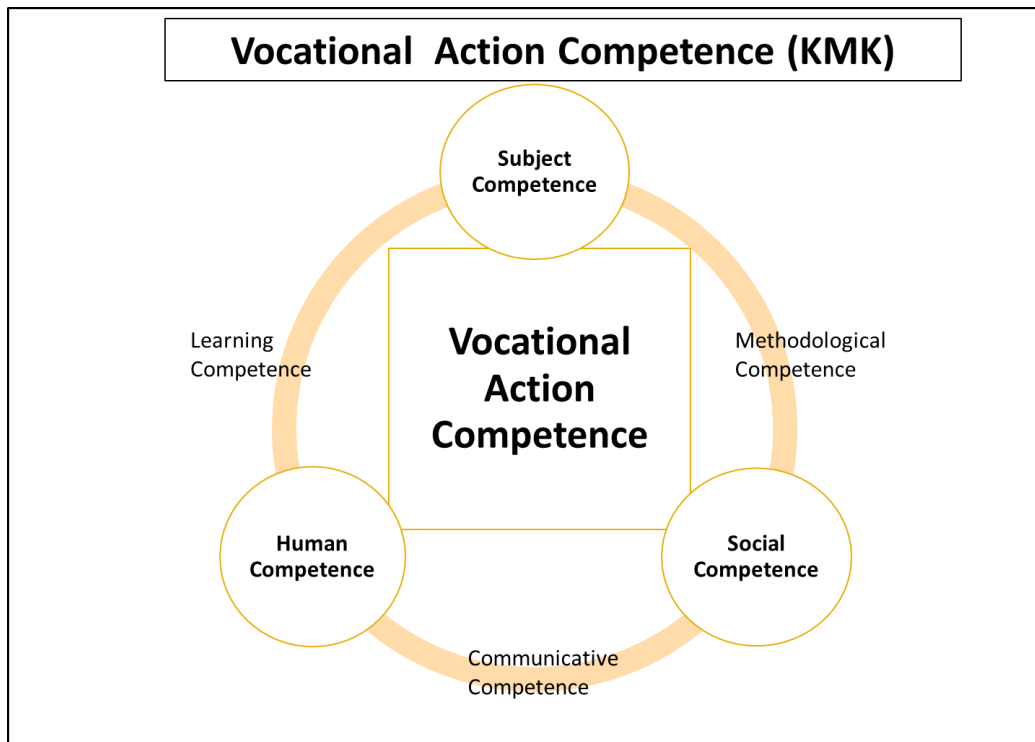


Figure 1: Vocational Action Competence (Sekretariat der Kultusministerkonferenz, 2021, p. 15–16; translated into English by the author)

Per Figure 1, each competence dimension and its sub-competences (i.e. critical thinking, creativity, problem-solving skills, teamwork skills, etc.) are based on a combination of knowledge, skills, the willingness to act, and a personal impulse to act. Developing vocational action competence and its sub-competences within TVET requires methods beyond traditional lecture-based instruction (talk-and-chalk teaching; Dwi Fosa et al., 2015). Therefore, project-based learning and integration of experiential learning across all learning venues are essential.

Vocational action competence, a core concept in German TVET, ultimately aims to develop individuals capable of acting effectively in professional, social, and personal contexts, drawing on foundational theories from Chomsky and Roth. Achieving this holistic vocational action competence, combining subject, social, and human competence, requires project-based and experiential learning. Thus, it signifies the importance of experiential learning in TVET, which is covered in the following section.

2.1.2 Theoretical Positions of Experiential Learning in TVET

This section explores the theoretical foundations of experiential learning in TVET. The two philosophical approaches that are always mentioned in the discussions are John Dewey's **pragmatism**, wherein knowledge is best acquired through practical application and continuous processes of experimentation and reflection (Dewey, 1938; Hickman et al., 2009), and **interactive constructivism**, wherein knowledge is actively built through social interaction and reflection on experiences (Reich, 2007).

Interactive constructivism is a socially and culturally oriented constructivist approach that focuses on and analyses the significance of cultural and life-world interactions in the re- and de-construction of realities. It emphasizes that interactions within our social and cultural

environments shape cognition and learning. Knowledge is thus seen as a continuous process of constructing and reconstructing an understanding of the world. While the world's objective reality is not accessible, interactive constructivism recognizes that it is better to develop useful and effective ways to interact with it.¹⁹ Therefore, if the learning process takes place in an authentic situation, that is, in an experience- and knowledge-oriented work environment, the learner can connect the context with the elements of knowledge.

The approach of interactive constructivism is closely related to John Dewey's pragmatism, which is considered a forerunner of constructivist thinking. Kersten Reich considers interactive constructivism an extension and refinement of Dewey's pragmatic principles (Reich, 2007). Pragmatism and interactive constructivism share the view that education and democracy are strongly related. Democracy is not only a social constitution, but also a learning process that creates the prerequisites for democratic participation through sufficient opportunities for participation in education and upbringing. The concept of “viability” as a criterion for evaluating qualitative research methodology is a direct outcome of this perspective, as discussed in Section 2.3.2 on qualitative research methodology and innovation. Pragmatism and interactive constructivism, thus, serve as key philosophical, sociological, and psychological foundations for the innovative provision of TVET based on WBL.

Like Dewey's pragmatism, experiential learning theories, such as David Kolb's experiential learning cycle (1984), reinforce the effectiveness of “acting”, wherein WBL is one variant among others. Kolb's model emphasizes four stages: concrete experience, reflection, abstract conceptualization, and active experimentation. This learning cycle mirrors the process found in work and learning tasks (WLTs), a crucial methodological and didactic design of WBL. Thus, WBL programs can be structured to support each stage of learning which enables learners to engage with real-world scenarios, critically analyse their experiences, and apply new insights to future challenges.

¹⁹ If there is lack of a directly accessible objective world, human beings have to rely on the shared constructions of this world. Thus, WBL, in this sense, can be viewed as a process that engages learners with complex, real-world problems. The interaction with colleagues and experts at workplace becomes essential for developing this constructed reality.

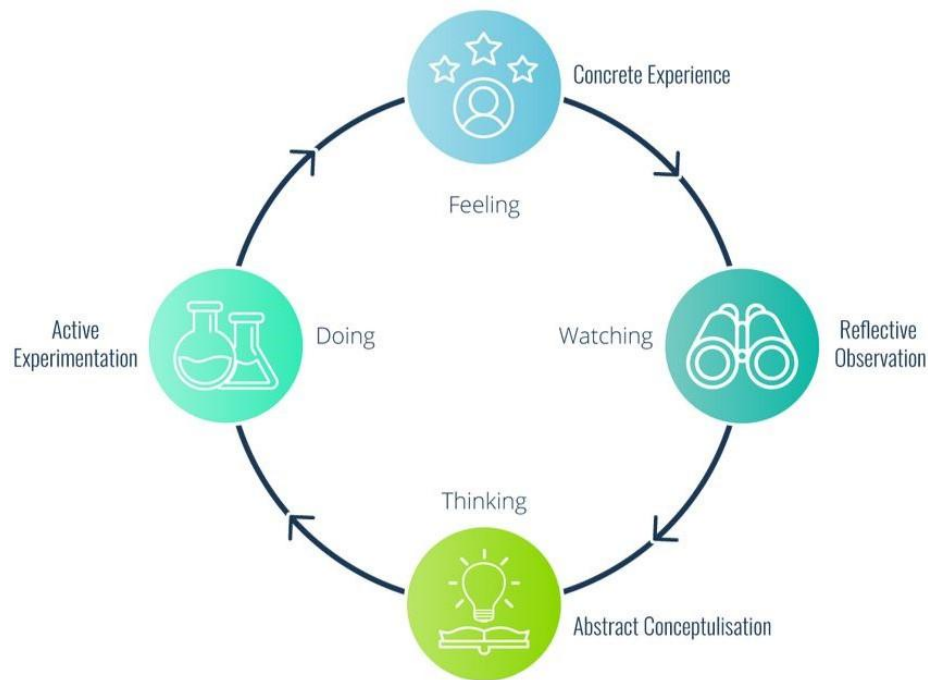


Figure 2: David Kolb's Experiential Learning Cycle (Kolb, 1984)

Developing vocational action competence requires moving beyond traditional classroom teaching to a context where knowledge is not limited to abstract and systematic information. This shift recognizes the importance of combining school-based learning with practical and work-based action. In this sense, vocational action competence can be developed through various learning pathways – formal, non-formal, and informal. While formal learning is an organized way of learning and occurs in structured educational settings, non-formal learning occurs outside learning institutions; informal learning, whereas, is unstructured and experience-based.

This distinction is, however, challenged by Billet (2013). He argues that workplace learning, which is usually seen as informal learning, involves highly formalized training processes. Billet recommends abandoning the term “informal”, since it does not lead to a deeper understanding of workplace learning. He rather emphasizes that acquiring complex knowledge requires interaction and communication with experts. Accordingly, focusing on the actual learning processes involved in each way of learning is more important than emphasizing their separation points. Moreover, Billet recognizes that expert guidance is crucial for acquiring workplace learning.

Developing holistic competence requires acquiring various types of knowledge. TVET cannot be reduced to classroom teaching, because it involves more than abstract theoretical knowledge, as already established in the KMK's concept of vocational action competence. Additionally, Böhle (2005) emphasizes that professionals need objective knowledge and subjective working activity (*subjektiviertes Arbeitshandeln*) to effectively manage complex and uncertain situations. Even though theoretical knowledge can be learned through formal learning, vocational action competence is not developed that way.

Moreover, as Molzberger et al. (2008) emphasize, most vocational action competence is developed through on-the-job training rather than formal learning. This highlights the

importance of the “social aspect of learning”.²⁰ For example, in a “community of practice”,²¹ as introduced by Dehnbostel and Schröder (2017), groups of people come together because of similar interests or life or work situations. Unlike in traditional classroom learning, the knowledge and skills learned within these communities cannot be separated from its genesis and surrounding situations, which lead to competence development (p. 3). Therefore, it can be concluded that these different forms of learning contribute to the development of vocational action competence, supporting the learners in applying their knowledge and skills in an action-oriented manner to solve problems from authentic work environments. These interconnected forms of learning that occur in the workplace are illustrated in Figure 3.

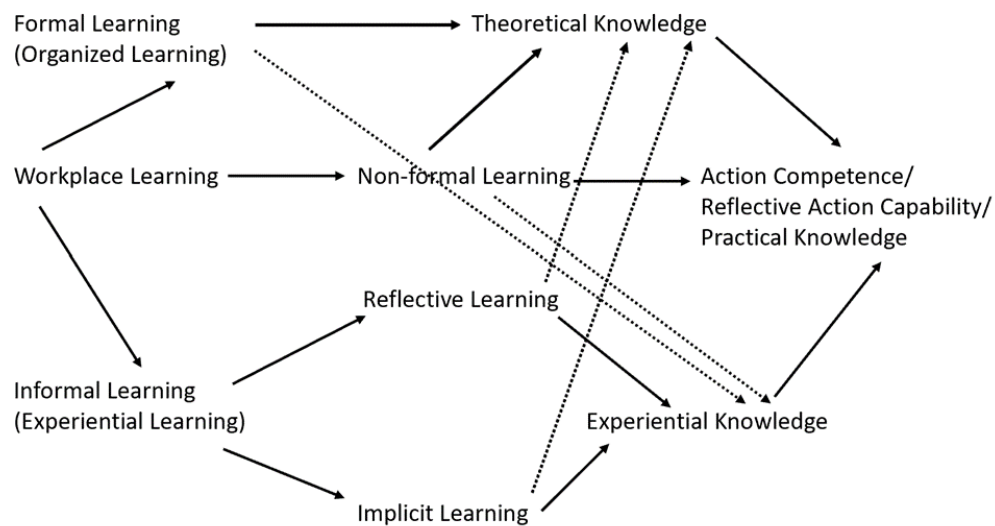


Figure 3: Differentiating Learning and Knowledge for Vocational Action Competence (Dehnbostel, 2022, p. 60; translated into English by the author)

Figure 3 differentiates the types of learning and knowledge that occur through workplace learning and contribute to developing vocational action competence. Aligning with Billet's idea that workplace learning is not merely informal, Figure 3 illustrates how formal, non-formal, and informal or experiential learning interact. According to this diagram originally developed by Dehnbostel, formal learning can be delivered through structured training programs and workshops. Non-formal learning includes on-the-job training and mentoring, while informal learning is gained through daily workplace interactions (with colleagues and experts) and work experiences.

Formal learning usually requires passive methods whereby the teacher or instructor dictates what needs to be learned (behaviourism). In contrast, informal learning often demands active and self-directed learning (Dehnbostel & Schröder, 2017) through experiential engagement with real-world situations, covering material, social, and cultural

²⁰ The social aspect of learning is considered as one of the aspects of vocational pedagogy (UNESCO-UNEVOC International Centre for Technical and Vocational Education and Training, 2014, p., 8).

²¹ For more detailed discussion see Wenger (1998) and Wenger et al., (2002).

factors. Dehnbostel and Schröder (2017) also suggested further learning approaches, such as situated and reflexive learning.²²

While the cognitivist view focuses on the creative application of rules, constructivism recognizes the “real world” as complex and unknown, thus stressing the need to discover solutions to challenges. A comprehensive discussion on this topic may be beyond the scope of this research, but understanding its impacts on TVET and on the WBL approach for formal TVET provision to balance theory and practice is essential.

The theoretical position of experiential learning in TVET is understood within the two broad philosophical perspectives, pragmatism and interactive constructivism, which assert that knowledge is best acquired through practical application and reflection in an authentic work environment through interacting within a learning community. Thus, TVET's main goal is to emphasize WBL as an approach to developing vocational action competence. Recognizing how crucial experiential learning is in TVET, the following section examines the interplay between the two main learning venues – TVET colleges and companies – as one of the prerequisites for successfully developing vocational action competence.

2.1.3 Cooperation Between the Learning Locations “TVET College” and “Company”

This section extends beyond the theoretical foundation of WBL and examines key implementation issues stemming from the weak cooperation between TVET colleges and companies. Effective TVET, especially DTVET, leads to the development of vocational action competence and, as discussed in the previous section, relies on authentic work contexts that foster experiential, active, and reflective learning within a professional community (Gray, 2001).

This understanding aligns with the concepts of WBL examined in Section 2.2²³ that emphasize the work-process-oriented learning approach, according to Dehnbostel and Schröder (2021), integrating TVET colleges, companies, and inter-company training centres. While the inter-company training centre is less common in Thailand, it is, however, relevant to this discussion, as it represents a potential learning environment.

The importance of cooperation²⁴ between TVET colleges and companies is generally well recognized. However, discussions on this topic often outline critical challenges in effectively implementing it in practice. One of them is the misunderstanding that WBL is only focused on developing teaching and learning methodologies within the company (Arnold et

²² Situated learning is an ongoing process of becoming a part of a group or community in which learning is deeply connected with participation. And reflexive learning focuses on learning through understanding and reflection of experiences (Dehnbostel & Schröder, 2017, p. 9–12; Lave & Wenger, 1991).

²³ The Dehnbostel-Schröder approach includes three learning venues: TVET college, company, and an inter-company training center. Inter-company training centers offer training to support smaller and highly specialized companies that may not have the resources to provide comprehensive training programs. While Thailand doesn't commonly use these centers, they are still important to discuss because they are a part of this approach.

²⁴ Further discussion on this topic can be found in the handbook of vocational education and training (Handbuch Berufsbildung) by Arnold, Lipsmeier and Rohs (2020). Especially in part VI where several essays are focus on learning venues and learning-venue cooperation.

al., 2020). This overlooks the significant role of collaboration between TVET colleges and companies.

Effective learning venues remain elusive despite the recognition of their importance. Schier (2005) notes that trainers within companies showed limited understanding of the curricula of vocational institutes (TVET colleges) and demonstrated a lack of interest in integrating their training programs with these curricula. A research study conducted by GIZ (2022), based on Mongolia and Pakistan, also highlights similar challenges, stating that in-company trainers often lack the necessary skills to effectively supervise and mentor the trainees (GIZ, 2022, p. 3). This disconnection reduces the potential benefits of WBL.

Additionally, research on learning-venue cooperation based on the German DTVET system has revealed systemic challenges (Euler, 2004; Zlatkin-Troitschanskaia, 2005). One significant issue is the lack of consistent support from education institutes and policymakers. This cooperation usually involves day-to-day problem-solving and systematic support to ensure sustainability and effectiveness. Moreover, fulfilling the sometimes-conflicting interests of various stakeholders is also challenging.²⁵

This highlights that learning-venue cooperation has not been institutionalized within the TVET system. As concluded by Zlatkin-Troitschanskaia (2005, p. 19), “If one considers the prevailing (educational) political consensus regarding socially ‘desired’ cooperation as a normative benchmark, cooperation between the various training institutions and their learning venues in vocational education and training can only be described as unsatisfactory overall.”

These challenges highlight the urgent need for innovative approaches to facilitate effective collaboration between TVET colleges and companies. Furthermore, it is significant to consider these issues from a broader perspective. A robust organizational framework and a shared knowledge of objectives, roles, and responsibilities of the stakeholders – teachers, trainers, employers, and learners – are crucial for successful collaboration. However, it is also crucial to recognize the differences in institutional cultures and the lack of resources. In addition, cooperation among learning venues may be influenced by broader framework conditions, including political, economic, and cultural factors, not just individual stakeholder actions.

This section has examined the practical challenges in implementing successful WBL by focusing on the cooperation between two major learning venues: TVET colleges and companies. There is an evident need for a better understanding of the potential benefits of improved cooperation between TVET colleges and companies to align or integrate their teaching and training curriculum, and, importantly, stronger support from policymakers to deal with the systemic challenges.

The identified challenges suggest that the WBL projects at RMUTL could be considered a practical solution to improving cooperation among learning venues and thus enhance the quality of WBL. The following section explores the concepts and types of WBL, thus providing a framework for analysing the RMUTL projects and their impacts (see Chapter 4).

²⁵ The "emancipatory" versus "functional" debate in TVET, as discussed earlier in Section 2.1.1

2.2 Concept and Types of WBL

As previously mentioned, DTVET is considered a method for developing vocational action competence, prioritizing experiential and reflexive learning. This section examines the concept and types of WBL based on the German DTVET system.²⁶ Specifically, it focuses on the work-process-oriented approach recommended by Dehnbostel and Schröder (2021), which recognizes three different learning venues: TVET colleges, companies, and inter-company training centres.

The Dehnbostel–Schröder approach is central to a reform-oriented approach to company pedagogy. It emphasizes developing comprehensive vocational action competence through a demanding learning process. This chapter delves into the following key aspects of this approach:

- Forms of WBL – Exploring different forms of WBL and how competence can be developed through active engagement within the three learning venues (2.2.1).
- Methodological and didactic design of WBL – Examining the “work and learning tasks” (Arbeits- und Lernaufgaben) and “learning and work tasks” (Lern- und Arbeitsaufgaben) presented by Schröder (2009a) and a framework for designing and implementing effective WBL (2.2.2).

This section deals with these topics to provide a comprehensive understanding of how different forms of WBL can contribute to competence development across learning venues within the DTVET system.

2.2.1 Forms of WBL According to the Three Learning Venues of the German DTVET System

Following the discussion of the theoretical foundation for WBL, this section explores forms of WBL according to the three learning venues of the German DTVET system, particularly focusing on the work-process-oriented learning approach developed by Dehnbostel and Schröder (2021). The German DTVET system (duale Berufsausbildung) is a well-regarded model of WBL that combines theoretical learning in TVET colleges with practical training in companies.

While WBL is now recognized internationally as a valuable approach to competence development (Bahl & Dietzen, 2019), the German DTVET system distinguishes itself through its unique structure.²⁷ This system, deeply rooted in German employment structures and cultural norms (Euler, 2023), goes beyond simply providing on-the-job training. It incorporates a structured, legally recognized program spanning two to three years, ensuring a balanced approach to theoretical and practical learning (Spöttl & Windelband, 2013). Furthermore, the system also includes training at inter-company training centres (Überbetriebliches Bildungszentrum, ÜBZ), which offer specialized instruction that is not available within individual companies. Supported by the government, this training allows

²⁶ The literature on this topic will focus mainly on Dehnbostel (2007; 2008; 2020); Dehnbostel & Schröder (2017); Schröder (2009a); Schröder & Dehnbostel (2021)

²⁷ Therefore, this dissertation positions itself that the German dual TVET system is suitable for Thailand as a model and cannot be entirely transferred. See Euler (2023).

access to specialized equipment and expertise – particularly valuable for smaller or more specialized companies.

The German DTVET system relies on strong collaboration among employers, TVET colleges, and the government (BIBB, 2019a). This structure ensures that training programs are relevant to the industry's needs, as well as the individual learner's development. Moreover, its emphasis on reflexive, self-directed learning and autonomy makes it suitable for preparing learners for the demands of Industry 4.0 (Windelband & Spöttl, 2019). The focus is on developing adaptable and independent workers with the competence to succeed in a rapidly changing and technologically driven workforce.

Schröder and Dehnbostel (2021; see also Dehnbostel & Schröder, 2017) present an expanded view of WBL, emphasizing that WBL is defined by its connection to authentic work processes rather than its physical distance to the workplace. The scholars systematically differentiate WBL forms based on the work-related nature of educational activities at each learning venue. Accordingly, WBL refers to learning in a company, at an inter-company training centre, and in a TVET college; it includes learning at work, within the work process, and through work (Dehnbostel & Schröder, 2017, p. 1). This framework highlights the importance of embedding learning within authentic work processes for developing holistic vocational action competence, which includes the following aspects:

1. Work-oriented learning (WOL) – Conducted in educational institutions like TVET colleges or universities, simulating real-world work experiences.
2. Work-connected learning (WCL) – Linked to workplaces through internships or part-time jobs where learning occurs near the company's production line.
3. WBL and work-integrated learning (WIL) – Occurs directly in the workplace, such as in apprenticeships or cooperative education programs.

With this classification of WBL forms, Dehnbostel and Schröder aimed to ensure that the benefits of WBL are realized across all learning environments. Figure 4 illustrates the differentiation of work-related learning²⁸ within the German DTVET system based on the classification presented by Dehnbostel and Schröder (2017, p. 5). The graphic also aims to clarify some terminological confusions that often complicate discussions around WBL.

²⁸ The Schröder–Dehnbostel approach uses "work-related" as an overarching term encompassing all these variations, while other models may use "work-based" instead. Also, to emphasize that learning should not be solely theoretical or abstract but connected to real-world work experiences.

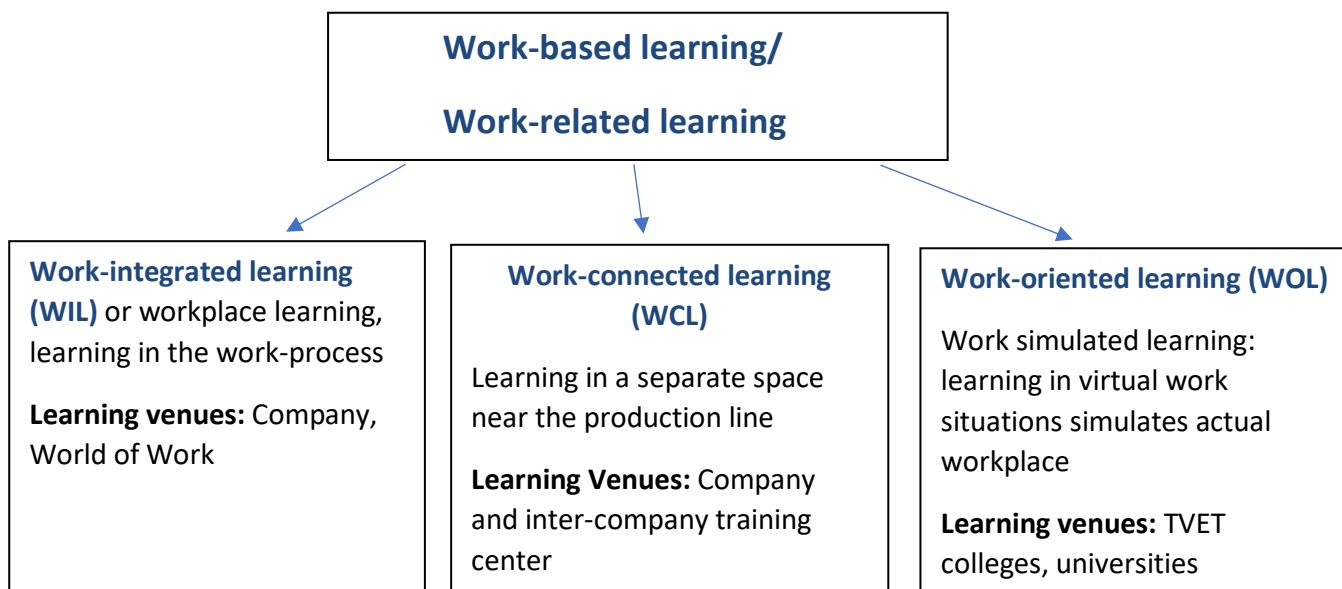


Figure 4: Typology of Work-Based/Related Learning (Dehnbostel & Schröder, 2017, p. 5).

The Schröder–Dehnbostel approach, rooted in the German DTVET system, argues that WBL extends beyond the simple separation between theory and practice. When the focus is on aligning learning contents with authentic work processes rather than with physical proximity to the workplace, WBL can be supported across three learning venues: TVET colleges, companies, and inter-company training centres. Therefore, three forms of WBL are identified: WOL, WCL, and WIL/WBL.

Another key aspect of this approach is the recognition that effective cooperation among learning venues is crucial for all forms of WBL and should not be limited to WIL. The learning that occurs at TVET colleges and inter-company training centres also relies on the expertise and input from companies.

2.2.2 Work and Learning Tasks (WLTs) and Learning and Work Tasks (LWTs): Methodological-Didactic Design of WBL

This section explores the crucial role of methodological and didactic design in enhancing the effectiveness of WBL, ensuring that learning is not undirected nor unintentional. As previously discussed, experiential learning in TVET is based on the active engagement of the learners in an authentic learning environment through social interaction within the learning community.

Work processes form the foundation of effective learning by providing a structured framework for the acquisition of knowledge and competence. Additionally, effective WBL requires a reflexive approach to teaching and learning. This involves creating learning experiences that encourage learners to actively reflect on their experiences, develop problem-solving skills, and take ownership of their learning. It also requires a balance between offering structured guidance and fostering learner autonomy.

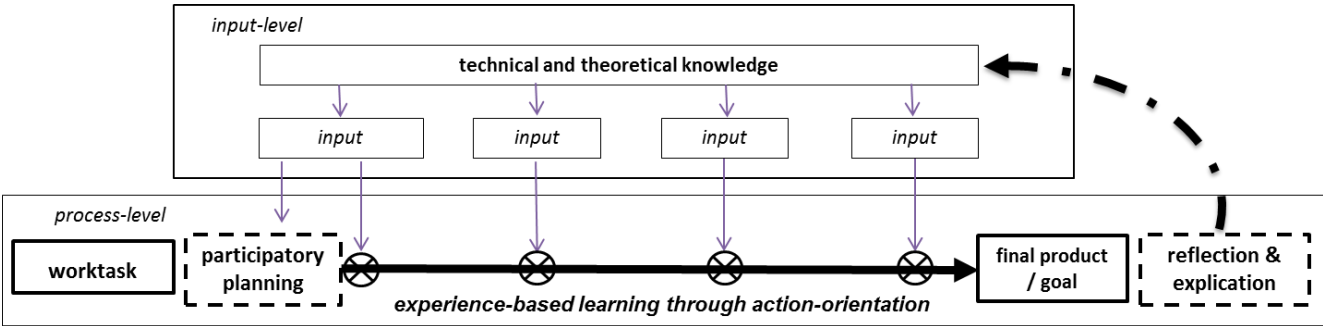
Vocational education science plays a critical role in achieving this balance by helping identify job-specific skills and design training programs accordingly (Spöttl et al., 2020). Analysing occupational tasks and work processes is essential for designing effective WBL

programs (Moonpa et al., 2024; Schröder, 2009b). This precise analysis of job requirements is important, as meaningful learning experiences cannot be created without a clear understanding of the competence needed.

To fully realize the potential of WBL, it is essential to adopt a methodological and didactic approach, as outlined by Schröder (2009a, 2009b, 2009c). This approach emphasizes the importance of organizing learning experiences to promote competence development. Two primary methodological learning instruments are (1) work and learning tasks (Arbeits- und Lernaufgaben) and (2) learning and work tasks (Lern- und Arbeitsaufgaben).²⁹ These instruments can be applied in different learning environments, including TVET colleges, inter-company training centres, and workplaces.

On the one hand, work and learning tasks (WLTs) are seamlessly embedded within the work processes in a company's setting, utilizing real-world challenges and conditions to drive experiential learning. This approach promotes learner autonomy, encourages reflection on work activities, and contributes to improving work design and organizational practices. On the other hand, in institutional learning environments, learning and work tasks (LWTs) are designed to replicate authentic professional scenarios. These tasks enhance the structure of learning, strengthen collaboration across various learning locations, and align closely with industry-standard work processes. While formal learning remains a core element, experiential learning is further supported through reflective practices to foster learner independence.

In both cases, effective collaboration among learning venues is crucial for success. Only tasks that closely align with industry standards and imitate authentic work processes can be valuable in this learning process. These learning processes are typically supported by a coach or a “learning facilitator” (a person who accompanies the learning and working process in a multidimensional way and has a special pedagogical qualification). This support fosters the development of a CoP, which is crucial for WBL. Figure 5 illustrates the conceptual framework for implementing WLTs and LWTs in all learning environments.



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Figure 5: Conceptual Framework for Designing Work-Process-Oriented Learning (Land & Schröder, 2021)

²⁹ It is acknowledged that there might be several tools for implementing WBL, such as “Lerninseln” and “Produktionsschule” (see Chapter 4). However, this dissertation discussed Work and learning tasks and Learning and work tasks as they developed through the ProWoThai project.

As illustrated in Figure 5, the process level begins with a specific work task or assignment. The learners then collaboratively plan how to approach the task with their coach; this step fosters ownership and encourages self-directed learning. The central phase – the input level – is focused on learners' active engagement in the work task, integrating technical and theoretical knowledge and experience-based learning through action-oriented learning. In the output phase, the products of learning form the final product or result, alongside competence development. Finally, the process ends with the crucial phase of reflection, wherein learners analyse their learning experiences and outcomes and reflect on their practical experiences with theoretical inputs. This final phase recognizes the significant involvement of a coach in creating a continuous cycle of learning and improvement.

Figure 5 provides a valuable framework for designing WBL activities. It highlights the significance of integrating theory and practice, involving learners in planning, and promoting reflection to increase learning outcomes. Moreover, it also emphasizes the active role of the learner in acquiring knowledge and developing competence through practical experience. Additionally, this conceptual framework will be referred to again when discussing the participatory action research approach in Section 2.3.2.

This section has explored three forms of WBL based on their connection to authentic work processes rather than to the physical distance between learning venues: WOL, WCL, and WIL/WBL. To effectively implement WBL across learning venues, two pedagogical-didactic designs of WBL have been suggested: WLTs and LWTs. The implementation of these designs requires strong collaboration among learning venues. The following section examines PAR as a research approach in TVET.

2.3 Participatory and Action-Oriented TVET Research

This section explores participatory and action-oriented approaches in TVET research to improve WBL effectiveness at the operational level, while also generating knowledge that informs policy. Specifically, it examines PAR as a research approach for the sustainable development of the TVET system. Section 2.3.1 discusses how PAR is crucial for TVET research, since collaboration among stakeholders is necessary to align curricula with the labour market's demand and, importantly, to support innovation at the operational level. Section 2.3.2 then examines PAR as a strategy for innovative development of the TVET system and highlights the crucial aspect of recognizing cultural and contextual differences for successful international cooperation in TVET.

2.3.1 Participatory Action Research (PAR) as a TVET Research Approach for Operational Innovation and Policy Information

This section examines PAR³⁰ as a strategy for the effective development of the TVET system. PAR emphasizes a collaborative and dynamic approach to research. In contrast to traditional research methodologies, which usually prioritize the researcher's perspective, PAR views

³⁰ Participatory action research (PAR) belongs to a design-oriented approaches. Their shared value is on achieving practical improvements (reform-oriented practice) based on the desired outcomes of the involved actors and stakeholders in the research. Specifically, design-oriented research is driven by the creation and planning (conceptualization) of solutions for reform and aims to address the needs and interests of those being studied ("research subjects"). Recommended further reading on this topic are the works of Tramm, Kremer & Reinmann (2017), Sloane (2020), and Euler (2018).

research as a collective inquiry involving all stakeholders in the research process, particularly in setting research goals (Bradbury, 2015). Moreover, PAR fosters a deeper understanding of the challenges and opportunities within the local TVET system. International collaborative research projects like ProWoThai (see Section 4.4), which focus on tailoring WBL initiatives to local needs in Thailand, have examined the value of PAR in improving the effectiveness of TVET programs.

Research in TVET relies on established quantitative and qualitative research methodologies rather than possessing a distinct, independent methodology. However, PAR prioritizes active and continuous engagement with practitioners throughout the research process, thus focusing on reform, development, and innovation. This transformation-oriented approach requires collaborative inquiry through various research methodologies.

Some of the research methods include, for example, semi-structured interviews for exploring individual experiences, group discussions for fostering shared understanding, document analysis for developing contextual insights into existing practices, and comparisons with expert statements for external validation (Schröder & Ragutt, 2024).³¹ Additionally, comparative research approaches (Grollmann et al., 2022) are applied in international cooperative TVET research. These comparative approaches can provide valuable information about lacking system elements or deficiencies that can inform the design of PAR projects.

PAR adopts a rather practical perspective on methodological questions, since the focus is the creation of innovative solutions to practical problems. As highlighted by Laur-Ernst (2018, p. 90), innovation in TVET research involves a cycle of design, implementation, and evaluation, focusing on developing and testing new learning environments, pedagogies, or technologies. It emphasizes the importance of practical relevance and focuses on the demands of the stakeholders to ensure that innovations are based on the needs of practitioners and learners in order to develop sustainable solutions. This aligns with the broader understanding of PAR as a methodology that integrates qualitative and quantitative techniques³² to collect comprehensive data and implement changes.

PAR emphasizes the need for robust research methodologies to explore the complexities of TVET contexts and inform evidence-based decision-making. While the clear separation between “qualitative” and “quantitative” methodologies is not a major concern, PAR offers a unique qualitative research approach. Its ability to provide real-world feedback through a cycle of planning, acting, observing, and reflecting is its strong point (Kemmis et al., 2014). This cyclical character differentiates PAR from linear research designs and emphasizes the importance of practical application and ongoing development. Additionally, through its focus on participation and collaboration, PAR constitutes a more inclusive and democratic approach (Heron & Reason, 2006, p. 16).

³¹ See Tracy (2010) and Tracy & Hinrichs (2017) for further discussion on qualitative methodology as an alternative research approach. See also Kaiser (2021) for the expert interviews which is relevant for the research described in the articles in Chapter 4.

³² This includes surveys, interviews, case studies, and participant observation (Schulte, 2020, p. 61). Moreover, Clement and Heras (2018, p. 799) highlights the importance of incorporating empirical data, theoretical frameworks, and stakeholder feedback to ensure curricula align with industry needs and promote effective learning outcomes.

Susman and Evered (1978) proposed a model for the PAR process which is similar to the organizational process of the WLTs depicted in Figure 5. This model emphasizes the collaborative involvement of stakeholders in a repeated cycle of diagnosing, planning, implementing, evaluating, and reflecting. Figure 6 illustrates these cycle stages within a PAR process. After the reflection phase, a new cycle of PAR can be begun if there is a need for further research and also the resources to realize it.



Figure 6: Participatory Action Research Process (Susman & Evered, 1978, p. 588).

This continuous process through the active collaboration of partners, when applied to TVET research, can drive innovation at the operational level and generate empirical data that can be used to inform broad policy decisions. Moreover, it also builds local research capacity and enables stakeholders to take ownership of their professional growth.

As shown in Figure 6, PAR can be considered a valuable research approach for effective TVET system development.³³ Schröder et al. (2013) proposed that the quality of TVET programs relies on a strong foundation in vocational education science. In terms of research strategy, such a foundation is best achieved through dialogical cooperation among learning venues. Developing curricula and the previously mentioned WLTs requires a deep understanding of the specific competences demanded by the labour market. The process should include dialogue and collaboration among all stakeholders in the above-mentioned cycle process.

Furthermore, Schröder et al. (2013, p. 5) highlight that vocational education science plays a crucial role in training TVET teachers by updating their competence with the

³³ While PAR offers a valuable framework for transformative change within TVET, other research methods, such as comparative studies and statistical analyses, contribute to curriculum development and a broader understanding of the field. These methods can offer additional perspectives for analysis and thus offer a more holistic understanding of TVET situations. For example, comparative case studies can provide insights into best practices across different TVET institutions, and statistical analysis can show trends and patterns in student learning outcomes.

changing demands of the occupational fields. Collaboration between researchers and practitioners to identify specific subject competence could support this training.

2.3.2 PAR as a Strategy for Systemic Innovation in TVET

The previous section examined how PAR could be used as an approach for TVET research for the effective development of the TVET system through operational innovation and policy information. This section further examines PAR as a strategy for systemic innovation in TVET. It also discusses cultural sensitivity as a critical factor for systemic innovation and for meaningful international cooperation in TVET.

Figure 7 demonstrates PAR's potential as a strategy for research and systemic innovation within TVET. It illustrates how PAR can generate empirical data, inform policy and administration, and lead to reform across the entire TVET system.

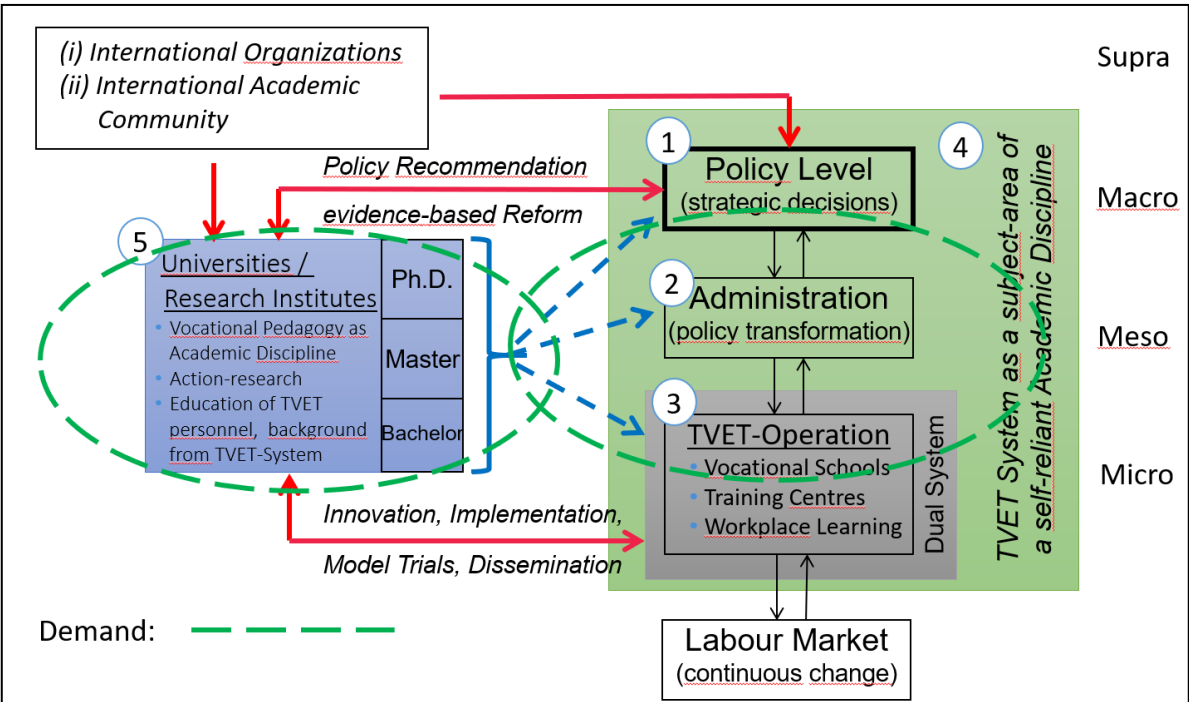


Figure 7: Innovation of the TVET System (Schröder, 2022)

As illustrated in the Figure 7, PAR cycle begins at the operational level that is TVET colleges and workplace learning. With support from the universities and research institutes, collaborative problem-solving and the implementation of new practices can lead to innovation at this operational level. Furthermore, the findings from model trials can also benefit the administration and policy level. Empirical evidence gathered through collaborative efforts is crucial for policymakers. These data will support them in making strategic decisions for the evidence-based reform of the TVET system and will eventually result in a systemic change that aligns with the changing demands of the labour market.

In international TVET cooperation, systemic innovation would involve adapting TVET models across diverse cultures. Here, PAR would be important, as cultural differences need careful consideration. These differences among the stakeholders and also with the “foreign experts” can be one of the challenges in international research collaboration. While TVET research (see Section 1.3) is not bound by national borders, its core objective in developing

learners' competence is inevitably connected to the specific nation's sociopolitical and cultural context. Even in a globalized world, TVET systems are deeply rooted in their sociocultural environments.

Internationally, PAR has become an important research approach for improving TVET systems.³⁴ It emphasizes collaboration among TVET researchers, practitioners (such as teachers and in-company trainers), and key stakeholders, including TVET colleges, companies, and policymakers. Local scientists are included in research to ensure that findings are culturally relevant and adapted to specific needs. Another strength of PAR is its democratic and bottom-up approach. Researchers act as facilitators or scientific coaches rather than as traditional knowledge providers. This positioning promotes global knowledge exchange while also considering the local context's demands and the local actors' wishes.

Moreover, “cultural sensitivity”³⁵ is particularly important when discussing the transfer of TVET models. Euler (2023), based on experiences of transferring the German DTVET model, highlights the local cultural and institutional contexts as crucial factors. A one-size-fits-all approach would not be suitable for sustained TVET system development. Similarly, Bahl and Dietzen (2019, p. 3) state that “enhancing the WBL model effectively requires an understanding of and adaptation to country-specific contexts and cultural traditions.” Simply transferring elements from one system to another is unlikely to be successful.³⁶ A more effective approach would be to adapt and contextualize these elements of the German DTVET to the particular destination country's specific needs and cultural realities (see Section 1.3).

Overall, it is widely acknowledged that participatory and action-oriented TVET research can support a reform-oriented TVET. In this regard, collaborative efforts among stakeholders throughout the research process must be emphasized to ensure that the practical application or solution is relevant and promotes continuous improvement.

2.4 Summary

This chapter has established the theoretical foundation for understanding and implementing WBL in a reform-oriented TVET system. Based on the German DTVET model, effective WBL implementation depends on a holistic approach to developing competence, experience-based learning, and strong collaboration across learning venues.

Firstly, vocational action competence has been positioned in this chapter as the overall objective of TVET. It includes subject, social, and human competences, which are further supported by methodological, communicative, and learning competences. Based on the philosophical understanding of pragmatism and interactionist constructivism, vocational action competence can be developed through experiential and active learning that is focused on reflection and social interaction within the learning community. Moreover, the lack of

³⁴ Internationally, this idea has gained increasing attention in TVET cooperation over the last two decades (see Wolf, 2009). In Southeast Asia context, the work of Schröder's participatory action research (2017a, 2017b, 2019b) is important and considered main sources of literature. This concept differs from the Eurocentric “development aid” models. The establishment of the Regional Association for Vocational and Technical Education (RAVTE) in 2014 demonstrated this effort.

³⁵ See also Li & Pilz (2021, p. 1).

³⁶ Euler (2023) and the essays by Schröder (2017a; 2017b, 2019b) can also be referred to again here.

strong and meaningful collaboration between TVET colleges and companies is identified as a challenge in the effective implementation of WBL. This highlights the significant role of RMUTL in facilitating this collaboration through its SiF and TEdSys projects.

Secondly, this chapter has explored the concept and types of WBL, focusing on the work-process-oriented learning framework by Dehnbostel and Schröder (2021), which is rooted in the German DTVET system. This framework extends beyond the simple separation between theory and practice and the physical distance to the company workplace. It emphasizes WBL across three learning venues: TVET colleges, companies, and inter-company training centres. It highlights that although Thailand does not usually offer training in all of these learning venues, as well as featuring limited collaboration across these venues, it can still effectively implement WBL according to this framework. WBL is connected to authentic work processes, and accordingly, there are three typologies of WBL: WOL, WCL, and WIL/WBL. This typology emphasizes the definition of WBL and that learning can occur through work, within the work process, and at work. It also recognizes the importance of effective learning-venue cooperation for all forms of WBL. Later, the methodological and didactic design of WBL was discussed in this chapter through the introduction of WLTs and LWTs. Additionally, the framework for implementing these tools within the ProWoThai project has been examined, which involves participatory planning and experience-based learning through action-oriented and reflective approaches.

Finally, the chapter highlights PAR as an important research strategy for reform-oriented TVET. PAR is focused on collaboration among all stakeholders to ensure that TVET programs are relevant and responsive to the labour market demand. Its process includes a cycle of planning, acting, evaluating, and reflecting. Acknowledging the cultural differences, the importance of cultural sensitivity must be recognized for meaningful international TVET cooperation. The PAR framework highlights the capacity building of Thai researchers to take ownership of their initiatives, as demonstrated in the SiF and TEdSys projects.

Overall, this chapter has provided a theoretical framework for understanding and implementing WBL in a reform-oriented TVET system. It highlights the development of vocational action competence through experiential learning settings, strong collaboration among learning venues, and the value of participatory and action-oriented research. While the potential of WBL is acknowledged for individual growth and production demands, challenges – such as weak collaboration among learning venues and transfer of TVET models without due consideration of cultural factors – can still be identified. Based on this understanding, the SiF and TEdSys projects are further discussed to examine the important role of RMUTL in facilitating learning-venue collaboration for effective WBL implementation in Thailand (see Chapter 4).

Chapter 3: The TVET System in Thailand, With a Special Focus on Dual TVET (DTVET)

Thailand's Technical and Vocational Education and Training (TVET) system has long attempted to integrate the benefits of work-based learning (WBL) to enhance its graduates' practical skills and employability. These efforts often draw inspiration from international models, particularly the globally successful German dual TVET (DTVET) system. However, the effectiveness of WBL implementation in Thailand is linked to the existing institutional frameworks. In other words, the success of sophisticated WBL initiatives at the micro level, such as those within individual companies or training programs, depends upon supportive measures at the meso level (e.g. industry associations, regional networks) and macro level (e.g. national policies, funding mechanisms).³⁷

A key observation is that despite support from state agencies like the Office of Vocational Education Commission (OVEC) and the Office of National Higher Education Science Research and Innovation Policy Council (NXPO), the crucial foundation of cooperation between companies and the education sector is still heavily dependent on private initiatives. This dependence stems from a systemic gap. Many educational institutions, particularly TVET colleges, often lack the necessary material and social resources (e.g. established industry connections) to offer robust DTVET programs that meet industry standards independently. This resource disparity frequently leaves colleges overwhelmed and unable to effectively implement comprehensive WBL.

This chapter examines Thailand's TVET system, with a specific focus on the growing importance of DTVET and the challenges in implementing WBL. It begins by analysing the socio-economic context in Thailand, highlighting critical challenges facing the TVET system (Section 3.1). Next, Section 3.2 underscores the potential of DTVET, while also outlining the broader obstacles that must be addressed for its successful implementation. The Thai TVET system is then examined within the broader ASEAN regional context (Section 3.3). The final section (3.4) subsequently summarizes the key points addressed in this chapter. Overall, this chapter sets the stage for examining whether RMUTL, through its various initiatives, effectively solves the problems in Thai TVET. It provides background information for a comprehensive understanding of RMUTL's role in shaping Thai TVET.

3.1 The Socio-Economic Situation and Structure of TVET in Thailand

This section examines the interplay between the Thai economy and the TVET system. It first explores the development of the Thai economy and the challenges stemming from its rapid

³⁷ UNESCO-UNEVOC (2021a, b, c) describes three levels of WBL localization, i.e., micro, meso, and macro. The teaching and learning processes employed in WBL programs are the main focus at the micro level. This emphasizes the effective pedagogy and learner involvement (UNESCO-UNEVOC 2021c). The focus of WBL on the meso-level are about cooperation among stakeholders, which are educational institutions and companies. This highlights the importance of partnerships for effective WBL (UNESCO-UNEVOC, 2021b). And the macro-level, the focus is on the governmental policies and regulations that influence WBL. This includes funding, standards, and also frameworks (UNESCO-UNEVOC, 2021a).

growth. Later, it analyses the structure of the TVET system in Thailand and its crucial role in developing a competent workforce for the required economic advancement. Lastly, it points out the key challenges and trends in the Thai TVET system.

3.1.1 Thailand's Economic Transformation: Progress and Challenges

Over the last two decades, Thailand's economy has grown significantly. Between 1998 and 2023, the gross domestic product per capita (GDP) increased by 289% (World Bank Group, 2024a). Tourism, finance, and technology services have contributed to this massive economic development. In spite of this progress, the country continues to face challenges such as income inequality (World Bank Group, 2023) and strong dependence on tourism. As of 2022, 5.4% of the Thai population earned below the national poverty line (ADB, 2024).

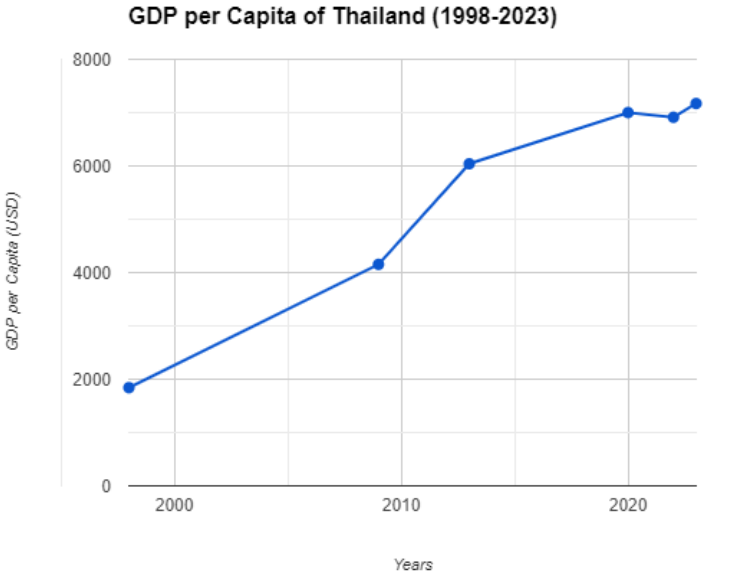


Figure 8: The Gross Domestic Product Per Capita of Thailand (1998–2023; World Bank Group, 2024a)

As highlighted in the 13th National Economic and Social Development Plan, Thailand is undergoing a complex economic transition. The country is dependent on foreign investment and low domestic value-added products, and it is vulnerable to changes in the global economy despite its economic progress. Moreover, low labour productivity and lack of investment in skills development and technology create additional challenges. Similarly, the service industry depends on low-skilled labour and outdated practices that limit the potential and growth in this sector (Office of the National Economic and Social Development Council, 2023, p. 6–8).

A comparison of the GDPs of developed and developing countries can help paint a clearer picture of Thailand's economic situation. For instance, comparing Thailand's value-added structure with that of countries like Myanmar³⁸ and Germany can provide valuable

³⁸ As one of the ASEAN member states, Myanmar is chosen for this comparison, that belongs to a low-income-country category while Thailand is in a range of upper-middle-income country. Additionally, Myanmar is one of the countries in ASEAN that can make use of the SIF and TEDSys

insights into Thailand's progress. While Myanmar represents a developing economy, Germany is an advanced industrialized nation. Table 1 shows the GDP of Myanmar, Germany, and Thailand in agriculture, industry, manufacturing, and services in 2015 and 2023.

	Gross Domestic Product \$ billions		Agriculture % of GDP		Industry % of GDP		Manufacturing % of GDP		Services % of GDP	
	2015	2023	2015	2023	2015	2023	2015	2023	2015	2023
Myanmar	59.6	66.8	26.8	22.7	34.5	37.6	20.8	21.9	38.8	39.7
Germany	3,357.6	4,456.1	0.7	0.7	27.1	28.1	20.3	19.0	62.2	62.2
Thailand	401.3	514.9	8.9	8.6	36.2	32.9	27.4	24.9	54.9	58.5

Table 1: World Development Indicators: Structure of Value Added (Myanmar, Germany, and Thailand; World Bank Group, 2024b)

According to Table 1, Thailand's GDP increased by 25% between 2015 and 2023, marking a significant shift towards a service-based economy. Agriculture's contribution to the GDP has slightly declined, from 8.9% in 2015 to 8.6% in 2023, while the service sector has grown to dominate over two-thirds of the economy, accounting for 58.5% of the GDP in 2023. In contrast to Myanmar, which still relies mainly on agriculture (22.7% of the GDP in 2023), Thailand's economic structure is now similar to that of developed countries like Germany. Germany's economy is predominantly service-based, with a strong industrial and manufacturing foundation, reflecting its advanced technological and economic development. Thailand's statistics show a clear progression towards a developed economy.

Thailand's economic transformation is closely linked to societal and population changes. As the country has transitioned from an agricultural to an industrial and service-based society (Moonpa et al., 2019), its social and economic structures have also rapidly changed (Grosch, 2018, p. 32). While agricultural productivity has remained low over recent decades, industrial productivity has steadily increased (OECD, 2021, p. 26–27). These industrialization and demographic trends have created a growing demand for skilled and qualified workers (Moonpa et al., 2019), especially in the industrial sector.

In spite of this economic growth, more than half of the Thai workforce remains in the informal sector. According to the National Statistical Office of Thailand (NSO, 2023), 21 million workers, or 52.3% of the 40.1 million working population, are employed informally. Informal employment is usually associated with lower pay and unstable jobs. Moreover, it provides limited safety benefits like health insurance or retirement plans. Farm workers, for example, earn much less than people with regular, full-time jobs. Additionally, Germany

projects to improve their TVET systems, discussed later in this dissertation (Section 3.3, and Chapter 5).

Trade & Invest (GTAI, 2024) highlights business challenges that are a result of a mismatch between the moderate income levels and the workforce's relatively low competence level.

Thailand needs to prioritize investment in human resource development to support its economic transition, with a special focus on the areas of innovation, digital technology, smart devices, and robotic automation. A competent workforce in these areas is essential to driving growth in modern industries and service sectors (ASEAN Secretariat, 2022a, p. 14). With an additional focus on improving infrastructure and enhancing research and development, Thailand aims to position itself as a regional leader in these sectors and boost its global economic competitiveness (Office of the National Economic and Social Development Council, 2023).

Thailand has achieved significant economic growth, transitioning from an agricultural to a service-based economy. However, it still faces challenges due to income inequality, heavy reliance on tourism, and a large informal workforce with low income and competence. Even if its economic structure is similar to that of industrialized countries, more investment in human resources, technology, and innovation is crucial to enhance Thailand's competitiveness and address its labour market inequalities. The following section examines the structure of TVET in the country and how it contributes to workforce development.

3.1.2 Structure of TVET in Thailand

The TVET system in Thailand plays a crucial role in the nation's economic and social development. It is strategically designed to develop a skilled workforce capable of competing effectively in the global arena (ASEAN Secretariat, 2022a, p. 11). The Thai government recognizes TVET as a crucial instrument for enhancing national competitiveness and fostering individual career advancement.

“Achiwasueksa” (อาชีวศึกษา), which means “vocational education”, is the Thai equivalent to TVET.³⁹ This terminology only recognizes the formal component of TVET. According to the Vocational Education Act of 2008, “vocational education” should be focused on developing a skilled, technical, and technological workforce. “Occupational training” complements this by offering short- and long-term skill development programs within and outside TVET institutes (p. 2). The 2008 Act also outlines DTVET as a model that integrates classroom learning at TVET colleges or institutes with practical training in workplaces, state enterprises, or government agencies, thereby providing learners with a balanced mix of theoretical knowledge and hands-on experience (p. 3). Despite the widespread use of “Achiwasueksa” in Thailand, this dissertation uses the term TVET, which aligns with UNESCO. This choice reflects a commitment to international standardization and facilitates broader comparative analysis within the ASEAN context.

The Thai TVET system provides a structured pathway for individuals to acquire TVET qualifications at various levels. This framework is aligned with the Thai National Qualifications Framework (NQF) and the ASEAN Qualifications Reference Framework

³⁹ It is acknowledged that in the Asia-Pacific region, the terms TVET and VET (Vocational Education and Training), as mostly used in German-speaking countries, are used interchangeably (UNESCO-UNEVOC, n.d.). However, the term TVET will be used in this dissertation.

(AQRF), facilitating both domestic and regional labour mobility. All forms of education, including TVET, are covered by the NQF, which was revised to eight levels in 2017. The National Vocational Education Framework (2019) further details the qualification levels, delivery methods, and quality standards (ASEAN Secretariat, 2022a, p. 19). Accordingly, TVET qualifications are categorized into three main types:

1. **Formal TVET Programs:** This category includes several levels of qualifications. The Vocational Education Certificate (PorWorChor), at Level 3 of the Thailand Professional Qualification Framework (TPQF), is earned after three years of full-time education at a TVET college or through a DTVET program. This certificate prepares graduates for roles such as technicians or electricians. Building upon this is the Diploma in TVET⁴⁰ (PorWorSor), a Level 5 TPQF that is completed in two years at TVET colleges or technical universities. This diploma level is designed for individuals seeking supervisory or specialist technical positions. At the higher end of formal vocational programs is the Bachelor's Degree in Technology, a Level 6 TPQF offered by technical universities (RMUTs).⁴¹ These programs focus on advanced technical skills for jobs in research, development, or management. While technically falling under higher education, these diploma and bachelor's programs prioritize applied skills and industry relevance, distinguishing them from traditional academic degrees (Grosch, 2018, p. 53).
2. **Non-Formal and Informal TVET:** These pathways align with NQF standards and provide opportunities for lifelong learning and skill validation for individuals outside the formal system. These include various short, medium, and long courses designed for continuous skill development, catering to diverse learning needs and career paths.
3. **DTVET:** These programs integrate theoretical education with practical training in collaboration with industries, providing students with hands-on experience highly valued by employers (Mongkhonvanit & Choomnoom, 2022). Completing the three-year DTVET program can earn one the Vocational Education Certificate (PorWorChor).

Figure 9 illustrates the formal TVET pathways in Thailand.

⁴⁰ According to UNESCO-UNEVOC, the term 'Technical Diploma' is used to describe a Diploma in TVET.

⁴¹ Diploma in TVET (PorWorSor) and Bachelor's Degree in Technology are the two main focus of this dissertation in the SiF and the TEdSys projects.

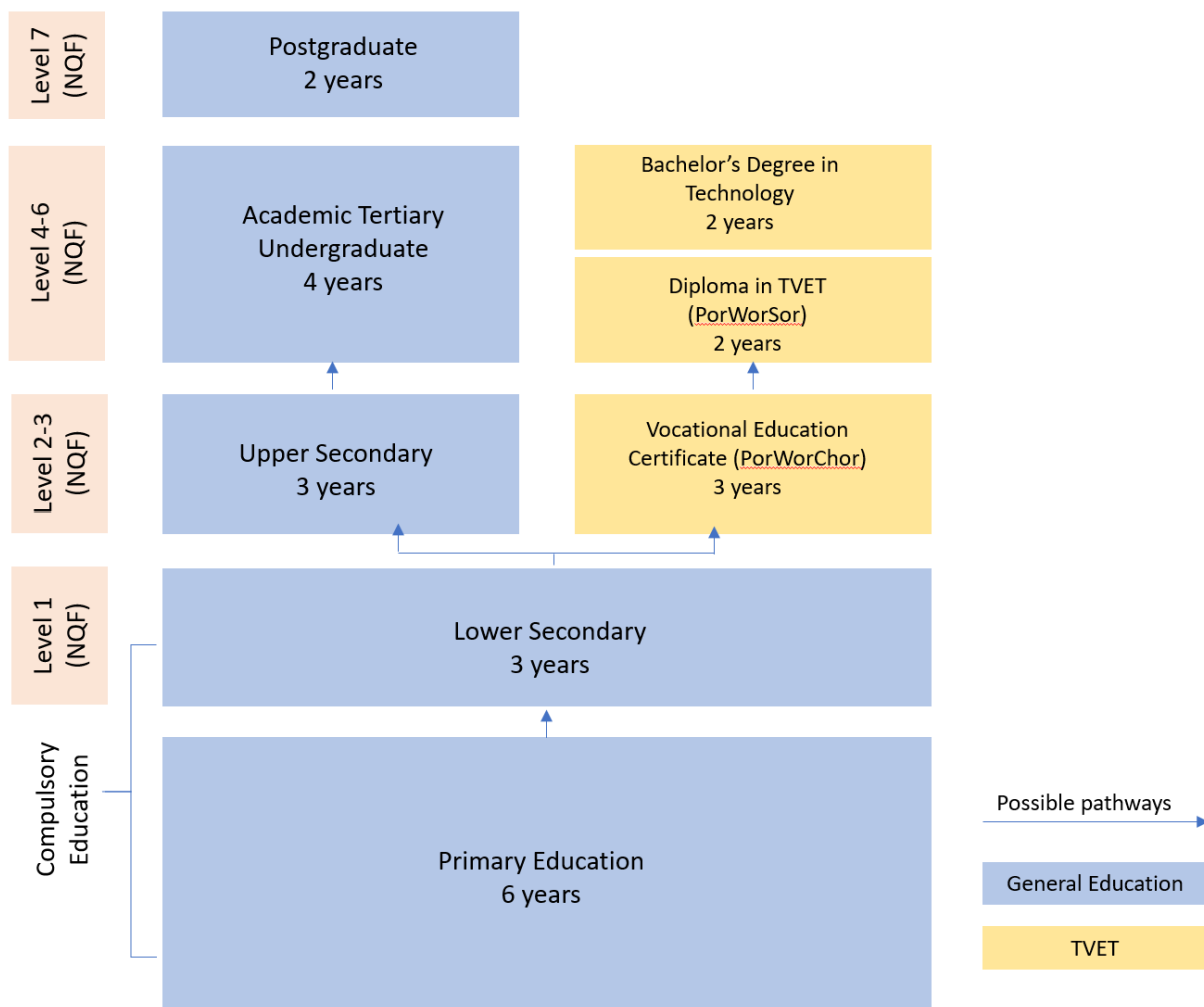


Figure 9: Formal TVET Pathways in Thailand (modified from UNESCO-UNEVOC International Centre for Technical and Vocational Education and Training, 2015)

Thailand's TVET system is governed by multiple organizations within a hierarchical structure (UNESCO-UNEVOC International Centre, 2022). Under the Ministry of Education, OVEC holds primary responsibility for formulating national TVET policies, managing the qualifications framework, setting standards and curricula, and overseeing both public and private TVET institutions. OVEC also supervises lifelong learning initiatives and ensures alignment with industry needs.

Complementing OVEC's work, the Department of Skill Development (DSD), under the Ministry of Labour, focuses on practical-skills training programs and develops national skill standards to meet international benchmarks. DSD also promotes skill development networks and navigates related legal procedures in collaboration with OVEC and the Thailand Professional Qualifications Institute (TPQI). The TPQI, under the prime minister's supervision, developed and implemented the TPQF. It also supports industries in creating competency standards, accredits assessment organizations, and awards professional qualifications, further collaborating with OVEC and DSD (Prontadavit & Hanvatananukul, 2017, p. 194). However, these governmental agencies have not prioritized strengthening learning-venue collaboration between private companies and educational institutions.

The Office of Non-Formal and Informal Education (ONIE), also under the Ministry of Education, oversees and promotes non-formal TVET programs, fostering collaboration and monitoring quality. Other bodies like the Office of the Education Council (OEC) contribute to the National Qualifications Framework, and the National Committee for Promotion of Skill Standards includes diverse stakeholders in developing national skill standards, in collaboration with the Minister of Labour. NXPO, under the Ministry of Higher Education, Science, Research, and Innovation (MHESI), conducts much of the research and development related to TVET and workforce development, as well as higher education.

Thailand's TVET landscape covers public and private colleges. In 2019, there were 429 public and 484 private colleges under OVEC's supervision, comprising nearly 1 million students (Choomnoom, 2022a). These institutions include a wide array of specialized colleges, such as technical colleges, industrial and community colleges, and business administration and tourism colleges. While Thailand's TVET system claims a wide range of specialized colleges, its emphasis on institutional diversity does not necessarily translate into a direct, occupation-oriented approach, as the principles of profession do not exist in Thailand (Grosch, 2018, p. 71).

According to Mongkhonvanit and Choomnoom (2022), Thai TVET has made significant progress. Some initiatives by Thailand include adopting a competency-based approach in its TVET curriculum, which was jointly developed by government agencies, led by the Bureau of Vocational Education Standards (OVEC), and industry to ensure that the curriculum is aligned with industry demands. Moreover, quality assurance is also well established with the annual internal self-assessment report, coupled with external quality assurance every five years. Learners are also required to pass standardized tests, such as V-NET (Vocational National Educational Test). However, recent reports indicate challenges with outdated school-based curricula that may not fully meet the demands of evolving industries (BIBB & iMOVE, 2023).

Thailand 4.0 and EEC are strongly related to Thai TVET's future strategic goals, which are centred on creating a high-income and innovative country. The emphasis is on preparing the workforce for the “S-curve” and “New S-curve” industries, such as digital technologies, electronics, and the automotive sector. To meet the demands of Thailand 4.0 and an aging population, reskilling and upskilling are prioritized (Mongkhonvanit & Choomnoom, 2022). Developing competent TVET workers, increasing access to lifelong learning, guaranteeing equal opportunity, and encouraging sustainable practices are other objectives.

Thai TVET is relatively well developed, with supporting organizations from several related ministries. It offers training programs through formal, non-formal, informal, and DTVET modalities. Its aim is to develop a workforce for the innovation-driven and knowledge-based economy. Thus, TVET plays a critical role in the nation's ongoing development. Against this background, the following section examines challenges and emerging trends in the system.

3.1.3 Key Challenges and Emerging Trends in the Thai TVET System

This section specifically examines the challenges faced by the Thai TVET system. Some of the challenges, such as a lack of formal TVET qualification, have already been mentioned (see Section 3.1.1). This section further explores this issue in detail and also other issues –

including high dropout rates, social exclusion, and negative perceptions of TVET – as well as emerging trends in the Thai TVET system.⁴²

One of the most concerning issues is the Thai workforce's lack of formal TVET qualifications. As shown in Figure 10, almost 40% of workers have no education or have only graduated from elementary school. The Thai government needs to pay attention to these low educational attainment rates (NSO, 2023, p. 212).

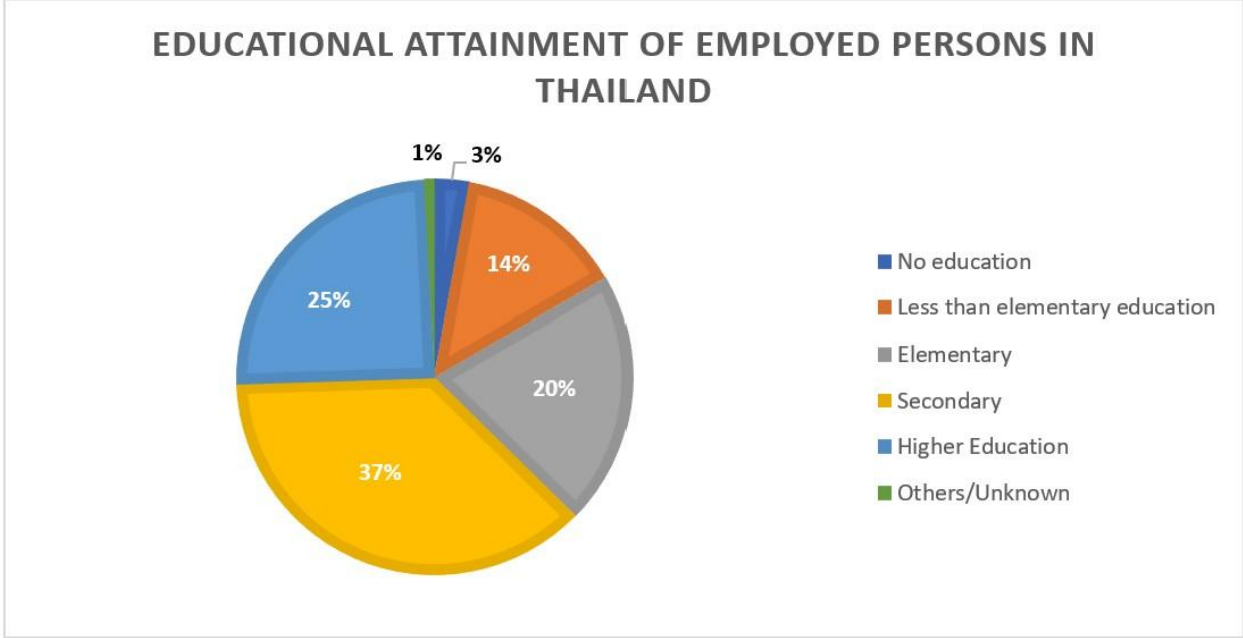


Figure 10: Educational Attainment of Employed Persons in Thailand (NSO, 2023, p. 212)

Moreover, a recent study by the ASEAN Secretariat (2022a, p. 11) has pointed out that there is a shortage of qualified TVET workers in key sectors such as logistics, digital technology, and mechatronics. Further problems – the lack of qualified TVET teachers, limited resources, outdated curricula, and insufficient training programs for TVET teachers – make the Thai TVET system unable to adapt to the fast-changing technology (Rukkiatwong, 2016; Chalamwong & Suebnusorn, 2018).

Another challenge is the high dropout rate of TVET students, particularly at the diploma level (PorWorSor). Data from the Office of the Vocational Education Commission (OVEC)⁴³ reveal a concerning issue in TVET learners' completion rates. For example, the completion rate of the Diploma in TVET program was approximately 50.5% in 2016 and dropped to around 40% in 2017 (Center for Information Technology and Vocational Manpower, 2017, 2020). Similarly, in 2018, at the vocational certificate level, PorWorChor reported a much lower completion rate of 53.9% when compared to 91.7% in the general education stream (OEC, 2021, p.141). In total, in 2018, the dropout rate of TVET learners,

⁴² See Moonpa et al., 2019; Moonpa et al., 2021 for other challenging issues, such as ability to adapt to fast-changing technology, the relevance of training programs to labour market demand, the quality of TVET teachers, and the lack of resources.

⁴³ Available only in Thai language. The completed data of the recent years was not available during the time of this research.

including both levels, was 18.6% (Center for Information Technology and Vocational Manpower, 2018).⁴⁴

The OEC has offered several explanations for this situation of low graduation rates: “the problems related to the personal behaviors of students, the unprepared family conditions needed for providing educational support, the school environments that do not support the student's learning, or the environments outside of the schools are inconvenient for travel” (OEC 2021, p. 140). Additionally, social exclusion and negative social perceptions of TVET further intensify these challenges (Chalapati & Chalapati, 2020). TVET is considered a low status and second-class education track. Although the overall level of Thai educational attainment has increased in recent years, the number of students from secondary school choosing the TVET pathway has declined (Lenssen & Trzmiel, 2019, p. 63). Due to the negative perception of TVET in Thai society, Thailand is unable to attract students to study in TVET. Statistics showed that only around 1 million youth aged 15–24⁴⁵ are enrolled in formal TVET programs, compared to a few million in general, higher education, and even non-formal TVET programs (Choomnoom, 2021; OECD, 2021). Thus, approximately 3–4 million young adults remain outside the education and training systems.

Despite these challenges, the Thai government has been trying to reform its TVET system since 2014. These attempts include the introduction of several strategies, such as the National Strategy for Vocational Education and Training 2017–2036, which can provide a long-term vision for these reforms. Some of the initiatives under this are the competency-based Thai Vocational Qualification and a credit transfer system to promote lifelong learning.

In addition, in 2020, OVEC introduced seven strategies to further strengthen the DTVET system (EEF, 2023): (1) increasing English proficiency, (2) expanding digital learning, (3) establishing regional TVET coordinating centres and a centre of excellence, (4) upgrading teacher skills, and (5) improving OVEC management. Moreover, (6) a curriculum reform and (7) efforts to enhance teacher training through a program called STEM⁴⁶ for TVET are also being implemented.

Amidst this scenario, the COVID-19 pandemic has not only worsened the existing issues, but also emphasized the importance of non-formal TVET programs. These non-formal specialized training programs are popular in Thai society (OECD, 2021, p. 14). The factors contributing to this trend may include the low completion rate in upper-secondary education (UNICEF, 2019), socio-economic disparities (UNICEF, 2019, p. 7; National Education Information Center, 2020), and these programs' high flexibility and affordability.

Thailand's TVET system has the potential to contribute to workforce development and economic growth. However, several issues, such as the quality of TVET teachers, low investment in technology, and socio-economic exclusivity, require further attention and intervention from the Thai government to ensure that the TVET programs are relevant to

⁴⁴ Cf. ASEAN (2022a, p., 60), the dropout rates are a bit higher, which is around 23%. Moreover, the statistical data on the dropout rates in the earlier years, such as from 2016, are not similar but the data from these sources signify that there are high dropout rates in Thai TVET.

⁴⁵ The number of the young adult population (15–24) vary, with the World Bank reporting 11 million and SEA-VET.net reporting 9.5 million.

⁴⁶ STEM stands for Science, Technology, Engineering, and Mathematics.

labour market demands. The following section explores Thailand's DTVET system and its challenges.

3.2 DTVET and the Challenges in Its Implementation in Thailand

This section explores the DTVET system and the implementation of WBL in Thailand. It further examines the challenges of implementing DTVET and WBL, specifically in the Thai context. The decentralized DTVET and individual WBL projects represent the characteristics of the Thai DTVET system. Thus, the relevance of the WBL approach, which focuses on integrating authentic work tasks into the learning process rather than emphasizing the physical distance between learning and training venues, cannot be overstated.

3.2.1 DTVET and Implementation Challenges in Thailand

The development of DTVET in Thailand is supported by the German government's "School-in-Factory" initiative, which dates back to 1984. This collaboration first introduced the dual concept of TVET in Thailand and later led to the formal establishment of DTVET in the country, which was recognized under the Vocational Education Act of 2008. This act provides a structural framework for implementing DTVET in the country. Its overarching goal is to foster learners' holistic competence, entailing not only technical proficiency, but also the ability to think and act autonomously (Vocational action competence; as discussed in Section 1.2), which can support and contribute to the development of Thailand's social and economic sectors (OVEC, 2017, p. 6, 7).

According to the Vocational Education Act of 2008, DTVET in Thailand integrates classroom learning with practical workplace experience and ensures that learners possess the relevant competence after graduation (OVEC, 2020). The Thai government recognizes the potential of collaboration between TVET institutions and companies, which can benefit individual students, companies, and the national economy through developing valuable work experience and a competent, productive workforce. The DTVET programs are implemented through partnerships among TVET colleges, companies, and students (OVEC, 2017, p. 7). The TVET college provides the theoretical foundation and coordinates with a partner company⁴⁷, which offers on-the-job training. Students alternate between a college and a company for three to five years, according to the level of the training program.

As of 2023, 510 TVET colleges – 409 public and 101 private – participated in DTVET. These colleges partner with around 9,300 companies and operate through 8,800 Memoranda of Understanding (MOUs; Pandum, n.d.). DTVET programs are offered at all TVET levels – vocational certificate, diploma in TVET, and bachelor's degree – with an increasing number of students opting for the higher-level training programs. The Thai Ministry of Education focuses on increasing education quality and DTVET enrolment. The government has set an ambitious goal that by 2025, the proportion of students choosing DTVET should be 50% of the total students enrolled in TVET programs; 50% of TVET

⁴⁷ To take part in the DTVET program, students have to first apply for a study program at TVET college. The TVET college then takes responsibility for finding and coordinating with suitable companies for the training component of the DTVET program for its students.

enrolment corresponds to approximately 334,000 students (Choomnoom, 2022a). However, statistics from 2020 showed that only 20% of TVET students (around 132,000) were enrolled in DTVET programs (Pandum, n.d.). This gap in numbers highlights the additional effort needed to achieve the government's goal.

OVEC is the leading organization that supervises the implementation of DTVET. It establishes guidelines for DTVET program quality and consistency which address training standards and the roles of partner institutions. However, OVEC operates as a standalone organization without formal linkage with or support from other relevant ministries, such as the Ministry of Labour (MOL).⁴⁸ Therefore, the support provided by OVEC comprises only a list of recommendations for the partners, mainly TVET colleges, that are willing to participate in DTVET.

Thailand's DTVET system has a strong foundation that can further enhance and develop a qualified workforce. However, it faces persistent problems similar to those faced by the broader TVET system. As already discussed, these include the quality of training and competence levels, skill mismatches with the labour market demands, negative social perceptions of TVET, and a lack of resources and qualified TVET teachers. Furthermore, small and medium-sized enterprises (SMEs) do not take part in DTVET programs (OECD, 2021). DTVET also faces unique challenges such as the lack of unified cooperation between TVET colleges and companies. Each collaboration mostly depends on individual agreements based on the general guidelines provided by OVEC, which can lead to inconsistencies and inefficiencies in DTVET.

OVEC recently launched the DVE DATA website (DVE DATA, 2024) to provide information on the demand for the TVET workforce from companies and statistical data of learners in the system. This initiative highlights the continued effort to strengthen DTVET in Thailand. However, as noted by OECD (2021, p. 8), “strengthening the DTVET system in Thailand is a step in the right direction, but without a robust quality framework, WBL may fail to equip students with the skills they need.” Similarly, Choomnoom (2022a) emphasizes the importance of monitoring, evaluation, and standardization in developing a high-quality DTVET system in Thailand.

Thailand's DTVET mainly depends on the individual agreements of its partners through MOUs. This suggests weak collaboration between relevant social partners and stakeholders, which is a crucial element for effective DTVET. This also highlights the need for a significant shift of focus to the implementation level. As discussed in Section 2.2.3, the emphasis of WBL should be not only on the physical distance between learning venues, but also on the connection to work processes. Thus, to enhance the quality of the DTVET system through WBL, the latter's methodological and didactic designs, such as LWTs and WLTs, must be harnessed for successful implementation. The following section examines the implementation of WBL in Thailand.

⁴⁸ As discussed in Section 3.1.2 that Ministry of Labour led by the Department of Skill Development (DSD) is also offered a TVET programs in parallel with the OVEC (Ministry of Education). There is no unified collaboration in qualified workforce development, through different social partners/stakeholders, but rather implementing similar initiatives under its own organization.

3.2.2 Work-Based Learning (WBL) in Thailand: Initiatives and Challenges

Globally, WBL is considered an important element of the TVET system, particularly in preparing the workforce for the demands of Industry 4.0 and digital transformation (Bahl & Dietzen, 2019). In Thailand, WBL has gained similar recognition, but it is often used interchangeably with the term “work-integrated learning” (WIL). Nonetheless, the concept has gained popularity as the Thai government tries to develop a competent workforce to drive economic growth and achieve the goals of Thailand 4.0 and the Eastern Economic Corridor (EEC).

The broad definition and understanding of WBL provided by Schröder and Dehnbostel (2021) is particularly relevant to Thailand. This work-process-oriented approach focuses on the connection to authentic work processes rather than the distance between learning venues, and it emphasizes that WBL can be realized across learning venues. Specifically, the lack of centralized stakeholders' collaboration in Thailand highlights the importance of this approach. This section examines the current state of WBL in Thailand by studying key initiatives and challenges concerning WBL implementation. Several strategies for enhancing WBL in the Thai TVET system are also offered.

The Thai government recognizes the importance of WBL, which is evident in several legal frameworks, strategic policies, and collaborative projects. From a legal framework, the Vocational Education Act of 2008 formally recognizes DTVET and promotes integration of classroom learning with workplace training. Additionally, the Skill Development Promotion Act B.E. 2002 further promotes the participation of private companies in DTVET by offering a tax deduction of up to 200% of the training cost to the company that provides the training. This legislation encourages more companies to become registered training providers (Choomnoom, 2022a).

Furthermore, several frameworks also support the implementation of WBL, such as the NQF, which standardizes TVET quality by aligning training outcomes with industry demands. Moreover, to support the 20-year National Strategy Plan, the National Commission of Vocational Education has set policies to enhance WBL. It emphasizes WBL for the digital economy and Industry 4.0 (National Strategy Committee, 2019).

Several WBL models have been successfully implemented in Thailand, despite the weak collaboration between relevant social partners. Among these is the ***School-in-Factory (SiF) project***, which is the central focus of this dissertation (see Chapter 4 for detailed discussion). SiF is a collaboration among Rajamangala University of Technology Lanna (RMUTL), Michelin Siam Company Limited, and the Office of National Higher Education Science Research and Innovation Policy Council (formerly STI). This project features an effective partnership between the industry and the educational institute (Schlattmann et al., 2024). Through strong collaboration and stakeholder contribution, this project aims to enhance workforce competence, solve the problem of shortage of practical engineers, and improve productivity. It has shown an 85% completion rate of the learners with a positive impact on subject competence, such as technical knowledge and skills and workplace adaptability. The employers are mostly satisfied with their performance.

Another significant initiative is *Dual TVET*,⁴⁹ which is supervised by the OVEC. This is organized in cooperation with private and public organizations that emphasize having over 50% of the program time for on-the-job training. The collaboration with company partners, based on individual MOUs, focuses on curriculum development to ensure that the training program is relevant to the employer's needs. Employment after graduation is often offered to the learners and fosters increased student enrolment (Mongkhonvanit & Choomnoom, 2022).

Additionally, “*Progressing Work-Based Learning based on the TVET system of Thailand (ProWoThai)*” is an international research collaboration between Thailand and Germany. Funded by the German Federal Ministry of Education and Research (BMBF), it aims to strengthen WBL in Thailand through analysing best practice examples, conducting participatory action research (PAR), and promoting TVET as a self-reliant and academic discipline in Thailand (see Section 4.4 for a detailed discussion).

Having introduced DTVET to the TVET system in Thailand, Germany continues to play an important role in its further development. Further, *German-Thai Dual Excellence Education (GTDEE)* is a project collaboration among the German-Thai Chamber of Commerce (GTCC), GIZ (Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH), BMW Thailand, and Robert Bosch Thailand, introducing an apprenticeship program based on the German model (GTCC, 2024).

GTDEE, managed by the GTCC, acts as the centre to provide all support to companies and TVET colleges throughout the implementation of this DTVET program, specifically on the curriculum and training plan. Importantly, the GTCC recruits qualified students to join the program. Moreover, it supports the development of curricula and training plans. Importantly, the Germans' centralized PAL (Prüfungsaufgaben- und Lehrmittelentwicklungsstelle) examination has been brought to Thailand. Graduates from the program receive a certificate from the GTCC and enjoy the same recognition as their apprentice counterparts in Germany. This certification attempts to ensure that the program has the same standard as in Germany. The two-year training program has been expanded to include professions like industrial mechanics, machine and plant operation, and, importantly, mechatronics; for the latter, the commercial textbook on mechatronics has been translated from German (*Fachkunde Mechatronik*) into the Thai language.⁵⁰ This exportation highlights the demand for Thailand to develop a learning curriculum at TVET colleges and training plans at companies.

The GTDEE project provides some insights about the state of WBL in Thailand:

- For the GTDEE project, the GTCC is the main organization mediating between companies and students; therefore, the lack of a regular institution doing this coordination work is obvious. The GTDEE has a role similar to that of the RCTVET at RMUTL.

⁴⁹ This will be discussed again in section 5.4 to provide a view of WBL on a national level.

⁵⁰ When this program started in 2013, Thailand, around the same time, established the Thailand Professional Qualification Institute (TPQI) to develop a qualification framework for each of the occupations/professions.

- The GTCC is involved in the selection process, which includes evaluating companies and TVET colleges based on three criteria: the suitability of the company, operational suitability, and personal suitability. Students are also selected based on an aptitude test and an interview with the company. This selection process for choosing appropriate partners is not usual in the Thai DTVET, even though the company partners are mostly national and multinational companies. This raises concerns about the quality of training – not only in large companies, but also in SMEs.
- One might question the main ownership of responsibility for the students. If the GTCC is the main body responsible for the students, not the company or, as in most cases in Thailand, the TVET college, the program implementation may not be sustainable. This again highlights that Thailand's private sector, including its professional organizations, has a low level of engagement in DTVET. The entire responsibility is on the GTCC.
- For the training, there is a specially developed curriculum because of the lack of a general Thai curriculum that aligns with the labour market's demand.
- Most importantly, the examinations are also conducted according to forms imported from Germany. The OVEC provides guidelines for the DTVET examination, which is conducted through a collaboration between the in-company trainer and the teacher supervisor. The examination criteria are based on knowledge, skills, ability to apply knowledge, personal behaviour, and personality; each aspect has five scores. This narrow scope of examination may not reflect the nature of WBL and may not be able to assess the competence developed.
- Therefore, the need for qualitative didactic material (including examination examples) is obvious. So far, the OVEC has developed a guideline and procedures for writing a company training plan to support the in-company trainers. TVET teachers write this guideline with support from experts from the company. To a certain extent, this procedure ensures that the training plan aligns with the curriculum of the TVET college. However, considering the lack of industrial experience or knowledge of TVET teachers, this may not be efficient or reflect the real work tasks and processes.

The GTDEE also provides soft skills workshops to apprentices and is responsible for registering training companies, TVET colleges, teachers, trainers, and examiners. This further highlights the burden on the GTCC. Who provides funding for these activities when the Thai government covers the cost of training and learning at TVET colleges? This raises the question of whether this program reflects a short-term, immediate solution to the lack of qualified workers for German companies operating in Thailand.

Additionally, the GTDEE offers a Train the Trainer Seminar for the certification of the “Ada International – Train the Trainer”, which is an international certification for apprenticeship trainers accredited by DIHK (Deutscher Industrie- und Handelskammertag). The participants have to pay a fee for this course, and the offer indicates the need for qualified in-company trainers in Thailand. “Qualified” here means that the trainers have at least some pedagogical knowledge in addition to their occupation-specific knowledge. At the ASEAN

level, a guideline for in-company trainers was developed by GIZ in 2015 (GIZ, 2019), but its practical implementation in Thailand is still not visible.

From the example of GTDEE, the interest of the external experts in enhancing the DTVET system in Thailand is strongly evident. Although in the initial phase of the program most of the company partners were represented by German international companies operating in Thailand, later in the project, more partners from the local national companies and TVET colleges have been included, leading to the expansion of the DTVET model. Thai companies and TVET colleges can benefit from these experiences, especially the Train the Trainer Seminar. However, it is also important to notice that this program is supported by external funders and not initiated by local practitioners and researchers.⁵¹ Thus, its sustainable implementation over the long term may seem difficult.

Furthermore, the initiative of Thai national companies to promote WBL is also evident. For example, *Panyapiwat Institute of Management (PIM)*, established by the Charoen Pokphand Group (CP All),⁵² has illustrated the industry-led WBL model in Thailand. This initiative led by a private company aims to train the workforce specifically to fit the company's requirements. PIM positions itself as a corporate university and offers education and training programs at all levels. Additionally, it offers a short course training program in the teaching profession. Its goal is to produce skilled and job-ready graduates for the CP All group's business and other companies. To realize these goals, its mission is specifically to

1. Produce quality WBL programs and produce competent graduates.
2. Produce high-quality research in the field of study provided.
3. Provide academic services to businesses, communities, societies, and the country.
4. Enhance organizational capacity to increase efficiency and effectiveness...and workplace happiness (Bhandhubanyong, et al., 2019, p. 362).

PIM acts as a higher TVET institute, accepting learners who have graduated from TVET pathways to continue their education at a higher level. Its initial establishment was to provide a higher level of education to learners who graduated with a Diploma in TVET (PorWorSor) from the Panyapiwat Technology College, which is also owned by the CP All group (Bhandhubanyong, et al., 2019, p. 360). PIM claims to be the first corporate university in Thailand. Even though there is no direct evidence that this is the private sector's reaction to the failure of the education and training system, it can be indirectly understood in this way. Recognized by the Office of Higher Education as a private university in 2007, PIM's programs are qualified and recognized based on the national education framework. Thus, funding for training is provided by the government, students' tuition fees, and CP All Plc. It is rather challenging to discuss the topic of ownership here – whether PIM or CP All Plc has the primary responsibility for students. While PIM is an educational institute founded by a private

⁵¹ The funding from GIZ ended in 2019.

⁵² It is a distribution arm of Charoen Pokaphand (CP) Group, a global conglomerate based in Thailand with operation and investment in agribusiness, distribution, and telecommunication (Bhandhubanyong, et al., 2019).

company, looking at this situation positively, CP All Plc is entirely responsible for the educational programs and must thus adopt ownership of students' responsibility.

The WBL model in PIM is organized not through a collaboration between a TVET college or university and a company, but rather primarily by the company itself. However, according to Bhandhubanyong et al. (2019), the internship period for students spans four academic years, totalling 1.5 years (3-6-3-6 months). Further, PIM claims to support and inspire students' growth in all aspects through a combination of classroom learning and workplace training, including social competences, life skills, and high-order thinking skills (p. 362).

As convenience stores are located almost everywhere in Thailand, a discussion of the economic perspective is not the primary objective here; rather, PIM provides a training venue that is easily accessible to learners. Additionally, it is one example of how the private sector can contribute to the development of a qualified workforce through its own initiatives. The critique of whether these skills and knowledge, learned from specific workplaces such as CP All Plc and Michelin Siam, can be applied elsewhere is important, and the focus of such critique should be on how the curriculum is designed.

Another critical aspect is balancing the demands between the social and the educational, between businesses and individual learners. PIM is an institution that mainly serves a company's interests, but its students get quality education and jobs. A critical point here is also reflected in the SiF and TEdSys projects: These projects offer good education and jobs for those few who accept the company's interest. Yet, these benefits are only available to a select few TVET colleges and are rarely accessible at the national level.

As seen in the examples of WBL projects and initiatives, a significant issue is strengthening collaboration between TVET colleges and companies. Effort in this direction can help create a suitable workplace learning environment and joint curriculum development, whereby industry experts from the companies can provide their knowledge and insights. Such collaboration can also help TVET teachers update their technological and industrial knowledge.⁵³ Another benefit involves the standardized training programs co-designed by TVET colleges and companies to ensure the same quality in the WBL experience.

Moreover, to meet the ever-changing demands of the labour market, a WBL program should also focus on developing skills such as digital literacy, critical thinking, and problem-solving. This further emphasizes a holistic approach to WBL which encompasses both functional/productive and emancipatory potential, whereby competent individuals who can contribute to the country's societal and economic progress are highly valued.

Pichedboonkiat et al. (2023) have demonstrated that project-based learning in TVET programs (at RMUTL) at the vocational education certificate level (PorWorChor) can promote creativity, innovation, and critical thinking in learners. Some recommendations⁵⁴ should be considered to strengthen WBL in Thailand further and address the inherent

⁵³ OVEC supported teacher training in companies for 30 hours/semester. However, only a few teachers from each TVET college are able to participate due to lack of funding.

⁵⁴ Further recommendations are discussed in Chapter 6.

challenges. First, as Moonpa et al. (2019) have pointed out, the quality and relevance of TVET should be enhanced through increased investment in teacher training and modernized technology. Second, employer engagement should be broadened and deepened, especially with SMEs. This effort should include a stronger employer role in designing, delivering, and assessing WBL programs (OECD, 2021). Third, clarity and consistency in related terminologies (i.e., WOL, WCL, and WIL) should be promoted to realize and support WBL across learning venues: TVET colleges and companies. Finally, successful WBL projects should be expanded, particularly into the rural areas of Thailand. Investment in research and data collection and continued international collaboration and knowledge exchanges are also important factors.

As Thailand adapts its TVET system to meet domestic economic demands, it also operates within the ASEAN Economic Community (AEC) context. This regional integration can be seen as an opportunity and a challenge for developing Thailand's workforce. The following section examines Thailand's TVET system in the regional context, especially how it aligns with ASEAN standards and initiatives, challenges for labour mobility, and economic competitiveness within Southeast Asia.

3.3 Thailand's TVET System in the Regional Context of ASEAN

This section explores the potential role of the Thai TVET system in contributing to the development of the AEC. It examines the common opportunities and challenges in TVET development across the region, the formulation of the ASEAN TVET policy, and Thailand's specific role in ASEAN's TVET development. As Thailand has actively participated in and engaged in regional networks in TVET, such as the Regional Association of Vocational and Technical Education in Asia (RAVTE), it can learn from best practices and also address the common challenges in TVET development. Similarly, the SiF and TEDSys models (see Chapter 4), established to solve the domestic requirements, can also serve as valuable examples for other member countries that try to develop their TVET system through WBL. This section analyses the relationship between regional TVET's focus and Thailand's national TVET system. It also assesses to what extent these WBL models can be transferred and adapted to the diverse contexts of ASEAN.

3.3.1 Opportunities and Challenges in ASEAN's TVET Development

ASEAN aims for regional economic integration through the AEC. This requires and includes developing a unified TVET policy at the regional level. One such attempt has already been made through the comparative study of TVET systems of all member states (ASEAN Secretariat, 2022a). This study focuses on improving human resources through responsive curricula, industry involvement, and labour market research and information.

Economic growth has been significant in the region over the last few years. However, as the population grows older, maintaining the same productivity level becomes challenging for the ASEAN. Effective human resource development (HRD) strategies are essential to cope with these problems, especially in TVET workforce development. ASEAN member states face common challenges, which include underutilized labour segments and rapid changes in industrial structures (ASEAN Secretariat, 2022b). Some countries, such as Singapore and the Philippines, can track skills development and engage employers in the TVET system.

Countries like Cambodia, Lao PDR, and Myanmar need to put more effort into TVET research, including labour market data collection and strengthened industry collaboration.

ASEAN's economic growth presents opportunities and challenges for TVET systems. A qualified workforce is required for the AEC to succeed. Global competitiveness also requires that the TVET system change and adjust accordingly. Additionally, demographic changes, such as an aging population and the impact of the COVID-19 pandemic, highlight the demand for resilient and adaptable TVET systems. Moreover, the Asian Economic Integration Report 2021 (ADB, 2021) highlights the importance of upskilling and reskilling human resources to address evolving labour market demands and cope with technological advancements, such as Industry 4.0 (ASEAN Secretariat, 2023). A competent workforce can support intraregional trade within the AEC and withstand global competition. To build a competitive workforce, ASEAN must consider lifelong learning strategies to prepare its workers with the necessary competences for the modern labour market (ASEAN Secretariat, 2023).

Other significant challenges, as Schröder (2022) points out, are that many of the TVET systems in ASEAN are similar in structure to higher education and usually lack resources and facilities for effective TVET system development. For resources, ASEAN heavily relies on external investment from international organizations and development agencies to support standardization, harmonization, and quality assurance initiatives (Schröder, 2022, p. 224). Collaboration with external partners may be valuable, but regional TVET might face challenges when funding priorities change.

Altogether, implementing a unified TVET system within ASEAN might be challenging due to the economic, cultural, and political differences. Institutional weakness adds to this regional challenge. The need for adaptable TVET systems further complicates the process. These obstacles highlight the need for sustained collaboration to develop an effective supranational TVET approach (Schröder, 2023).

Recognizing these challenges, ASEAN member states have implemented a few policies and initiatives. One prominent policy is the ASEAN Work Plan on Education (2021–2025), which provides a framework for regional cooperation. Another initiative is the AQR, which promotes standardized qualifications and workforce mobilization within ASEAN. The most important initiative is the formulation of the ASEAN TVET Council (ATC) and its Work Plan from 2021 to 2030, which outlines actionable goals for driving an innovative TVET system for the region. The following section deals explicitly with this topic.

3.3.2 ASEAN's TVET Policy: A Regional Framework for Skilled Workforce Development

The progress of ASEAN's TVET is mainly connected to its goal of developing a skilled workforce to support the integrated economy and the changing world of work (ASEAN Secretariat, 2022b); the establishment of the AEC in 2015 further highlights this demand. Since then, several initiatives and milestones have been achieved. One crucial development has been the formation of the ATC in 2020. The ATC is a collaborative platform for improving and driving progress in TVET in the ASEAN region. It focuses on several key issues of ASEAN TVET (ASEAN Secretariat, 2022b).

The ATC's efforts were later formalized in the ATC Work Plan (2021–2030), which prioritizes enhancing skill workforce development and harmonizing TVET systems across the member states (Schröder, 2023). Specifically, the Work Plan targets six areas, including

strengthening the labour market orientation, improving digital readiness, improving the image of TVET, harmonizing the TVET policies across the region, and enhancing the capacity of TVET personnel. This Work Plan reflects ASEAN's commitment to prepare its workforce for the challenges of Industry 4.0, globalization, and demographic changes in the region. To achieve this objective, strengthening partnerships among governments, industries, and TVET institutes is crucial. As discussed earlier, a strong connection between TVET colleges and companies is important for ensuring that TVET programs are aligned with the labour market demands. This will foster private companies' involvement in TVET and also support regional integration.

To further enhance regional cooperation in TVET, ASEAN member states should focus on systematic labour market data collection and analysis, especially regarding the skills needs of migrant workers. Precise labour market information can guide competent development and promote regional labour mobility. Collaborative initiatives like joint curriculum design, TVET teacher training programs, and joint research projects can further support regional knowledge sharing and networking in TVET. Further developing and validating regional qualifications frameworks such as the AQRF is crucial for learner and worker mobility across the member countries (ASEAN Secretariat, 2022b, p. 136).

These ongoing efforts to establish a common regulatory framework for TVET reflect the regional labour market's demand for a dynamic and responsive TVET system. With its goals of fostering collaboration between stakeholders, supporting research-driven initiatives, and enhancing capacity building in TVET personnel, the ATC is important in increasing the competitiveness of the regional TVET system for sustainable growth in the ASEAN region (ASEAN Secretariat, 2022c; Schröder, 2023).

3.3.3 Thailand's Role in ASEAN's TVET Development

As a relatively developed member state, Thailand can contribute to and benefit from the regional emphasis on ASEAN's TVET system development. The country has been actively shaping the TVET landscape by contributing to the 2013 Thanyaburi Statement, which promotes regional TVET development efforts (RMUTT, 2013). Moreover, Thailand has already implemented innovative data-driven initiatives, such as company and household surveys and follow-up studies on graduates (ASEAN Secretariat, 2022b). The country also aligns with global workforce development trends by integrating soft skills⁵⁵ and involving employers in TVET program development through tax incentive schemes.

In 2019, Thailand adapted its national qualification framework to match the AQRF. This change has enhanced employment opportunities, while Thai graduates can work freely and have their qualifications recognized across the ASEAN region. With this important role, Thailand can further support TVET system development within Southeast Asia (SEA) by sharing its successful experience.

The ASEAN TVET policy, as earlier discussed, focuses on the need for standardized training programs in the SEA region to create a common skill set and facilitate workforce mobility within the AEC. The Thai government has advanced its TVET development with initiatives such as incorporation of the German DTVET model, as discussed in Section 3.2.3. However, expanding this model within the broader national TVET framework remains an

⁵⁵ Soft skills are similar to the social competence of the German understanding of vocational action competence (see Section 2.1.1).

ongoing challenge. The main issue is the lack of a culture of collaboration between TVET colleges and companies – a challenge reflected in other SEA countries. However, the WBL models implemented at RMUTL have shown a positive outcome in solving this problem through creating strong partnerships among companies, universities, and TVET colleges, which is crucial for effective WBL implementation. These models can, thus, contribute to developing the national and regional TVET systems.

Given the diverse cultural and economic backgrounds across ASEAN member states, the potential for transferring and adapting WBL models in the ASEAN context needs to be carefully examined. Yet, acknowledging that Thailand and other ASEAN member states face similar challenges in effective TVET system development, it is practical to suggest that RMUTL's WBL models could serve as best practice examples in the region. With adaptation and implementation, these models can potentially improve TVET systems across the SEA region.

3.4 Summary

This chapter has provided an overview of Thailand's TVET system, focusing on the implementation of DTVET and WBL in Thailand and SEA. It began with exploring Thailand's economic situation to identify the opportunities and challenges for its further development. Thailand has successfully shifted to a service-based economy. Still, it faces some significant challenges, such as income inequality, dependence on tourism as a primary source of income, and a large informal workforce with a low level of competence.

The chapter has further examined the crucial role of TVET in developing a qualified workforce to support national development strategies like Industry 4.0 and the EEC. TVET in Thailand is offered via formal, non-formal, informal, and dual programs and is governed by several governmental organizations such as the OVEC, DSD, and TPQI. Moreover, this chapter has also identified several challenges facing the TVET system, including the lack of formal TVET qualifications, the varying quality of TVET teachers, high student dropout rates, and, lastly, the negative social perception of TVET.

The DTVET model in Thailand is inspired by the German DTVET model. It highlights the integration of classroom learning at TVET colleges and workplace training. The collaboration between these learning venues occurs through MOUs provided by the OVEC. However, the lack of a unified collaboration with the companies and the lack of involvement of SMEs presents a specific challenge. Moreover, several other challenges have been identified through analysing WBL approaches implemented in the country. The challenges of implementing these approaches include weak collaboration between the TVET colleges and companies, a lack of resources, and weak support from relevant governmental organizations and social partners. This highlights the importance of the work-process-oriented WBL approach that emphasizes effective didactic tools – such as LWTs and WLTs – and strong industrial partnerships.

In addition, this chapter has analysed Thailand's TVET system within the ASEAN context, specifically examining its role in contributing to the development of ASEAN TVET and identifying common challenges faced by Thailand and other ASEAN member states. It concludes that Thailand can contribute to regional TVET development through its experiences with WBL and public-private partnerships (PPPs). The WBL projects implemented at

RMUTL can offer valuable lessons in addressing systematic gaps and promoting WBL adoption in other countries, especially in Cambodia, Laos, and Myanmar.

This dissertation's aim is to investigate how WBL can contribute to reforming the TVET system, enabling the development of a competent workforce for economic growth in Thailand. For this purpose, the following chapter specifically explores the SiF and TEDSys projects of RMUTL, examining their implementation, challenges, and success factors. Through the analysis, this dissertation aims to provide valuable insights for strengthening the TVET system and fostering the successful implementation of WBL in Thailand and within the SEA region.

Chapter 4: The School-in-Factory (SiF) Project and the Tripartite Education System (TEdSys): Published Articles from 2017 to 2024

Background information was introduced in the previous chapters to help develop an understanding of the central issue addressed in this research: the role of work-based learning (WBL) in reforming the Technical and Vocational Education and Training (TVET) landscape of Thailand. Specifically, Chapter 2 established the theoretical foundation for TVET, focusing on the evolving labour market and the individual's demand for a successful life. Chapter 3 analysed the TVET system in Thailand to conclude that while the Thai system is relatively developed and exemplifies some best practices for other ASEAN member states, it requires significant improvement, especially regarding WBL, which is also evident in the entire Association of Southeast Asian Nations (ASEAN) region. Even though the direct replication of the German dual TVET (DTVET) model is not promoted as a practical solution, its elements, for example, vocational education science, which is an important factor for sustainable TVET system development, can be a valuable concept for Thailand and ASEAN.

This chapter examines the WBL projects at RMUTL based on the framework of developing a reform-oriented TVET, as defined in Chapter 2, to solve the challenges of the Thai TVET system through WBL.⁵⁶ It further explores the innovative potential of the School-in-Factory (SiF) and Tripartite Education System (TEdSys) projects in Thailand's TVET system. These two projects represent a modern and innovative approach to learning-venue cooperation and align with Dehnbostel and Schröder's approach to WBL (see Section 2.2.1). They emphasize two- to three-year training through learning environments, including universities, company workplaces, and training centres, and a comprehensive concept of competence that encompasses technical, human, social, and methodological aspects. Furthermore, they focus on self-directed and experiential learning supported by coaching or mentorship.

4.1 Work-Integrated Learning (WIL) at the Tertiary Education Level: The SiF Project

The SiF project emerged from the shared recognition of the stakeholders in TVET, which include RMUTL, Michelin Siam Company Limited, and the Office of Vocational Education Commission (OVEC), for the need to strengthen WBL within the Thai TVET system. However, its early implementation was quite limited in scope. The SiF project, at this stage, only focused on a small number of learners. Moreover, its training program was closely linked to the specific requirements of the Michelin Siam production sites, raising a question about its broader impact on the Thai TVET system.

SiF is an innovative TVET initiative, but also features concerns over power imbalances among partners. Michelin Siam's strong commitment to supporting the project may cause the program content to be aligned more with the company's specific demands than with the interests of the individual learners. Furthermore, SiF's initial focus on higher education institutions limited its immediate impact on the Thai TVET system. The inclusion

⁵⁶ The six published articles are included in the appendices in their original form.

of TVET colleges in the later stage, supported by the Chevron Enjoy Science project, expanded the program's impact.

This section further explores these issues, including the benefits and challenges of the SiF project within the Thai TVET context. It also analyses whether SiF could be considered an innovative approach to learning-venue collaboration. Importantly, it explores how to further develop this project to ensure that it meets the demands of learners and the Thai economy.

The article *“School-in-Factory (SiF): An Approach of Work-Integrated Learning⁵⁷ in Thailand” (Phalasoorn, 2017)* presents the initial model of the SiF project. It emphasizes the integration of university teaching and learning (“theory”) with practical WBL (“practice”). This integration was aimed at supporting learners' ability to apply theoretical knowledge in authentic work environments through combining abstract knowledge with practical action to develop vocational action competence.

This project represents an early attempt to implement work-integrated learning (WIL) within a reform-oriented approach in the vocational education science framework. The cooperation agreement among the partners – Michelin Siam Co. Ltd., RMUTL, OVEC, and STI (former NXPO) – stated several goals and objectives. However, the focus of the SiF project was initially influenced by the business partner's demands, such as reducing employee turnover. The focus on production-oriented outcomes can significantly limit the development of competent individuals for broader educational and societal goals.

Furthermore, the article explores the implementation of WIL in Thailand by drawing on insights from the WIL Working Group (WWG) in Thailand. It introduces the SiF project as a best practice example of WIL for Thai TVET, concluding that “the SiF project, a successful collaboration among government agencies, educational institutions, and industry, effectively addresses the immediate need for skilled workers by producing graduates who meet industry demands” (p. 9). While this conclusion emphasizes only the production-oriented perspective of the SiF project, the educational and societal goals also need to be included. The interests of all stakeholders have to be carefully integrated into the objectives of SiF to ensure that the focus of WBL programs is more than just meeting the immediate demands of the industry.

Nonetheless, the SiF project is crucial for advancing the TVET system at RMUTL. The university contributed to the curriculum design and promoted reform-oriented vocational education science, such as developing competence profiles. As a project partner, Michelin Siam's short-term demand is understandable – as long as it is balanced with the educational and societal goals of TVET.

Moreover, it is also crucial to examine the role of RMUTL in this collaboration. The collaboration between RMUTL and Michelin Siam goes beyond a simple receiver–provider relationship. RMUTL has actively contributed its resources and expertise to the SiF project. It supports academic expertise in research and development (R&D) and addresses problems in

⁵⁷ As already mentioned in Chapter 2 that the terms work-based learning (WBL) and work-integrated learning (WIL) are used interchangeably in this dissertation.

the Michelin Siam production line. Subsequently, RMUTL's lecturers have also gained access to Michelin Siam's modern production technology relevant to Industry 4.0, which they can integrate into their teaching. RMUTL also provides resources for training programs, especially training on basic technical knowledge and skills, before learners begin their training at Michelin Siam.

However, integrating research and teaching methods into SiF to promote critical thinking and problem-solving among graduates is rather difficult. Teachers require capacity building for research methodologies, including how to use research in their teaching. This will ensure that the SiF project meets both the educational goals and industry demands.

The SiF Project: Evolution and Impact Since 2013

The SiF project has grown considerably since its inception in 2013. It began with one industry partner and has now expanded its collaboration with 12 companies: Michelin Siam LMC,⁵⁸ Michelin Siam RYG, Michelin Siam PPD, Star Holding Group, SVS Holding Group, Nuovo Plus, BDI (BDI Alloy Enterprise Co., Ltd.), Wrenchre, Betagro, Mouldmate, Arthit Machinery, and Sanom Tractor. These partnerships have resulted in 14 training sites for the learners, including Green Discovery and Harvestor. Beyond expanding its collaboration, the SiF project has further strengthened its partnership with other educational institutions, mainly TVET colleges. These include Sankhampaeng, Chiangrai, Chomthong Technical Colleges, and Prao Wittayakhom School. These partnerships led to the development of TEdSys.

The number of programs offered has been increased to include more training levels and fields of study. There was only a diploma program in industrial technology in the initial phase. Currently, the training programs offered under the SiF project include diploma programs in agriculture and mechatronics, a bachelor's degree in engineering, a master's degree in mechanical and electrical engineering, and a doctoral program in mechanical engineering through a partnership with the BDI group. A total of 1,447 learners have graduated from the SiF project, out of which 80% completed the diploma level (Moonpa, 2024). In spite of this success, the SiF LMC⁵⁹ project recorded a dropout rate of 5.7% (n = 23) between 2013 and 2022. The main reasons for dropout are substance abuse and challenges in balancing work and study. Further, learners at the diploma level have reported difficulties in balancing learning with work, and master's degree students have reported difficulties in transitioning from study to work.

Post-graduation outcomes show positive results despite the relatively limited quantitative data. A survey conducted in 2023 found that most learners found a job at their training companies. A smaller group of graduates study further at a higher level for higher incomes. The learners' satisfaction with the SiF project is varied. A study by Schlattmann et al. (2024) illustrates that 70% of graduates reported a positive experience of WBL in their job performance. Some highlights are improved work process knowledge, adaptability, and

⁵⁸ LMC refers to the Laemchabang site, RYG refers to Rayong site, HTY is Hatyai site, PPD is a training site at Phrapradaeng. Sites at LMC and RYG are situated in the Eastern Economic Corridor (EEC).

⁵⁹ The results are only based on the study of the SiF LMC site.

practical skills. However, some graduates expressed dissatisfaction with the relevance of the training to their current employment situation.

The size and resources of the partner companies have a strong impact on the sustainability of the SiF project. Long-term partnerships involve large, established companies such as Michelin Siam and Betagro. The international firm Michelin Siam, as earlier mentioned, has shown a strong commitment to collaborating with RMUTL for the WIL project since the project's beginning. This highlights the importance of resources and capacity of an individual company for the sustainable implementation of the SiF project.

Yet, the transferability of the SiF project is debatable, which raises the question of whether SiF could be a “best practice example” for ASEAN or if its success is closely tied to the specific conditions of Michelin Siam's production sites – and perhaps also other similar companies in Thailand alone. Challenges such as regional inequalities and less developed infrastructure in rural areas may obstruct the effective transfer of the SiF project. These challenges may question the perspective that SiF project demonstrates its capacity to share best practice and lead collaborative efforts to improve TVET system throughout ASEAN.

4.2 WBL in Thailand: Exploring the Theoretical Concept

The second article, “*Approaches and Structures of Work-Related Learning in TVET in Thailand*” (Moonpa, Phalasoan, Gulich, and Beecker, 2019), provides an overview of Thailand's socio-economic conditions, with a focus on the role of TVET, particularly the DTVET system. It highlights the development of competency through on-the-job training.

The article examines the WBL approach, as outlined by Schröder and Dehnbostel (2017), which encompasses all types of learning experiences within the German DTVET system – TVET colleges, companies, and inter-company training centres – as forms of WBL. It further classifies the learning approaches into three different categories: work-oriented learning (WOL), WBL, and WIL.⁶⁰

This approach to WBL challenges the conventional separation of “theory” and “practice”. It emphasizes that even though these learning forms are situated in different locations, they are not divided between theory (at TVET colleges) and practice (in companies). Accordingly, all learning experiences within the DTVET system are considered forms of WBL. Additionally, the didactic requirements for implementing WIL to develop competent individuals, based on the recommendations of Dehnbostel, are also discussed. The German DTVET system is suggested as a best practice model. Thus, methods such as production schools, learning bays, and work and learning tasks (WLTs)⁶¹ are presented as effective strategies for supporting WIL.

⁶⁰ The categorization of WBL approaches in this article is minor adapted from the original work of Schröder and Dehnbostel (2017). In their work, the term work-related learning is preferred over WBL and the categorization is WOL, WBL, and WIL. This dissertation adopts the terms WRL and WBL as an overarching topic and the typologies are WOL, WCL, and WBL/WIL.

⁶¹ The author has translated these terminologies into English. “Produktionsschule”, “Lerninsel”, and “Arbeits- und Lernaufgaben” are the corresponding original terms in the German language.

In contrast to the first article, this one explores the concept of WBL more thoroughly by referring to the framework of Dehnbostel and Schröder. It provides a principle of WBL, but the scientific grounding for the presented concepts is still missing in this article. However, it offers a valuable collection of fundamental principles that reflect a reform-oriented approach for the ASEAN TVET community via the *TVET@Asia* journal. These concepts have been discussed in Chapter 2 of this dissertation.

A significant development in this article is the expansion of learning-venue cooperation. The initial SiF project focused only on the collaboration between RMUTL and company partners. The second article highlights the inclusion of TVET colleges, an Industrial Liaison Office, and a TVET hub as a knowledge and coordination centre. SiF's focus has now extended to include partnerships among RMUTL (higher education), TVET colleges, and high schools, thus contributing to the development of TEdSys⁶² (see Figure 11 in Section 4.3). This signifies a broader scope for RMUTL toward the role of facilitator and agent in the knowledge exchange among stakeholders within the TVET system.

A key weakness of the SiF project lies in its incomplete realization of the WBL concept. Some of the teachings still rely heavily on abstract theoretical instruction. This lack of connection to the authentic work process deviates from the approach of Schröder and Dehnbostel. Another challenge is the associated companies' strong business interest in the immediate outcome of the project. While this article does not provide a thorough analysis of the tripartite TVET system, especially its significance in the context of the SiF project, it is important to critically analyse SiF's implementation to identify potential weaknesses that could lead to further refinement of the project.

A direct replication of the German DTVET system, which relies on collaboration among different venues, may be challenging for Thailand. As outlined in Chapter 3, the Thai TVET system differs from the German DTVET model, especially in its lack of inter-company training centres. Thus, the Thai approach to WBL should focus not on the availability of all learning venues, but rather on creating a work-process-oriented and experience-based learning environment. As already mentioned, learning experiences that occur through various learning venues are considered forms of WBL. However, a strong collaboration between educational institutions and the world of work is important for the exchange of knowledge and the effective implementation of WBL.

Additionally, a clear distinction between higher and post-secondary education within the Thai context must be established. Since the learning objectives and delivery mechanisms may differ between these two levels, such a distinction can support effective adaptation of the WBL approach of Dehnbostel and Schröder. While this approach claims a universal benefit of WBL within DTVET systems, a suitably adapted approach is necessary for the specific requirements of the Thai context.

Produktionsschule represents a learning tool and method for WOL, while Lerninsel and Arbeits-und Lernaufgaben are the tools for WCL and WBL/WIL respectively.

⁶² The term "Tripartite TVET System" is used in this article while the "Tripartite Education System" is its further development and expansion and its broader focus in education.

Successfully integrating the Dehnbostel–Schröder WBL approach within the Thai context requires a thorough understanding of workplace realities and careful consideration to integrate these WBL principles into each level, from TVET colleges to higher education institutions. As outlined by Spöttl et al. (2020), analysing vocational action competence is important. Without a clear understanding of the competence required in actual work settings, integrating theory and practice would become challenging.

Finally, the article concludes with the valuable insights gained from a three-day workshop held at RMUTL. It prioritizes the development of a research agenda on work process analysis, documentation, knowledge transfer, and career exploration, highlighting the urgent need to improve the Thai TVET system. The findings from the workshop subsequently led to the implementation of the “ProWoThai” project (see Section 4.4). This project has developed guidelines for conducting work processes and work tasks analyses, as well as a methodological and didactic tool for WOL settings, also known as learning and work tasks (LWTs).

4.3 TEdSys: Going Beyond the Tertiary Level

WBL implementation in Thailand's TVET system is impeded by challenges, such as a lack of resources, outdated curricula, and teachers' limited industrial-related experience. It thus requires strong collaboration between educational institutions and private company partners. Many traditional TVET colleges in Thailand struggle to establish connections with companies. RMUTL⁶³ has led the development and management of learning venues' collaboration with industry through the SiF and TEdSys projects, which focus on meeting the labour market's demand for a competent workforce below the bachelor's and master's degree levels. In this context, the vocational education certificate and diploma in TVET are recognized as valuable qualifications for the Thai labour market.

The article “*Tripartite Education: A Collaborative Structure of Learning Venues Conducive to the Improvement of TVET System in Thailand*” (Moonpa, Chaiyong, and Schlattmann, 2021) explores the collaborative framework of learning venues designed to enhance Thailand's DTVET system at the tertiary level, as well as at the upper and post-secondary levels.⁶⁴ This article highlights the roles and responsibilities of key partners, including the private sector, educational institutions (including TVET colleges), and the public sector, in collaborating and sharing knowledge to develop a competent workforce and drive innovation. It also emphasizes the importance of TVET research in defining cooperation objectives for stakeholders, which include curriculum development and the implementation of elements of WBL in education. Moreover, it promotes participatory action research (PAR) to achieve the collaboration's objectives.

⁶³ Before RMUTL was upgraded to a university, it initially established as a “Payap Technical College”. Later, it became one of the Universities of Technology and Vocational Education. This historical development explains its involvement in both Higher Education and TVET. However, the programs offered during these developmental phases are not focused on the collaboration with the industrial partners, as elaborated in the SiF and TEdSys projects.

⁶⁴ See figure 9 for a formal TVET pathway in comparison with the general education.

Beyond focusing on the structures and roles of the partners, this study on SiF and TEdSys emphasizes the significant role of RMUTL in supporting TVET colleges (at the upper and post-secondary levels) to benefit from TEdSys, even though they are still in smaller numbers. It emphasizes the importance of clear communication and a shared understanding among partners for successful collaboration. In this regard, RMUTL plays a significant role in establishing connections between TVET colleges and companies. The structure of communication is illustrated in Figure 11 below.

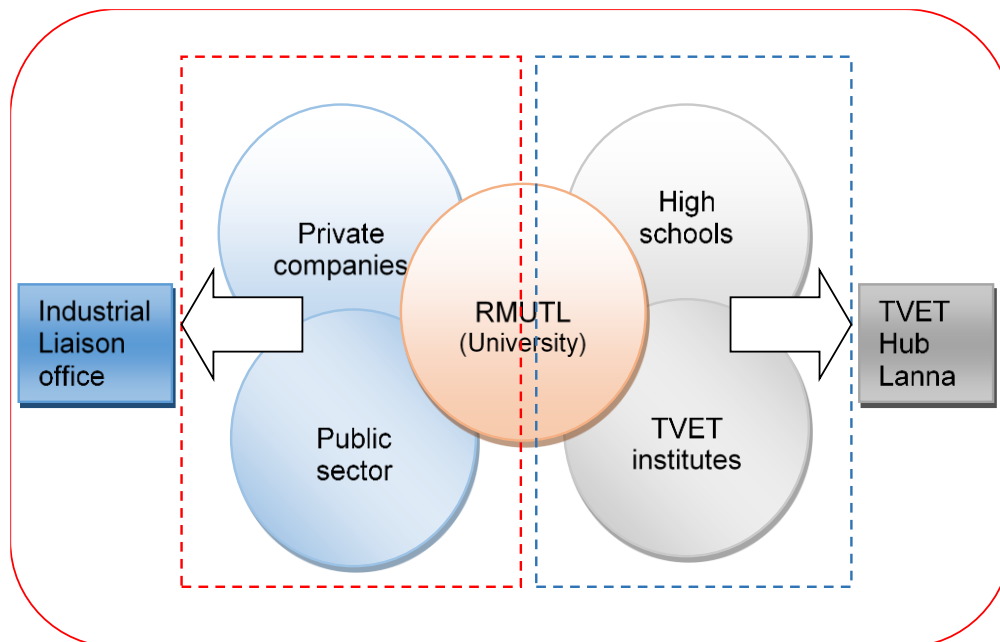


Figure 11: RMUTL Serving as the Central Communication Hub Within the Tripartite Education System (TEdSys; Moonpa et al., 2019).

Additionally, the discussion on the development of TEdSys is also relevant to the German education system, where the separation between humanistic education and practical professional tracks is prominent. RMUTL challenges this division by offering bachelor's and master's degrees while also focusing on the diploma in TVET.⁶⁵

4.3.1 Integrating Upper and Post-Secondary Education

TEdSys represents RMUTL's unique approach to WBL. The strong role of RMUTL in fostering collaboration between education and industry makes this approach distinct from other WBL initiatives. RMUTL, as a key player, not only provides the theoretical knowledge, but also integrates several functions to form a unique public-private partnership (PPP). It combines three key roles that are usually institutionally separate in other WBL settings: (1) deliver the educational component within a DTVET program at the higher education level (diploma in TVET and bachelor's degree in the SiF project); (2) facilitate the linkage between TVET colleges and industry at the upper and post-secondary levels; and (3) conduct TVET

⁶⁵ RMUTL's efforts align with NXPO's "Reinventing Thailand's Higher Education" strategy, which aims to connect higher education more closely with the professional world, notably through WBL programs. See NXPO's Higher Education Strategy on <https://www.nxpo.or.th/th/en/report/11816/> (20.01.2025).

research, including curriculum and WBL program development, that is suitable for Thailand's sociocultural context.

TEdSys includes upper secondary education alongside post-secondary TVET programs. It facilitates pathways from the upper secondary level to specialized TVET. This integration offers valuable advantages to students at all levels, especially those pursuing vocational education certificates and diplomas in TVET, which are in high demand in Thailand's labour market. It fosters the development of vocational competence relevant to their work settings. Moreover, the SiF project provides enhanced learning experiences to post-secondary students pursuing a diploma in TVET.

Although affiliated with RMUTL, the SiF project shows a clear commitment to both the diploma and bachelor's-degree levels of education. One example is the employment of master's degree students as learning facilitators in the projects – to specifically support the competent development of learners in the diploma and bachelor's degree programs. Furthermore, the SiF project provides a three-month period of pre-factory training at the RMUTL campus to ensure that learners are well trained in basic technical skills.

The main goal of the SiF project is to be responsive to labour market demands. Through close collaboration with company partners, RMUTL can ensure that the curriculum is up-to-date and relevant and address the skill gaps identified by employers. The project structure reflects the emphasis on meeting industry needs and aligning with employer expectations. The collaborative curriculum development, competency-based framework, and industry involvement in assessment demonstrate an effort to produce graduates who are competent at both the technical and operational levels.

Importantly, the project's focus extends beyond traditional higher education to emphasize vocational action competence and industry connection. This suggests that the project's value is in TVET more than the pursuit of advanced degrees. The diploma in TVET is not just a prerequisite for a bachelor's or master's degree; it is rather a valuable qualification that prepares learners for successful entry into the workforce.

4.3.2 Enhancing TVET College Participation in Work-Based Learning Initiatives

TEdSys is designed to facilitate effective WBL partnerships among the government, industry, and educational institutions. This framework expands the scope of the SiF project by including TVET colleges as partners. The inclusion of TVET colleges in TEdSys is seen as an opportunity to enhance the quality of TVET in Thailand. However, it is necessary to carefully examine the positive impacts and explore the challenges of this collaboration in detail. Specifically, it is important to evaluate whether the knowledge transfer from RMUTL to TVET colleges can support the latter in implementing WBL on their own. A key question to consider is whether this support has improved the curricula of TVET colleges, particularly in light of the limited involvement of TVET teachers in the teaching and learning processes. Moreover, it is also important to avoid the perception that RMUTL only focuses on higher education, specifically bachelor's and master's programs. Its involvement in the diploma in TVET demonstrates its active support of TVET colleges.

The successful implementation of the SiF project over the past 10 years (since 2013) demonstrates that this WBL project has the potential to be expanded nationwide. However,

the number of participants in the project needs to be increased. One possible way is to expand SiF through partnerships with TVET colleges throughout the country. The RMUTL research team can support this implementation process by disseminating best practices and fostering a broader impact of the SiF project.

As reported by Pichedboonkiat et al. (2023), TEdSys highlights the effectiveness of project-based learning in improving the quality of TVET in Thailand. The research conducted at RMUTL, Chiangrai campus,⁶⁶ demonstrated that students developed a strong understanding of the subject knowledge and applied it to real-world scenarios. Additionally, other essential skills, such as creativity, innovation, and critical thinking, were also developed (p. 193). These outcomes align with WBL principles and WLTs.

However, it is essential to acknowledge that the initiatives such as SiF and TEdSys, as well as the previous Chevron Enjoy Science initiative that led to the establishment of TVET Hub Lanna in 2016, may prioritize production needs and industrial innovation. While these goals are important, the development of holistic competence and the emancipation of TVET learners are equally significant. Thus, further analysis is required to carefully examine the learners' well-being, personal growth, and career goals, which extend beyond economic factors. A schedule of six days a week, working eight hours per day and studying for three hours, raises concerns about exploitation and its impact on these critical aspects of learner development.

4.4 ProWoThai: Participatory Action Research (PAR) in International TVET Cooperation

The article *“ProWoThai: Progressing Work-Based Learning in Thailand's TVET System – Design-Oriented and Participatory Action Research in International TVET Research Cooperation”* (Schröder, Schlattmann, Gulich & Hupfer, 2024) provides an in-depth analysis of the ProWoThai project. RMUTL is one of the project partners, and its WBL projects formed part of the research cases studied to examine the critical challenges in Thailand's TVET system. This article identifies limitations in the existing WBL programs. It highlights the need for more effective and collaborative educational strategies, especially in aligning TVET with the demand of the rapidly changing labour market.

The ProWoThai project promotes collaborative efforts by educational institutions and local partners to create a strong WBL framework. It emphasizes the role of PAR in fostering these efforts, highlighting the need to develop a culture of a research-driven approach and research capacity building for educators. Furthermore, the article points out areas that require further attention, including insights for policymakers and educators for advancing TVET.

4.4.1 Scientific Coaching and WBL

The ProWoThai project is one of the leading initiatives in ASEAN for advancing WBL approaches through the PAR approach. This action research project is based on international

⁶⁶ RMUTL consists of 8 campuses spreading throughout the northern part of Thailand. These are Chiang Mai (Main Campus), Chiang Rai Campus, Tak Campus, Phitsanulok Campus, Nan Campus, Lampang Campus, Lampang Agricultural Research and Training Center, and Jomthong campus. Chiang Mai, Chiang Rai, and Nan campuses are actively involved in the WBL programs.

cooperation in TVET. It aims to improve the Thai TVET system through research and practical implementation.

Since the beginning of ProWoThai, RMUTL has positioned it within the framework of international TVET collaboration for further development of WBL. RMUTL's partnership with Michelin Siam, an international corporation, and the Thai government illustrates this objective. The ProWoThai project builds upon this foundation and incorporates TVET research cooperation as a core element. The Research Center for TVET (RCTVET) at RMUTL was established to continue and further expand the objectives of the ProWoThai project. However, the increasing role of the RCTVET requires critical examination.

The RCTVET might conduct new research initiatives, as well as those that were delayed in the ProWoThai project due to the COVID-19 pandemic. It is unclear whether these initiatives are a continuation of the collaborative and research-driven approach, which is the primary objective of ProWoThai. Specifically, the question here is whether the research activities under the RCTVET still reflect the aim of enhancing TVET through collaborative action research.

The ProWoThai project emphasizes scientific coaching that is specifically designed to enhance competence and capacity building among partners, mainly TVET researchers and practitioners. The project's design orientation focuses on practical application and collaborative development that can be adjusted and refined according to real-world situations and data analysis. The design orientation can provide a scientific foundation that includes the explanation for what is being done, what is being designed, and what is being implemented. Moreover, it also includes how coaching is conducted, who conducts the coaching, the activities involved, and other elements of the coaching process.

The scientific coaching, as discussed within the ProWoThai project, can be integrated into the framework of SiF and TEdSys to facilitate collaboration and knowledge sharing among stakeholders for these projects. For example, experienced researchers could act as coaches to guide the implementation process of WBL initiatives. These projects employ master's students as coaches or facilitators – a crucial element in supporting their implementation. However, this step may not fully align with the broader goal of developing comprehensive vocational action competence through ProWoThai. The inclusion of master's degree students should thus be seen only as a supplementary strategy. Further initiatives may be required to provide more targeted pedagogical training for those involved in WBL implementation. Specifically, a clear distinction should be made between scientific coaching for researchers and pedagogical coaching or mentoring for TVET teachers and trainers.

4.4.2 Equity and Collaboration in International TVET Research

International cooperation that employs PAR offers benefits for RMUTL. The university's collaboration with TU Dortmund and the Regional Association of Vocational and Technical Education in Asia (RAVTE) is a valuable opportunity for RMUTL, at the very least, to connect to a well-established DTVET system, such as the German one.

This collaboration raises the usual questions of knowledge transfer and differences in practice across distinct TVET systems. It is important to note that this collaboration does not

signify a donor–recipient relationship. The German BMBF provides financial funding to TU Dortmund, and RMUTL receives funding from the Thai government. RMUTL is not a passive recipient of Official Development Assistance (ODA), which demonstrates its commitment to equal partnership, allowing Thai researchers to contribute to the ProWoThai project alongside their German partners.

Moreover, the collaborative nature of the research shows a degree of equality. RMUTL benefits from access to German expertise and connection to a DTVET system while receiving financial support from its own government. This shows that the contribution from the Thai side is important. However, some evidence suggests an imbalance in the partnership. The German partners might have more decision-making power in choosing, for example, research topics, while Thai partners may not fully utilize their expertise on the Thai TVET system; this indicates a potential area for improvement.

The partnership between RMUTL and TU Dortmund is rather complex, but valuable. The two universities bring unique strengths and perspectives to the project. However, for a truly equitable collaboration, it is necessary to assess and address any power imbalances to ensure that it benefits all partners. The focus should be on empowering Thai researchers to assert their expertise for a more balanced partnership in the future.

4.4.3 RMUTL and the SiF Project: Navigating Globalization and the Local Context

The SiF project views itself as a self-directed form of DTVET. It autonomously shapes its own approach rather than duplicating it. The project's evolution may include the addition of new elements, but its primary focus is on adapting to the local framework and context. This implies a sense of ownership within the SiF project. Stakeholders, like Asst. Prof. Dr. Niwat Moonpa, in the Thai-government-funded project are considered the owners and drivers of the initiative. This is further illustrated by the ProWoThai project, where cooperation occurs on an equal level between international partners.

In the context of this collaboration, “transfer” refers to the flow of knowledge and practices from Michelin Siam to RMUTL rather than the transfer of scientific knowledge between German and Thai academic research on TVET. RMUTL researchers do not receive a transfer from German TVET research. Instead, the exchange of knowledge and best practices related to TVET research occurs through the professional community, such as the RAVTE network. This highlights a model of collaborative learning and peer-to-peer exchange rather than a one-way transfer of knowledge.

While scientific coaching (SC) has provided a structured approach to “culturally sensitive transfer”, its implementation was significantly interrupted by the COVID-19 pandemic. This highlights the challenge of implementing the planned research activities in the face of unforeseen global events. Moreover, another challenge in international cooperation which was prominent in the 1960s and 1970s is “technicism”; this view frames development challenges as purely technical and culture-free problems, thus overlooking the importance of the local context and cultural differences. It is important to examine how RMUTL has avoided this technicist approach in its implementation of WBL projects while collaborating with multinational companies.

It is especially crucial to understand how RMUTL navigates the conflict between global standardization and local contexts in its WBL implementation. RMUTL may have a limited impact on international companies, such as Michelin Siam, regarding global standards. A key body that deals with this tension is the joint committee established by RMUTL and Michelin Siam. This committee serves as a platform for dialogue and negotiation to ensure that the requirements and expectations of both the partners are met. It provides a space for merging the demands of a globalized production system with the specific needs of the Thai educational environment as represented by RMUTL.

Therefore, although collaboration with RMUTL may not change Michelin Siam's global practices, their joint committee can facilitate a process of shared adjustment. This adaptation allows WBL projects to meet the technical requirements of a global corporation and the specific needs of the Thai educational setting. This joint practice suggests that successful WBL implementation requires ongoing communication and flexibility among all partners involved.

4.5 Impact of the SiF Project: Empirical Findings

The article *“The Impact of Work-Based Learning on Graduates' Job Performance: Insights from the School-in-Factory (SiF) Project”* (Schlattmann, Chaiyong, and Moonpa, 2024) examines the impact of the SiF project in Thailand. This article highlights the advantages of close collaboration between educational institutions and companies. It evaluates the program completion rates and analyses the impact of WBL on graduates' job performance. It further provides an overview of the SiF project by introducing its objectives and its importance within Thailand's TVET system. It also discusses how a collaborative partnership between educational institutions and companies enhances the relevance of training programs and workplace readiness.

This research employs the IPOO (input, process, output, outcomes) model as an analytical framework to assess the project's effectiveness (Grollmann et al., 2021). The key findings pertain to graduates' improved workplace performance and the benefits of integrating authentic work experiences into TVET. The discussion section compares the SiF project with traditional TVET programs, highlighting how WBL can address skill gaps and enhance job performance.

Importantly, this article mentions for the first time that the SiF project aims to develop comprehensive and multidimensional competence in learners – a central goal of reform-oriented vocational education science. This includes the development of subject-specific expertise, including technical proficiency and professional conduct, constructive communication and expression, teamwork, and job-related problem-solving competence. From the employers' perspective, SiF graduates have demonstrated these competences, especially technical knowledge and skills, as well as workplace readiness.

RMUTL plays an important role as a learning venue and support system in this process. As Schlattmann et al. (2024, p. 220) state, “one of the key missions of the RMUT universities is to support and promote Thai TVET colleges in implementing DTNET through WBL for technology development and innovation.” This supporting system is essential, especially when the current success of WBL in Thailand are largely centred on individual

connections with private companies. The SiF LMC⁶⁷ project is moving towards a more sustainable WBL framework. It strengthens collaboration with company partners by facilitating in-company training and training teachers to meet the requirements of WBL. Thus, RMUTL provides crucial support for improving the TVET system, which is currently not provided by Thai governmental organizations.

Proposing a New Research Initiative

A major concern that emerges from the evaluation of the SiF project concerns the reliability of the data about its impact. The findings are limited and do not show strong evidence that the SiF project led to the mentioned outcomes. However, its continued implementation since 2013 suggests SiF has been exerting a positive effect. At the least, the sustained effort indicates a promising direction for the TVET system in Thailand.

Nevertheless, to obtain better information, a new research project must be developed. Such a project should include both qualitative and quantitative research methodologies, as this mixed-methods approach can help address the issue of lack of in-depth information resulting from the nature of expert interviews. This proposed research project is needed to produce meaningful and actionable findings and, importantly, to support the application of the PAR framework.

Future research in this direction should further maintain methodological rigor while also demonstrating social relevance. Moreover, it should focus on the issue of equality and accessibility within the Thai TVET system. For example, it can examine how the SiF project impacts various groups of people. A well-designed research project, with evident relevance to the social impact, can significantly contribute to enhancing TVET practices in Thailand and beyond. Its results can provide critical insights to stakeholders involved in improving the Thai TVET system, including policymakers, educators, and industry representatives.

4.6 Different Forms of Organizing the SiF Project: Strengths and Limitations

The following discussion is based on the article *“Developing the Tripartite Education System for the ASEAN Region: A Comparative Analysis of Three Variants of the School-in-Factory Program at the Rajamangala University of Technology Lanna”* (Chaiyong, Gangern, Tanapeng, Moonpa, and Schlattmann, 2024). This article examines the different models of the SiF project within TEdSys⁶⁸ at RMUTL. These models foster PPPs and demonstrate flexibility and adaptability through their three organizational variants. Established in 2012 and operational since 2013, these models feature collaborations among companies, RMUTL, and TVET colleges. The article suggests that while the SiF project could serve as a “best practice” for ASEAN, particularly for Cambodia, Laos, and Myanmar, successful implementation would require considering challenges such as clear communication and well-defined roles for partners, as well as context-specific adjustments.

⁶⁷ As already mentioned in the article that this study is only relying on the SiF LMC site, one site of the SiF project. This also raises a question if the other sites of the SiF project have implemented the same initiatives.

⁶⁸ In this article, the SiF project is considered one of the initiatives under the broader perspective of the Tripartite Education System.

The article explores three collaboration models of the SiF project, namely A, B, and C. It highlights their unique structures, objectives, and student selection processes, emphasizing RMUTL's important coordinating role in ensuring that the training curriculum aligns with the practical industry requirements. It examines the strengths and limitations of each model by focusing on their shared goal in developing a competent workforce for Thailand 4.0 and the EEC. Furthermore, it identifies challenges, such as communication barriers and unclear roles, that hinder the implementation of these partnerships. Additionally, it notes that continuous evaluation and adaptation are necessary for meeting the evolving needs of the labour market.

The article further highlights the SiF project as a leading WBL model in Thailand. It also acknowledges the development of RMUTL's focus on the diploma in TVET programs and emphasizes the university's unique role in facilitating *learning-venue cooperation*. From this perspective, RMUTL offers dual functions: providing theoretical instruction and acting as an intermediary between stakeholders (see Section 4.3.1 for an elaboration of RMUTL's roles).

Additionally, the article identifies three distinct organizational variants of the SiF project within TEDSys, but argues that their differences are not systematically significant. In all three variants, as already discussed, RMUTL consistently plays a crucial role in facilitating the communication across all stakeholders. Its involvement in the collaboration offers valuable experiences. SiF can thus be considered a “best practice” example of the WBL approach for Thailand. Additionally, it is also relevant to other ASEAN member states⁶⁹ that aim to strengthen their TVET systems through a similar WBL approach, especially for Cambodia, Laos, and Myanmar.

Importantly, the organizational differences in the SiF projects under TEDSys suggest a benefit in transferring them to other ASEAN countries. The variety of organizational forms demonstrates flexibility that could support successful adaptation and implementation in other contexts – as long as the socio-economic and cultural differences are considered.

⁶⁹ As illustrated in the ASEAN TVET Council (ATC) Work Plan that its member states require stronger collaboration between TVET colleges and the company for the improvement of their TVET system (see Section 3.3.1).

Chapter 5: Ten Years of Work-Based Learning (WBL) at RMUTL – Results and Perspectives

The previous chapter, through the six articles, discussed the School-in-Factory (SiF) project and the Tripartite Education System (TEdSys) at the Rajamangala University of Technology Lanna (RMUTL). It explored and critically examined these projects, including the argument that advancing work-based learning (WBL) in Thailand can be challenging when certain groups, such as young people from rural areas, face systematic disadvantages and exclusion. Over the last decade, RMUTL's WBL initiatives, such as SiF, TEdSys, the Research Center for TVET (RCTVET), and the ProWoThai project, have helped successfully develop a dual TVET (DTVET) model based on reform-oriented vocational education science.

In this context, RMUTL aims to develop independent TVET research capacities in Thailand, as well as in the Association of Southeast Asian Nations (ASEAN). This effort began in 2016 with the establishment of the TVET Hub Lanna, which was later developed into the RCTVET in 2022. In addition, RMUTL also acts as a facilitator in supporting TVET colleges to connect with the industry. This role marks a new function for the university in TVET, especially for countries that rely heavily on stakeholders' initiative from the education and industry sectors for their DTVET. This chapter outlines key aspects and the structure of this collaborative framework based on the vocational education and company pedagogies, which are the focus of this dissertation.

This chapter is structured as follows. First, Section 5.1 provides an understanding of the SiF and TEdSys projects, within their sociocultural and economic contexts, as successful reform-oriented vocational education science, as well as best practices for the ASEAN region. Then, Section 5.2 discusses how RMUTL has acknowledged the need to establish and develop regional TVET research capacities and has formalized this recognition in the RCTVET in 2022. Section 5.3 subsequently elaborates how the role of RMUTL in the SiF and TEdSys projects highlights the demand for a new function of universities in TVET, especially in countries that lack institutionalized DTVET. Finally, Section 5.4 explores WBL implementation in Thailand beyond RMUTL's best practice examples.

5.1 The School-in-Factory Project and the Tripartite Education System as Reform-Oriented Vocational Education and Company Pedagogies

The success of RMUTL in effectively implementing its WBL models is directly linked to its objective to solve the existing problems in the TVET system (see Section 3.1.3). The SiF and TEdSys projects focus on competence development and foster collaboration among learning venues (RMUTL, companies, and TVET colleges). Learning in these projects is an active, experience-based process that demonstrates a reform-oriented initiative within a traditionally school-based TVET system. The success of RMUTL is attributed to the following points:

- The foundation for curriculum development is based on learning in professional and operational work tasks and processes. RMUTL closely aligns its curriculum with the industry and acknowledges the current demands of the workforce.
- A comprehensive concept of vocational action competence enhances learning success in TVET. This concept supports and shapes both learning and its assessment

processes. It emphasizes that competence development requires thoughtful methodological and pedagogical design that includes both work tasks and learning tasks.

- The two projects are implemented in work-based learning environments that exist both in companies and at RMUTL. This follows the principles of company and vocational pedagogies. The prerequisite is effective cooperation between the distinct work-based learning environments.

The DTVET model established by RMUTL can be considered as one of the best practice examples in regional TVET cooperation. This is due to its focus on reform-oriented vocational education and company pedagogy, including the concept of vocational action competence (see Section 2.1.1), cooperation among learning venues (see Section 2.1.3), and the development of methodological and didactic tools (see Section 2.2.2). Additionally, strong industry partnerships, a competency-based framework, and experiential learning are seen as advantages by the project's stakeholders (Moonpa et al., 2022).

Moreover, the successful implementation of a DTVET system requires collaboration among learners, TVET colleges, companies, and the government (Mongkhonvanit, 2017, p. 116). Students should be engaged and motivated to participate in training programs according to their career goals. In addition, the companies should provide meaningful work experiences and also support students' learning process. The important role of the government is in funding TVET initiatives, ensuring quality standards, and facilitating stakeholder partnerships. Collaboration between TVET colleges and companies based on principles such as formal agreements, regular dialogue, joint planning, and experience sharing enhances training relevance, motivation, and learning outcomes (Hiim, 2023).

Additionally, the SiF and TEdSys projects can be examined deeper through applying the criteria for a TVET Center of Excellence (CoE) in Thailand as outlined by Ode-sri (2020). According to him, a successful TVET CoE is built on a foundation of strong governance, financial stability, research and innovation, and alignment with societal and industry needs (p. 145). Based on these criteria, the following points highlight the strengths of SiF and TEdSys.

1. Strong industry partnerships: The SiF project's collaboration with industry partners, particularly with Michelin Siam, aligns with the TVET CoE criterion of fostering external partnerships. This collaboration ensures that the training programs and curricula are relevant to the demands of the labour market and prepare students for employment.
2. Research-driven approach: The establishment of the RCTVET at RMUTL highlights the commitment to research and innovation. The RCTVET focuses on improving TVET practices, supporting collaboration, and promoting capacity building within the TVET system. This aligns with the CoE goal of promoting research excellence (see Section 5.2 for detailed discussion).
3. Student support: The support offered to students includes a three-month pre-factory training period at RMUTL and mentorship during on-the-job training by facilitators and lecturers.
4. Employment opportunities: Most of the students from SiF and TEdSys are later employed by the projects' company partners that offer them training. Moreover, these

training experiences with the company partners also guarantee their future employment, thus creating meaningful employment pathways for students.

5. Quality assurance: The SiF project emphasizes collaboration in curriculum development and assessment. It also involves industry representatives in the evaluation process to ensure that the programs align with workforce expectations.
6. Infrastructure readiness: Through the collaboration among partners, modern infrastructure is available to students for their training, as well as to lecturers. This is a significant advantage in the context of Thailand, especially given the relatively limited government funding for modern training equipment.
7. Rigorous selection process: The thorough selection process for both students and lecturers is important. Inclusion of the industry partner in the students' selection process ensures that the students fulfil the basic requirements for the programs.
8. Financial stability: Collaborative funding – in kind and in cash – between RMUTL and its partners ensures that there is sufficient financial support for the training (see Phalasoorn, 2017, p. 8 for further details).

These criteria for a TVET CoE not only serve as the foundation for reform-oriented vocational education and company pedagogies, but also represent the results and outcomes of RMUTL's projects. Through their strong industry partnerships, research-driven approach, and emphasis on practical training, as discussed above, the SiF and TEdSys projects focus on the key requirements for a TVET CoE. However, challenges such as high dropout rates, the questionable sustainability of partnerships, and limited research capabilities (discussed in the next section) highlight areas for further improvement.

A dropout rate of 5.7% in the SiF LMC project highlights the need to adapt the curriculum to academic and professional demands, which is important for long-term success. Further research is also required to determine the reasons for the dropout. Moreover, the reliance on large, established companies highlights the importance of maintaining and expanding partnerships. Developing strategies to sustain industrial engagement is necessary. New collaborations with other national or international companies need to be planned. Additionally, collaborations with SMEs also need to be promoted (OECD, 2021).

Further, as discussed in Section 4.1, there might be a strong interest of the company partners in RMUTL's WBL projects. The selective nature of the SiF project might exclude certain groups of people, which may create inequality instead of positively contributing to the improvement of the Thai TVET system. This criticism highlights the significant role of vocational education science to ensure that WBL programs are effective and inclusive.

Overall, RMUTL's projects have shown success based on the TVET CoE criteria. However, there is still a need to better address the needs of vulnerable groups and less developed regions. While SiF and TEdSys have developed a unique WBL model tailored to Thailand's local contexts, their expansion to less developed regions is the next target. To strengthen the Thai TVET system and support the goal of Thailand 4.0, it is necessary to develop high-quality WBL models tailored to local contexts and accessible to all to foster a culture of innovation and to empower learners. Moreover, the focus should be on TVET at all levels, not only at the higher level.

Ultimately, the knowledge gained from implementing SiF and TEdSys projects should be disseminated widely to benefit TVET colleges in rural areas in Thailand and also shared with other developing countries within ASEAN, especially in Cambodia, Laos, and Myanmar (CLM countries).

5.2 Further Development of DTVET in Thailand Through TVET Research and International Cooperation

The underlying concept of RMUTL's WBL projects is based on research in TVET. Recognizing that TVET research is necessary for developing and improving TVET programs (see Section 1.3 for detailed discussion), further development of these projects in ASEAN requires autonomous regional TVET research. The focus of this research should be on teacher and trainer training, as well as the design of suitable curricula through close cooperation between educational institutions and companies. Moreover, these efforts must be adapted to the local conditions, and participatory action research (PAR) can be particularly helpful in this context. As a member of the ProWoThai research team has stated, "TVET research is the way to develop a model that is suitable for the Thai context, both in methodology and practical implementation. Such a 'truly Thai WBL' model could make a valuable contribution to the field."

The RCTVET at RMUTL (see Moonpa 2023)⁷⁰ represents another significant effort that contributes to the development of TVET research and regional cooperation in Southeast Asia (SEA) and the ASEAN region.⁷¹ The establishment of the RCTVET can be traced back to the founding of the TVET Hub Lanna⁷² (in 2016) and the Industrial Liaison Office. The TVET Hub Lanna focuses on teacher training that emphasizes the development of industry-relevant competencies through experiential learning (iMOVE, 2016). The Industrial Liaison Office, for its part, fosters collaboration between education and industry through public-private partnerships (PPPs). In recognition of the lack of TVET research in Thailand, the

⁷⁰ The two Rajamangala Universities of Technology established TVET hubs under the Chevron Enjoy Science initiative (RMUTL in 2016 and RUTS; Rajamangala University of Technology Srivijaya in 2017). Only RMUTL in Chiangmai later developed its TVET Hub Lanna into the RCTVET in 2022. Further information on the RCTVET can be found at <https://rctvet.rmutl.ac.th/page/overview>

⁷¹ TVET research in Southeast Asia and the ASEAN region has gained more recognition. This is evident in the establishment of research institutions and emphasize on regional cooperation. The initial effort began with the establishment of MyRivet at Universiti Tun Hussein Onn Malaysia (UTHM) (MyRIVET, 2024) that prioritize policy development, lifelong learning, STEM in TVET, and address gaps in skills and knowledge (Salleh & Sulaiman, 2020). The TVET-RC at Universitas Pendidikan Indonesia (UPI, Indonesia) focuses on aligning TVET with industry needs through research on pedagogy, policy, and international collaboration (Rahmanullah et al., 2022). Furthermore, the alignment of training programs with regional industries was promoted by the Provincial TVET Councils in Vietnam (GIZ, n.d.). Another important research institute is the KRIVET (Korea Research Institute for Vocational Education and Training). It focuses on enhancing TVET quality through collaborative research and international knowledge exchange and sharing strategies that are particularly relevant to the ASEAN contexts (AKCF, 2024). And finally, as discussed, the RCTVET at RMUTL in Thailand.

⁷² TVET Hub Lanna is one of the initiatives under the "Chevron Enjoy Science" project funded by the Kenan Foundation Asia (2020). Further information can be found at <https://www.enjoyscience.kenan-asia.org/en/about-tvet/>

RCTVET was established based on the outcomes of the national and joint international research projects, TEdSys and ProWoThai.

The RCTVET currently serves as a central platform for coordinating TVET initiatives and fostering collaboration with industry partners through the Industrial Liaison Office and TVET Hub Lanna. Its main objectives include conducting policy-relevant TVET research, developing innovative teaching methodologies such as WBL and project-based learning, enhancing TVET research capacity, and strengthening partnerships between education and industry. According to Asst. Prof. Dr. Niwat Moonpa, co-founder of the RCTVET, “As a core focus, the research center collaborates closely with private companies to plan, develop, and implement TVET programs while also providing further education to their TVET personnel through these partnerships.”

However, considering that RMUTL is a research unit, it should be able to produce high-quality curricula, based on the principle of vocational education science, rather than merely implementing industry requirements. The RCTVET's cooperation with regional platforms, such as the Regional Association of Vocational and Technical Education in Asia (RAVTE), and international partners, like TU Dortmund University, is crucial for its development, especially in addressing this challenge. Furthermore, taking into account the differences between Germany and Thailand, the German Federal Institute for Vocational Education and Training (BIBB; Bundesinstitut für Berufsbildung) might serve as an example for developing a Thai research centre to improve TVET quality through collaborative and multidisciplinary research. BIBB is one of the organizations that promote WBL internationally (Thomann, 2023).

International cooperation in TVET is also important, as evidenced by RMUTL's involvement in the ProWoThai project. This international collaborative research in TVET is facilitated through a partnership among the RCTVET at RMUTL, TU Dortmund University, and the Malaysian Research Institute for TVET (MyRIVET) at Universiti Tun Hussein Onn Malaysia (UTHM). In this project, guidelines have been developed for selecting and analysing work tasks and processes, as well as for integrating them into formal learning environments.⁷³ This connection between the workplace and curriculum can enhance the relevance and impact of TVET programs. Additionally, the strong orientation of the RCTVET in international cooperation is also evident in RMUTL's membership in RAVTE and its relations with UNESCO-UNEVOC. Importantly, the active role of RMUTL during the 2023 Thai-German TVET conference on Research Cooperation in Southeast Asia was also recognized through its strong statement in support of research-based TVET in SEA.

Moreover, from a broader perspective, the development of high-quality research on TVET and vocational education science can offer several benefits. In the context of the ProWoThai project, such research can lead, firstly, to an enhancement in the consulting

⁷³ These two guidelines are 1. Handout for the selection and analysis of work tasks for vocational training and 2. Developing and Implementing Learn and Work Task (LWT) in a Formal Learning Environment (Moonpa et al., 2024). The first guideline can be accessed via https://tvvet-online.asia/wp-content/uploads/2024/11/20241104_Guideline-1.pdf and the second guideline at https://tvvet-online.asia/wp-content/uploads/2024/11/20241104_Guideline-2.pdf

expertise of TU Dortmund University through scientific coaching, which in turn supports training institutions and informs national TVET policy (e.g. Thailand 4.0 and the Eastern Economic Corridor [EEC]). Secondly, it can foster competence in international collaboration, for example, through support for weaker countries in the ASEAN region. Thirdly, autonomous regional TVET research is necessary for creating context-specific solutions in transfer projects. This supports the adaptation of models from other contexts to local sociocultural and economic conditions. Lastly, all research processes (national, regional, and international) should prioritize the meaningful involvement of practitioners and their expertise. PAR that emphasizes both qualitative and quantitative research methodologies can be very helpful here. Dialogue among partners is the basis for autonomous, regionally suitable solutions at both national and international levels.

An ongoing effort to broaden the scope of the RCTVET has resulted in a proposed collaborative doctoral program with TU Dortmund University. This study program aims to educate a new generation of Thai TVET researchers. It signifies a commitment to develop TVET researchers within the ASEAN region through support and valuable knowledge from Germany (Busian & Schröder, 2015). The broader goal is to develop the advisory expertise of RMUTL through the RCTVET, which can benefit other institutions, such as TVET colleges, and inform national TVET policy. The objective of the RCTVET is to develop context-specific solutions through international collaboration, which typically involves adapting existing models to align with Thailand's sociocultural and economic context. PAR strategies that facilitate the involvement of practitioners and their knowledge are important in this process. This is crucial when defining the current skill demand within a specific labour market.⁷⁴ Lastly, scientific coaching, as noted by Schröder (2015), is also important in conducting TVET research and developing the competence and capacity to establish autonomous vocational education as an academic discipline in Thailand.

5.3 A New Role for Technical Universities in the DTVET Model

The unique position of RMUTL in its SiF and TEDSys projects creates an important discussion point. Beyond its traditional university functions, RMUTL acts as a facilitator by providing access to WBL programs and industry partnerships (including knowledge, expertise, and communication with industrial partners) to TVET colleges that lack the resources or ability to establish these industrial partnerships on their own. This extended role requires a re-evaluation of the role of technical universities in the TVET system in Thailand and within the ASEAN region. This re-evaluation is necessary because Thailand lacks a state-secured binding system for learning-venue cooperation. Hence, the responsibility for DTVET primarily falls on individual stakeholders.

In the German DTVET system, universities do not play a role in the system. The responsibility for training and examinations is assigned to the Chambers of Industry and

⁷⁴ See again Spöttl et al. (2020) on work process analyses for modern work environments in an industry 4.0. Vocational (education) science, as also proposed by Schröder et al. (2023), provides a framework for curriculum development based on authentic work processes. By employing methods like PAR and analyzing specific occupational competencies, researchers and educators can collaboratively design training programs that meet the demands of regional labour markets.

Commerce (Industrie- und Handelskammer) and the Chambers of Crafts (Handwerkskammer; HWK). The Federal Ministry of Education and Research (Bundesministerium für Bildung und Forschung; BMBF) oversees the entire TVET system. However, cooperation among learning venues still poses practical challenges in the German DTVET system, as already discussed in Section 2.1.3. Universities, including technical universities, fall under the category of “school-based” training. Moreover, some universities, primarily private ones, offer dual studies courses for further and continuing education (bachelor's and master's) in cooperation with industry. These courses are designed to meet the specific needs of learners. However, they operate within the context of an established TVET system.

In contrast, the Thai TVET system lacks a mandatory binding DTVET framework. This challenge places greater responsibility on stakeholders of the SiF and TEdSys projects for collaboration among learning venues and also curriculum development. In RMUTL's case, this has led to an expanded role for the university in TVET. This contrasts with the German DTVET system, which does not include a specific role for universities in this context.

In its expanded role, RMUTL is involved in curriculum development in collaboration with industry and facilitates access to industry partnerships for TVET colleges. This highlights the role of RMUTL as a school-based learning venue and a facilitator in supporting the implementation of DTVET. In some ways, RMUTL's role is similar to that of a governmental organization that cooperates with industry partners in the German DTVET system. Furthermore, RMUTL, through the RCTVET, engages in TVET research and ensures that training programs are relevant to the labour market by cooperating with industry. This includes generating and disseminating knowledge to support holistic competence development in TVET colleges. Therefore, it can be said that RMUTL promotes a reform-oriented approach to WBL by focusing on holistic vocational action competence in the ASEAN region.

Successful learning-venue cooperation is important for improving DTVET, as it can be considered a tool for developing vocational competence. This requires effective institutions (state, subsidiary institutions)⁷⁵ and personnel (qualified teachers, trainers, and managers) framework conditions. This framework is less robust in Thailand compared to the German DTVET system. The SiF and TEdSys projects can be viewed, in this context, as innovative solutions to address the problem of lack of a qualified TVET workforce in Thailand, even without a state mandate. Playing a major role in this context, RMUTL presents itself as an intermediary organization bridging the gap between the education and industry sectors. This role helps the university contribute to the development of a structure similar to the German DTVET model, which is facilitated by the state, corporations, and subsidiary government bodies.

However, a critical examination of how RMUTL utilizes its expanded role is required. A major question to be addressed is whether reform-oriented, emancipatory approaches can be established, or if the WBL projects at RMUTL merely transfer demands from the industry

⁷⁵ Subsidiary is a Latin word meaning help or reserve. Subsidiary institutions in this context means additional institutions created by the government to support people in dealing with the problems that they cannot solve themselves.

to the education sector. This question highlights the balance between production demand and the emancipation of learners in TVET (also discussed in Section 2.1.1). While Thailand may face other challenges in becoming a highly developed industrial nation, solving this question is also important for developing a high-quality and sustainable TVET system.

5.4 Beyond RMUTL: Discussing Thailand's WBL at the National Level

The previous section focused on RMUTL's WBL projects, emphasizing the technical university's unique role in facilitating and supporting the implementation of the Thai DTVET system through its intermediary position among all stakeholders. Recognizing the ongoing challenges of the RMUTL projects, the work tasks and processes still need to be analysed and integrated into the curriculum to enhance training quality. To support the derivation of conclusions and recommendations offered in the next and final chapter, this section provides a general overview of other elements of DTVET in Thailand. These elements include – but are not limited to – TVET teachers' education; the training and qualifications of practical instructors; curriculum development, including the development of training regulations; learning and assessment materials; and learning forms and methodologies.

5.4.1 TVET Teachers' Education

TVET teacher education in Thailand faces problems in both quantity and quality: Apart from the general teacher shortages, the quality of teachers varies between rural and urban areas (OECD, 2022, p. 68). The minimum requirements to become a TVET teacher in Thailand are completing at least a bachelor's program and obtaining a teaching license. These criteria allow students who complete a bachelor's degree in a field other than education to become TVET teachers, provided they obtain a teaching license.⁷⁶ However, the TVET teacher education programs differ across universities. The programs are offered over either four years or five years. The five-year programs include a one-year teaching component at a TVET college, as well as the teaching license, whereas the four-year programs only include one semester of teaching experience; students in the latter programs must attend an additional one-year training program to obtain a teaching license from the Teacher Council of Thailand (TCT). Moreover, this teaching license training is generally applicable to all individuals seeking to become teachers. This difference in training elements may result in diverse quality levels among teachers.

In 2020, the Bureau of Vocational Education Teacher and Personnel Competency Development (part of the Office of Vocational Education Commission [OVEC]) mandated the following additional requirements for TVET teachers' qualification (Mongkhonvanit & Choomnoom, 2022, p. 21):

1. “Keep updated with the changing world of work and changing technology in the specialized area of study
2. Analyze occupational standards and identify competence requirements
3. Translate occupational and competence standards into learning standards
4. Design competence-oriented teaching, learning, and assessing processes
5. Develop a qualification for the quality assurance system

⁷⁶ This teaching license is provided by the Teacher Council of Thailand (TCT).

6. Spend at least 6 months on an industrial experience program and continue networking and learning from the industry
7. Develop a sustainable relationship with industrial partners for the quality improvement of learners and the placement of graduates
8. Application of digital learning platform in the field.”

These additional requirements, however, are based on the individual demand of each teacher for their professional development and, therefore, are provided only through in-service training programs.

According to Rukkiatwong (2016), there are only four TVET teachers per 100 students in Thailand,⁷⁷ while in Singapore this ratio is almost doubled: seven teachers per 100 students (p. 10–11). This statistic highlights that teachers' excessive workloads can lead to quality problems in Thai TVET. High qualifications do not help if teachers have to teach too many students, especially when learning in TVET is practice-oriented and requires a kind of “single guidance”. This problem (of quantity of TVET teachers) is aggravated by the fact that most TVET teachers are hired on yearly contracts and receive a much lower income than a permanent government officer (Beamter in German).⁷⁸ This situation does not attract young people to become TVET teachers.

Additionally, to supervise and support learners in the DTVET programs, a TVET teacher is required to attend an extra training program to become a qualified supervisor for DTVET. Currently, only around 8,300 out of the total 25,000 TVET teachers are qualified for DTVET (DVE-DATA, 2024).

5.4.2 Training of Practical Instructors

The practical instructors in TVET are usually referred to as shop-floor trainers and in-company trainers. In Thailand, as evident from the requirements for TVET teachers, there is no special separation of rules or regulations for the training of practical teachers. The shop-floor trainers are specifically trained through in-service programs provided in collaboration with industry and related professional agencies. These initiatives include (1) in-house training programs, (2) industrial experience programs, (3) a TVET teacher professional learning community, and (4) a professional teacher club (Mongkhonvanit & Choomnoom, 2022, p. 21–22).

Generally, in Thailand, in-company trainers are not usual. Around 2017, RMUTT collaborated with RWTH-Aachen (Rheinisch-Westfälische Technische Hochschule) to train university lecturers from all RMUTs in a Meister training program. It concluded in the so-called “Thai Meister Certificate”. Apart from this single case, in-company trainers in

⁷⁷ Mongkhonvanit & Choomnoom (2022) further explain that the average ratio between teacher to student is 1:30. However, in the occupational fields like industry, textile technology, and entertainment the ratio is 1:20. In agriculture, fishery, home economics, and arts the ratio is 1:30. Finally, in the programs like business and commerce, tourism and hospitality the ratio is 1:40 (p. 7). Moreover, this teacher-student ratio is differed between regions, ranging from 1:20 in the south and 1:29 in the northeast region (OECD, 2022, p. 67).

⁷⁸ Similar contractual trends are also being witnessed in Germany.

Thailand, in general practice, are experts or experienced workers within the company, but not specially trained for this job, thus lacking pedagogical knowledge. Recently, the 30-hour training program for in-company trainers was begun by OVEC (ASEAN, 2022a, p. 56). Only in large companies, such as Michelin Siam (through collaboration with RMUTL), is there a special person appointed as an in-house trainer to assist the learning processes of learners, for example, those in SiF projects. However, in smaller or national companies, the in-company trainers are mostly unusual.

This gap is addressed in the SiF and TEDSys projects through “facilitators” who connect the world of work and the world of education by supporting diploma-in-TVET students while they work and learn within the project. Additionally, expert-developed guidelines for in-company trainers by GIZ (2019) are available for the ASEAN region; however, private companies must assume a more active role in supporting this initiative.

5.4.3 Curriculum Development and the Development of Training Regulations

In Thailand, the development of TVET curricula and training regulations are discussed separately. Discussions within the DTVET system do not include training regulations. In general, TVET curriculum development and endorsement are done by OVEC, while training regulations for in-company training are not fully developed. So far, OVEC has provided a general guideline for developing a training plan at the company for TVET teachers (to write it together with the representatives from the involved companies). However, standard practice throughout the country with strong involvement from relevant stakeholders,⁷⁹ as seen in Germany, is not yet in place.

TVET curriculum development in Thailand is overseen by OVEC, which appoints a committee to review, revise, and also create TVET curricula that align with the National Vocational Education Qualifications Framework. Moreover, according to Mongkhonvanit and Choomnoom (2022), TVET colleges can propose a specific curriculum. OVEC then appoints a committee⁸⁰ to approve these curricula, involving social partners such as specialists, related public agencies, and employers' organizations.⁸¹ The committee is responsible for the following duties:

1. “Identify competence requirements,
2. Identify the gaps between the demand and the existing curriculum,
3. Provide sets of competence requirements for TVET graduates, and
4. Coordinate industrial experience programs for teachers and also involve specialists from industries for curriculum development.” (ASEAN, 2022a, p. 53).

Structures of the TVET curriculum consist of four main parts: (1) life or core skills, covering general subjects; (2) technical subjects;⁸² (3) practical experience in industry for at

⁷⁹ Including BIBB, expert from employers, coordinator from employers, states committee, coordinator from employees, and experts from employees (Rechmann, 2024).

⁸⁰ The Public and Private Committee for Vocational Education Manpower Development, consisting of leaders from the Federation of Thai Industries, Thai Chamber of Commerce, Tourism Organization, Agricultural Association and other important economic sectors.

⁸¹ See (ASEAN 2022a, p. 51) for details procedures in designing curriculum.

⁸² This splits into basic, specific, elective technical skills as well as the Vocational Skills Training and Vocational Skills Development Project (OVEC, 2017, p. 20).

least one semester; and (4) extra-curricular activities (Mongkhonvanit & Choomnoom, 2022, p. 13). These curricula are updated every five years. The required competence is reviewed by key industrial partners, and the occupational standards are reviewed by the Thailand Professional Qualifications Institute (TPQI). At the TVET college, when an update is necessary, new subjects can be created. Contents of each subject can be revised and adjusted with support from an industrial representative. New subjects can be added as elective subjects in the curriculum.

The freedom of TVET colleges or TVET providers to offer training programs, endorsed by OVEC, is strongly criticized for its lack of relevance to the labour market demand (Rukkiatwong, 2016, p. 8; Education Committee, Thai Senate, 2023). Alignment to the Thai Professional Qualification Framework (TPQF), as recommended by the Education Committee of the Thai Senate, is still not a standard practice. The following initiatives can be considered as the initial steps for effective and work-oriented curriculum development and the development of training regulations:

- A guideline for in-company trainers developed through a three-day expert workshop in 2015 by GIZ (2019) to support learning supervision at the company, in the context of a project to support TVET in the Mekong region.
- A guideline for writing “training plans in the company” (2017) by the Dual Vocational Education Centre (OVEC). As previously noted, while TVET teachers develop this training plan for in-company trainers, they are not guaranteed to possess the practical competence to do so.
- ProWoThai: A guideline for analysing work tasks and work processes, as well as guidelines for integrating these into the TVET curriculum (learning and work tasks [LWTs]). This guiding document has been formulated, but is not yet in use; it is thus difficult to evaluate its practical benefits.

5.4.4 Learning and Assessment Materials

While learning materials in Thai TVET⁸³ can be compiled by either TVET teachers, based on their *teaching plan*, or commercial publishing houses, they are primarily provided by the latter. These commercial textbooks are written based on the curriculum framework of OVEC; the Vocational Promotion Center⁸⁴ is one of the leading publishers. These textbooks are also available according to the main parts of the TVET curriculum, such as core skills – general subjects – and technical subjects. For the core skills, the same standard textbooks are used for the same occupational fields. For technical skills, textbooks are divided into basic and specialized categories. TVET colleges can recommend suitable textbooks or produce their specialized technical textbooks to meet their specific and local demand.

These learning materials, as previously discussed, are the textbooks used at the TVET college for work-oriented learning.⁸⁵ Assessment methods and tools are already designed

⁸³ Additionally, TPQI and OVEC have prepared online learning materials that can be accessed by all, not only TVET colleges.

⁸⁴ <https://www.ssobooks.com/> available in the Thai language.

⁸⁵ As a part of the 15 years free education scheme, the learning materials, along with other such as tuition fees, uniforms, training equipment, are offered to learners at the Vocational Certificate level

within these textbooks. However, they are primarily used by TVET teachers to assess the theoretical and technical knowledge of learners at TVET colleges. The learning materials for in-company workplace training, including assessments, are designed collaboratively by TVET teachers and company representatives.

In 2017, OVEC published a guideline for writing a vocational training plan in the workplace. Its objectives are to train TVET teachers to develop a training plan for the company workplace, which can be later used for work-integrated learning within the company. TVET teachers, in collaboration with representatives from the company, work together to develop the training plans with the support of the provided guidelines. The TVET college and the company hold a meeting to identify the training areas for the DTVET program. The training plans at the companies, according to the structure of the TVET curriculum, belong to the elective technical-skill subjects (OVEC, 2017, p. 21). Once the training area is chosen, the objectives, competences, training duration, evaluation, and credits are specified. According to this guideline, the training plan should include the learner's training position, main tasks, subtasks, the name of the trainer, and the duration of training. Moreover, it should also include teaching methods, the equipment required, and assessment methods (OVEC, 2017, p. 67).

The fact that training plans at the companies are an elective subject highlights the limitation of designing work-process-oriented TVET curricula, where only certain teaching subjects from the TVET curriculum are based on work tasks and work processes. Other textbooks produced by commercial publishing houses may lack relevance to the contents of these training plans. Moreover, it is to be noted that there are no standardized, specially designed materials in each occupational field for training and learning in TVET colleges, companies, and examinations.⁸⁶

Learning assessments for theory-based subjects are conducted at the end of the semester through written tests, while practical training is evaluated within the competency unit or learning module. In the full-time TVET program, learners are also evaluated by the company during a one-semester internship. For work-based learning at the company, assessments are conducted in collaboration with the company. To complete the study program, learners have to pass the national standard tests. On the national level, there are two standard tests: the Vocational Education Standard Testing and the Vocational National Education Testing. While the former is an exit exam for all TVET learners across all levels of training, which assesses both theoretical and practical skills in each occupational field, the Vocational National Education Testing is mainly focused on other competence areas such as communication, mathematics, and information and communications technology (Mongkhonvanit & Choomnoom, 2022, p. 11).

(PorWorChor) free of cost in public and private TVET colleges (Mongkhonvanit & Choomnoom, 2022).

⁸⁶ In the GTDEE project, where the German apprentice program is applied in Thailand, employed the centralized PAL examination for the learning assessment of the apprentices. This highlights that Thailand needs standardized "practical examination".

5.4.5 Learning Forms and Methodologies

In response to rapid industrial change, OVEC has emphasized outcome-based education (Mongkhonvanit & Choomnoom, 2022, p. 28), which highlights the need for learning methods to be flexible and focus on the competence development of learners. Information on learning methodologies in Thai TVET is only available on a broad national level. For example, a study by ASEAN (2022a) generally states that learning methods for formal TVET programs feature “lecture, demonstration, practical experiences, project-based learning, simulation model, and online learning” (p. 56). These are combined with at least one semester of work-based learning in industries. While learning methodologies for DTVET programs have not been discussed, the general guideline is that learners have to spend at least 50% of their learning period on work-based learning in industries. Additionally, the ASEAN study mentions that theoretical subjects are organized by TVET colleges, while practical training is provided by industries.

The above information indicates that learning forms based on work (i.e. tasks, for example, LWTs) to promote active and experience-based learning, as discussed in Chapter 2, are not available in Thailand, which is already reflected in the curriculum development. The initial steps towards this development are the writing of a training plan at companies, as previously mentioned, as well as the implementation of a guideline for developing LWTs for the work-oriented environment in Thailand.

As discussed earlier, the main argument of this dissertation is that, according to the WBL typologies, the SiF and TEdSys projects are successful implementations of a WBL approach in Thailand. The learning processes of these two projects occur in the company workplace and at a technical university. These programs have fully integrated the different variants of a WBL approach into their implementation. The concept of work-oriented learning (WOL) is integrated through pre-factory training and other classroom teaching by RMUTL, which provides basic technical knowledge and skills. Work-integrated learning (WIL) occurs through on-the-job training. Further, work-connected learning (WCL) has also been used to enrich and support the learners' learning experiences in the SiF learning space, outside the company workplace.

Through strong collaboration among the company, the technical university, and TVET colleges, these projects have demonstrated a positive impact on addressing the issue of shortage of a qualified technical workforce. Additionally, they contribute to the joint responsibility of the state, industry, and social partners, and the overall learning within the work processes implies qualified TVET personnel at companies, TVET colleges, and the technical university (Schlattmann et al., 2024, p. 220). However, the ongoing challenge of these projects is that work tasks and processes still need to be analysed and integrated into the curriculum to enhance the training quality. Recognizing this issue as one of the existing challenges, the following chapter provides recommendations and insights for further research.

Chapter 6: Conclusions, Recommendations, and Research Desiderata

This last chapter presents some concluding remarks *about* and some recommendations *for* the Thai TVET by taking the SiF and TEdSys models at RMUTL as a basis of discussion. The objective is to offer recommendations for the development of the Thai TVET system. It focuses specifically on developing and implementing effective WBL approaches, which generally require the following:

- Strong collaboration between TVET institutes (TVET colleges, technical universities) and companies on the basis of coherent and occupation-based, work-oriented, and work-based curricula and training regulations;
- Intermediate organizations that support and organize the relations between the private sector and the education sector (e.g. the RCTVET at RMUTL, the former TVET Hub Lanna, with its Industrial Liaison Office) in a socially balanced manner, combining the strengths and interests of all stakeholders;
- The development of up-to-date, work (task)-based curricula that allow flexible adaptation of new technologies in an ever-changing labour market (in collaboration with all stakeholders);
- High-quality training of the in-company trainers, as well as TVET teachers; and
- A just balancing of the interests of companies, working individuals, and the society, represented by intermediate state-run entities.

Additionally, the chapter covers the implications of the research, limitations of the study, and future research directions.

6.1 Strong Collaboration Between TVET Institutes and Companies

One of the leading priorities of a work-oriented TVET is that it must serve the interests of companies (i.e. labour market demand), the state, and the individuals constituting the workforce. To serve this demand, the collaboration among these partners needs to be strengthened, since close collaboration can form the basis for developing a coherent, work-oriented, and work-based curriculum and training regulations. The intermediate organizations (discussed in the next section) have a crucial role in assisting this collaboration and ensuring that the demands of all stakeholders are fulfilled.

Thailand, where there is no *corporate social tradition*,⁸⁷ requires a **stronger role of professional organizations (Chambers)**⁸⁸ in its TVET system, especially for DTVET. Their participation is urgently required because these associations (on both sides, *capital* and *labour*) are nearest to the real demands of the labour market, as well as the individual actors. Moreover, the design of TVET policies and programs should rely on inputs from these stakeholders.

Due to the lack of a corporate social responsibility tradition in Thailand, companies are not obliged to offer work-based training within their organizations. It is also not necessary for these companies to become members of the Thai Chamber of Commerce. Therefore,

⁸⁷ See Greinert (2015) for a detailed description and explication of this tradition in Germany.

⁸⁸ As a term to designate all kinds of professional organizations in the area of civil society.

strengthening collaboration between companies and TVET colleges is not an easy task, and it is difficult to say whether the Thai Chamber of Commerce currently represents all Thai companies. However, it is essential to note that the Thai Chamber of Commerce has established its own university, which provides education in commerce and trade and serves as a research unit; thus, it is contributing to professional education. What needs to be improved is its cooperation with other private and public initiatives. For example, the Federation of Thai Industries, the Thai Chamber of Commerce, and OVEC have collaboratively developed the Vocational Co-Operation Board Vocational Manpower Center (Mongkhonvanit & Choomnoom, 2022, p. 24), which provides information about DTVET programs. Such initiatives should be further expanded.

The Confederation of Thai Professional Councils has been in existence for almost 20 years and comprises 11 professional councils (The Confederation of Thai Professional Councils, 2024). These councils are less recognized as representatives in the TVET system because of the lack of a profession concept compared to their German counterparts. While these professional councils are attempting to develop genuine “professional” curricula, their significant role in TVET may not be as visible. Therefore, establishing and strengthening professional associations should be a central development objective for Thailand. Nevertheless, on a positive note, the experts/representatives from these professional councils are invited to support the professional qualification frameworks developed by the Thailand Professional Qualifications Institute (TPQI).

The weak role of the chambers may also be a cause for the lack of qualified in-company trainers.⁸⁹ Companies normally do not know how to support the learning process of trainees. Chambers could find a task here and should be involved in Thai DTVET through producing/supporting the creation of in-company trainers (including recognizing them formally and officially). When neither the company nor the Chamber is responsible, as Assistant Professor Dr. Niwat Moonpa once said during a personal meeting, most of the in-company (industrial) trainers are integrated into TVET institutions – mostly in technical universities. Over time, their expertise has lagged behind the industry's advancements.

Thailand also needs to **make its DTVET system more attractive to strengthen collaboration with other stakeholders**. The attractiveness of the DTVET program lies in the fact that the apprentices are being paid. This motivates students to participate in the program, but also poses challenges for the company. While DTVET programs can offer some revenue, in Thailand, it remains a challenge to convince companies that this training would lead to their own economic advantage.

The government tries to motivate companies by offering revenue in the form of tax reductions (up to 200% tax reduction to companies for what they spend on training; Choomnoom, 2022a). However, unlike in Germany, companies are not required to pay tax if they do not provide training to learners or apprentices. OVEC has recently invested considerable effort in supporting the private sector to take ownership, including (1) providing management data for DTVET (identifying the number of job positions required in each

⁸⁹ Cf. Mongkhonvanit & Choomnoom (2022) for an exceptional role of the petrochemical industry in providing in-company trainers to its TVET college partner; Maptaphut Technical College in producing qualified TVET workforce to feed its industry (p. 24).

profession by company, across different regions in Thailand) and (2) promoting and initiating collaboration between TVET colleges and companies through Dual Vocational Education Centers, which are now established in major cities.

However, based on some expert interviews, despite these efforts, companies do not show great interest due to the amount of paperwork involved in getting a tax refund, for example. The complexities in this process thus have to be reduced, perhaps with the support of an intermediate organization.

To strengthen collaboration among the stakeholders in DTVET, the Thai government needs to support and ensure that the program is attractive. In addition to the efforts of the regional Dual Vocational Education Centers, the government can also provide evaluation criteria for companies to become training partners with TVET colleges. This step can support and facilitate companies in preparing for DTVET, especially for SMEs, as successfully employed by the GTCC in selecting companies for its GTDEE program in Thailand. The establishment of selection criteria by public authorities is necessary, as is quality assurance to ensure fulfilment of these standards. Moreover, such criteria will ensure quality training at the company and motivate more learners to participate in the DTVET program.

Altogether, professional organizations need to be more active in the TVET system. Including them in the form of a committee for specific purposes is a good starting point that needs to be expanded. The Thai government, however, needs to recognize their significant role more officially and permanently on a national level, for example, through including the representatives from these organizations in the board of OVEC and giving them the power to decide on important matters in the TVET system (such as the budget). Such measures will address the complex and fragmented governance of the Thai TVET system and ensure that TVET in the country is well aligned with the needs of its labour market.

6.2 Crucial Role of the Intermediate Organizations

One of the main characteristics of German TVET, apart from its corporatist structure, is the legal basis of the entire system. Furthermore, it is clear that as long as DTVET is not regulated by law, financing, cooperation, and the distribution of responsibilities among various partners, as well as steering mechanisms, will need to be defined contractually. According to Thai TVET expert Dr. Siripan Choomnoom, there are no laws supporting DTVET in Thailand; only regulations for training have been established under the Department of Skills Development, Ministry of Labour. Therefore, **additional support from intermediate organizations is necessary for DTVET in Thailand.**

Concerning legal regulation, the state, as an institution (or its substitutes in the sense of the subsidiary principle), assumes some of the responsibilities, thereby reducing individual responsibility – for instance, the economic risk associated with establishing a contractual apprenticeship relationship. Thailand is an example of a country where the risks are nearly exclusively on the shoulders of the partners (companies, intermediate organizations, and learners).

Some aspects defining Thai DTVET are outlined in the Vocational Education Act (2008), which serves as the governing framework for Thai TVET; however, there are no

regulations governing responsibilities and implementation. It is worth noting that the act (and some additional regulations) are valuable initiatives, but they often remain ineffective when supporting bodies are not established. A legal framework alone cannot be effective if TVET does not feature the collaborative effort of all social partners, especially professional organizations (Chambers).

Moreover, from a broader perspective, an attempt to expand DTVET in Thailand (e.g. by motivating companies of all sizes to assume responsibility for apprentices) will likely fail without organizational support to establish and manage contractual agreements between learners and companies. In Germany, the chambers support this collaboration process by providing standardized forms for all the contractual issues.

With the recognition of the active role of the 77 Dual Vocational Education Centers throughout Thailand, it is recommended that the Thai government consider including the extended role of RMUTL in its Research Center for TVET (RCTVET). These roles and responsibilities must be aimed at facilitating collaboration between TVET colleges and companies, as well as conducting TVET research and supporting curriculum development.

6.3 Development of Work (Task)-Based Curricula

The importance of TVET research has been stressed throughout this dissertation. Vocational action competence is the objective, and a strengthened learning-venue collaboration is needed. The result should be a curriculum that not only meets the demand of the production sphere, but also promotes the learners' emancipation. In collaboration with all stakeholders, **work-based and work-oriented curricula** can be developed which are flexible and adaptable to changing labour market demands.

The Thai government and other social partners need to focus on further developing the existing guidelines. OVEC has published a guideline for writing a training plan at the company. GIZ has compiled a guideline for in-company trainers. Moreover, importantly, the ProWoThai project has introduced two guidelines for (1) analysing work tasks and work processes conducive to learning and (2) developing learning and work tasks (LWTs) for work-oriented learning. Further implementing and piloting these guidelines would be the initial step to developing up-to-date TVET curricula.

However, incorporating these guidelines into practice is another challenging issue. Participatory and action-oriented research (and development) with (international) experts through scientific coaching is crucial here. Robust knowledge exchange among practitioners, researchers, and experts would ensure that the research process and results are relevant to the local context of Thailand. Additionally, it would also support research capacity building for Thai TVET researchers. Moreover, the standardized learning and assessment materials for each occupational field also need to be developed.

In addition to developing curricula that respond to the demands of all stakeholders, the **work-based didactic approach**, which prioritizes experiential learning in authentic or simulated work environments, also needs to be introduced to support the development of vocational action competence. This step can ensure that the “what” (curriculum) and the “how” (teaching and learning forms) are strongly related to the world of work. LWTs and WLTS could be examples of how these elements are integrated. They could also serve as

examples for the methodological and didactic design of WBL in Thailand. The conceptual framework for designing work-process-oriented learning (see Section 2.2.2) that prioritizes participatory planning, action, experience-based learning, and reflective practice can also be considered as a valuable guideline.

6.4 High-Quality Training for TVET Teachers and In-Company Trainers

It is commonly acknowledged that the quality of TVET depends strongly on its personnel (in-company trainers and TVET teachers), and the quality of the personnel depends strongly on their formation – especially their industry-related experiences. As Choomnoom (2022b) highlights, “all TVET teacher training programs are focused on the need to enhance the quality of learners according to the economic and social development plan of the country” (p. 289). Thus, it is necessary for Thailand to **improve the quality of TVET personnel through work-based learning (WBL) and work-oriented learning (WOL)**. These elements could be incorporated into educational programs and in-service professional training programs.

First of all, TVET teacher education programs in Thailand need to be standardized. Another relevant suggestion in this regard comes from the Education Committee of the Thai Senate (2023): TVET teachers must conduct or be involved in TVET research in collaboration with companies. Moreover, “networking and partnerships with all stakeholders, especially local agencies, industries, and universities, are also crucial for a successful TVET teacher training program” (Choomnoom, 2022b, p. 289). As a best example for such a practice, the SiF and TEDSys projects may be referred to, where TVET teachers are involved in research activities through the RCTVET. Additionally, “TVET teacher education program at universities should also provide more opportunities to the students to have industrial experiences” (p. 288).

However, quality is not the only concern for Thai TVET teachers. Funding in Thai TVET is relatively low (OECD, 2021, p. 47). The government thus urgently needs to invest more money to hire TVET teachers on long-term contracts and offer competitive salaries, as well as other social welfare benefits, compared to private companies. Additionally, the government needs to ensure that TVET is an attractive option for young teachers. More effort should be put into recognizing *supervisor training for DTNET programs*. Incentives should be provided to teachers who complete this training program, as it would be an additional workload for them.

For the systemic education and development of TVET teachers, a joint doctoral study program between TU Dortmund and a network of Thai technical universities (RMUTs) could also be established. Each doctoral candidate can work on a research and development project addressing existing problems in Thai TVET. These learning and research processes could be combined with the scientific coaching of the German and Thai experts. This measure requires governmental recognition and funding.

Lastly, for the training of in-company trainers, the initial program from OVEC and the Thai Meister program, led by Rajamangala University of Technology Thanyaburi (RMUTT), need to be expanded. The government may support this endeavour through making the training course freely available and easily accessible. At the same time, the chambers should

also promote and support this training. Incentives could also be provided to those with this additional qualification.

6.5 TVET for a Just Society

As already suggested, effective teacher training depends on regional and local competent TVET research. This **research-driven approach is fundamental to the development of the TVET system** and, as discussed in Chapter 2, would help formulate evidence-based reform recommendations that are just and fair. This again highlights the important role of research institutes like the RCTVET. Strong collaboration among stakeholders is necessary. However, it is also essential to ensure that the interests of the companies, individuals, and society are fulfilled.

It cannot be denied that there is a tendency to “favour the fittest” in the Thai TVET process, thereby leaving behind less talented learners. However, TVET should be a means to give a chance to those who need help and offer them a better career pathway. WBL can be designed to meet the demands of learners who may be expected not to fulfil the latest requirements of a changing labour market, but to provide practical skills for the non-formal and informal sectors.

Altogether, it seems realistic to consider Thai TVET not only as a tool for high-performing students, but perhaps even more as a tool for poverty reduction, considering that the majority of the Thai labour force still works in the informal sector. Consequently, WBL programs should be extended to non-formal education, bearing in mind the abilities of the learners at less demanding levels. Nevertheless, the long-term development of the TVET system should prioritize high quality: Only high-quality TVET can enable an economy to sustain a large non-formal sector.

Finally, this final section deals with the **implications of the research, limitations of the study, and future research directions**. Through this research, it is seen that developing DTVET in Thailand cannot rely solely on market mechanism or government policy. Thailand needs to establish intermediate organizations, such as RCTVET at RMUTL. These organizations must coordinate and manage relationships and simplify complex paperwork to effectively promote SMEs to participate in the WBL programs.

Theoretically, this research confirms the importance of vocational action competence through WBL. Furthermore, it reflects that TVET must consider a socio-political dimension to make sure that the TVET system can foster social justice and not only a mechanism for supplying labour to the market.

For the limitations of this study, it is recognized that scope of the study area is only limited to the SiF and TEdSys models that are conducted mainly within the context of RMUTL. Moreover, the perspectives from the company partners may not be fully represented in this research. Companies in Thailand are highly diversified, ranging from multinational corporations to SMEs. The results obtained from this research may not cover all perspectives from smaller companies that mostly form the informal economic sector. Lastly, the education policy in Thailand is changed frequently.

For future research directions, Thailand must focus on building research capacity, conducting designed-based and action-oriented research, and research on conceptual alignment.

- To boost TVET research capacity, a **joint doctoral study program** between Thai technical universities (RMUTs) and TU Dortmund university should be established. Doctoral candidates would work on research and development projects that are directly solving the existing challenges in the Thai TVET system. This needs governmental recognition and funding.
- Moreover, there is a need for **more research and development** in WOL and WIL. This supports the creation and testing of innovative learning models and standardized LWTs and WLTs that can make TVET more attractive for both learners and companies. **Action-oriented TVET research** is required to ensure that knowledge exchange among practitioners, researchers, and experts and outcomes are relevant to the Thai local context.
- Future research should be conducted on **conceptual alignment** between occupational standards, curricula, assessment tools, and TVET teacher education through WBL.

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Appendix: Six published articles in their original form

This section contains the published articles that form the basis of the discussion presented in this dissertation.

Article 1:

Phalasoorn, S. (2017). School in Factory (SIF): An approach of Work Integrated Learning in Thailand. In: TVET@Asia, issue 9, 1-11. Online: https://www.tvet-online.asia/issue9/phalasoorn_tv9.pdf (retrieved 30.06.2017).

Article 2:

Moonpa, N., **Phalasoorn, S.**, Gulich, J., & Beecker, P. (2019). Approaches and Structures of Work-related Learning in TVET in Thailand. In: TVET@Asia, issue 13, 1-19. Online: <https://tv9-online.asia/issue/13/phalasoorn-et-al/> (retrieved 30.06.2019).

Article 3:

Moonpa, N., Chaoyong, P., & **Schlattmann, S.** (2021). Tripartite Education: a collaborative structure of learning venues conducive to the improvement of TVET system in Thailand. In: TVET@Asia, issue 17, 1-17. Online: <http://tv9-online.asia/issue/17-1/tripartite-education-a-collaborative-structure-of-learning-venues-conducive-to-the-improvement-of-tvet-system-in-thailand/> (retrieved 31.07.2021).

Article 4:

Schröder, T., **Schlattmann, S.**, Gulich, J. & Hupfer, B. (2024). ProWoThai – Progressing Work-Based Learning in Thailand’s TVET System: Design-Oriented and Participatory Action Research in International TVET Research Cooperation. S. 235–262 in: Gessler, M., Zlatkin-Troitschanskaia, O., Bohlinger, S. et al. (eds.), *Expanding Horizons. Research on the Internationalization of Vocational Education and Training*. Wiesbaden: Springer Nature.

Article 5:

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Article 1

Phalason, S. (2017). School in Factory (SIF): An approach of Work Integrated Learning in Thailand. In: TVET@Asia, issue 9, 1-11. Online: https://www.tvet-online.asia/issue9/phalason_tv9.pdf (retrieved 30.06.2017).

School in Factory (SIF): an approach of Work-integrated Learning in Thailand

Abstract

In the fast-growing economic world, Thailand is faced with the problem of producing qualified vocational human resources. In general, educational institutions are unable to educate students to meet the demand of the labour market. The government realized this issue by promoting Work-integrated Learning (WIL) as one of the strategies to cope with the challenges of producing job-ready graduates. As a result, various forms of Work-integrated Learning have been implemented and many of the industries are involved in this educational program. The document analysis method has been used in this article to describe the educational system, national plans and policies, theoretical and didactical concepts of Work-integrated Learning and current approaches of WIL programs in Thailand. The discussion in the present paper concludes that to solve the problem of mismatch in graduates' qualification between the demand and supply sides, it is crucial to build effective collaboration between educational institutes and the industrial sectors to provide better education to students. The School-in-Factory project is one of the best practice-examples implemented in Thailand that showed positive outcomes for all stakeholders. For the sustainable development of WIL programs, it is recommended that the government needs to be involved in this process more than just promoting its implementation through educational plans and policies. It is also important to note that Thailand needs to put more effort into teacher development.

Keywords: *School in Factory, Work-integrated Learning, Public-Private Partnership*

1 Introduction

The total population of Thailand (2013) is approximately 67 million people. Comprising about 55 million people of working age (15 - 64 years), the group is categorized into the labour force of around 38.5 million people of which 38 million people are employed (Ministry of Labour 2015, 13). Of those employed, the employment rate for agriculture, services and industries sectors are 12%, 43% and 45% respectively. While almost 30 years ago the employment rate for agriculture was around 65% (National Statistical Office Thailand 2012). This data both reflects the changes in the labour structure and indicates growth in services and industries sectors.

Moving away from a low-wage country and basic production processes towards a high-tech and knowledge-based economy, Thailand will undergo a structural change in its labour market. As a result, average wages will be increased, less employment in labour sectors may be visible and an advanced education system is necessary (PWC 2014, 19). This leads to one of the major challenges in Thai labour force wherein around 70 % of the employees are

educated to a lower level than upper secondary education (op. cit., 2015, 18). These employees lack the necessary skills in almost every aspect for a modern workplace. Among these competencies are English language, critical thinking, time management, communication and problem solving skills.

One of the various reasons for lack of skilled manpower in Thai industry can be found in the mismatch of the supply and demand between educational institutes and industry. The educational sector cannot keep pace with rapid change in the economic world (Promwong and Pittayasophon 2011, 2). For this reason, there needs to be a mechanism that effectively links universities with industry, which effectively allows information, knowledge and skill exchange between the two parties (ibid., 2011, 4).

Consequently, the educational institutes have been developing various Work-integrated Learning environments to reduce this gap in the labour market. This requires an effective collaboration between stakeholders: university and an industrial partner to provide students with either theoretical basics or practical skills that can develop their job competencies. The university provides theoretical knowledge to students while the industrial partner trains them in the real working situation.

2 Educational system and policies in Thailand

Formal education in Thailand comprises basic education, vocational and technical training and higher education. The transition for each of the educational levels is demonstrated in the figure below.

Thai National Education System

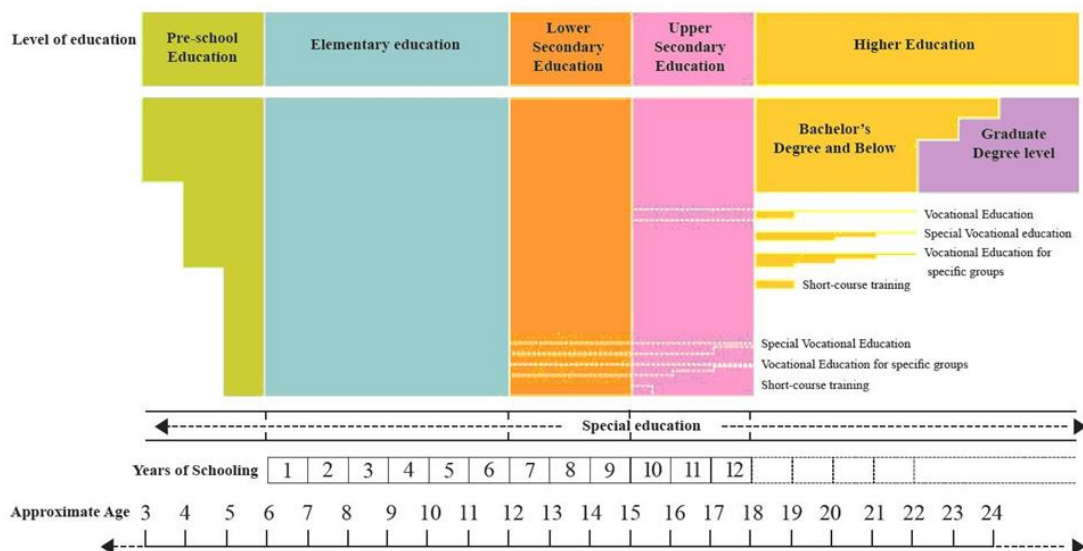


Figure 1: Thailand's National Education System (Southeast Asian Ministers of Education Organization 2017)

The basic education consists of nine years of compulsory education, divided into primary and secondary levels. Upon completion of the secondary education, students can continue in upper secondary schools (general education) or in vocational colleges. Upper secondary education leads to the university while vocational education leads directly to employment or higher vocational training. Most students (70%) aspire to higher education. However, only around 30% opt for vocational educational (Office of the Permanent Secretary 2014, cited in Education in Thailand: An OECD-UNESCO Perspective 2016, 46). These figures require a better understanding of how vocational education and training and higher education operate in Thailand.

2.1 Vocational Education and Training

Vocational education and training (VET) in Thailand is under the supervision of the Commission of Vocational Education. This commission is generally responsible for promoting and providing vocational education for the country (Office of Vocational Education 2017, 1).

Vocational education and training is organized in three different levels: first is a fundamental education of three years' vocational certificate level (equivalent to upper secondary education), followed by two years' diploma program (Post-secondary and first part of a higher education level) and finally two years for a higher academic graduation (level of Bachelor degree). On successfully completing each educational level, students can choose to study further or enter the workforce. However, most students continue to pursue their higher education to obtain a higher degree and earn more income. Programs are offered in the fields of agriculture, commerce, business, and industrial specializations.

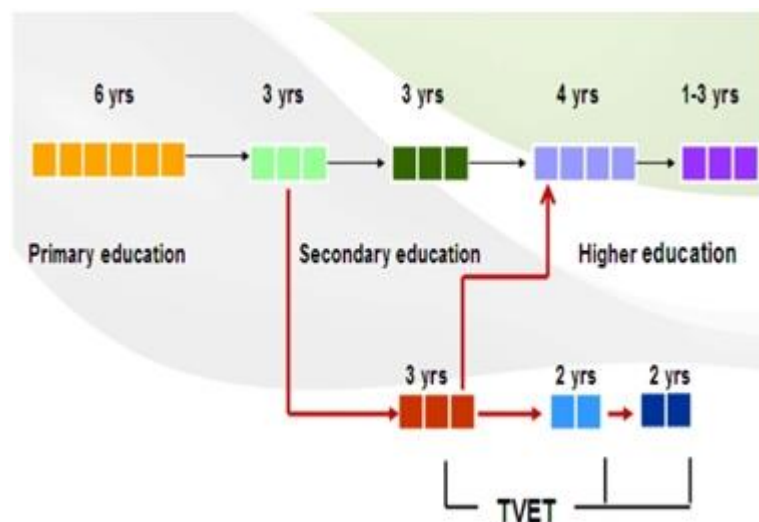


Figure 2: Vocational Education and Training System in Thailand (Researching Virtual Initiatives in Education 2014)

The higher level of vocational training is offered by specialized institutes, colleges, and universities, for example at the Rajamangala Universities. Further technical training for people in the workforce is provided under the Ministry of Labour.

In the year 2012, around one million students enrolled in the formal VET program from various institutions available throughout the country. Even though the number of vocational graduates continued to increase, the share of employees graduating from vocational school to the upper secondary dropped from 32 % in 2001 to 28 % in 2010. (Labour Force Surveys 2001, 10) The significant decline of students is believed to be the result of the historical concept in education which shows a negative attitude toward vocational education.

Consequently, the Office of Vocational Education Commission (OVEC) is challenged with the problem of promoting positive images for vocational education as well as providing essential VET programs that meet the demand of the industrial sectors. To assist the work of OVEC, the Ministry of Education (2012) issued the “Implementation Guidelines for the Office of Vocational Commission: Strategic policy on the development of vocational manpower”.

2.2 Higher Education

The Office of Higher Education Commission (OHEC) is responsible for Thailand’s higher education, overseeing approximately 170 higher education institutions at both undergraduate and graduate levels (Office of Higher Education Commission, 2017). This sector consists of 80 public higher education institutions, 14 autonomous universities, 16 traditional universities, 40 Rajabhat universities, nine Rajamangala Universities, and one Pathumwan Institute of Technology.

Regardless of tremendous changes in higher education in the past decades, some major problems are still not eliminated. A clear long-term development plan for higher education must be formulated (Study International News 2017).

The number of students enrolled in higher education has significantly increased over the last few years, more precisely from around 20 % to 40 % (for the year 2013), which is equal to around two million students. However, there are more students graduated in the areas of humanities and social sciences (UPBEAN 2016, 2) than in areas that are meeting the current and prospective labour market demands, e.g. in the production, trading and service areas. Additionally, the teaching and learning settings in general have less connection to the real world of work. Hence, students lack necessary or adequate knowledge, skills and attributes required by the employers.

Fully aware of current situation, the Thai government’s national policies are planned toward the same direction with the goal to promote a learning strategy that can produce work-ready graduates to meet the demand of the industrial sectors. One of the main strategies aiming to achieve this goal is to endorse and strengthen WIL programs in all levels of education. The Thai National Policy Office therefore started to promote the implementation of WIL program by organizing WIL conferences, conducting pilot research, and encouraging educational

institutions to pay close attention to the learning outcome of their graduates (Konchiab 2015, 1).

2.3 Educational Plans

The Ministry of Education is also trying to promote WIL practice in vocational and higher education institutes. To provide a short overview, this section will review some of the educational plans and policies that promote the implementation of WIL in Thailand.

The 12th Educational Development Plan (2016 - 2021) is the master plan for framing the current educational development policy. The key principle is ‘people-centric development’ which aims to create a better quality of life for Thai people, by equipping them with knowledge, skills and, as well, a good sense of citizenship (Office of the Prime Minister, 2016). To bring these changes into Thailand's education system, the Ministry of Education, the main organization in education sector, has introduced various strategies. However, only strategies that support Work-integrated Learning will be discussed here. The three main strategies are:

1. *Improvement in curriculum, teaching and learning process and assessment.* This attempts to develop a standard-based curriculum that can support “School-to-work transitions” as well as to guide teaching and training at schools and the workplace (op. cit. 2016, 21).
2. *Development of educational personnel.* Improving the quality of teachers and educational personnel to meet the needs of educational levels and professional standards.
3. *Improving human resources and research that contribute to country's competitive development.* Focusing on competency development of vocational manpower by promoting close collaboration between educational institutes and industry through dual vocational education. Additionally, it is important to include professional associations in education planning. This will promote the implementation of a qualification framework that enables the transfer of learning credits between vocational training and general education.

The 15-year Implementation Guideline for the Office of Vocational Commission: Strategic policy on the development of vocational manpower (2012-2026). To improve the country's competitiveness and economic growth, vocational human resource is playing a major role. To support this development, the Ministry of Education (2012) issued a VET policy called “The Implementation Guidelines for the Office of Vocational Commission: Strategic Policy on the development of vocational manpower”. This guideline lays out four policies, 10 strategies, 28 approaches and 93 flagship projects (Ministry of Education 2012, 8). The four policies are:

1. To produce vocational manpower in response to labour market demands,
2. to raise the quantity and quality of teachers, faculties and personnel in vocational education,
3. to develop the quality of educational institutions and new learning sources and
4. to develop management efficiency.

3 Theoretical and didactical concept of Work-integrated Learning

This chapter will provide a theoretical approach to Work-integrated Learning and give an overview of WIL-related didactical concepts. To provide a better understanding of the term Work-integrated Learning, some definitions are given and discussed in the following.

3.1 Theoretical approach

Generally, there is no universally accepted definition of work-integrated learning (WIL). It is more like an “umbrella term for a range of approaches and strategies that integrate theory with the practice of work within a purposefully designed curriculum” (Patrick, Peach, & Pocknee 2009, 1).

Similarly, Cooper, Orrell and Bowden (2010, xiii) define work-integrated learning as the “intersection and engagement of theoretical and practical learning”. In other words, it describes the process of bringing together formal learning and productive work, or theory and practice. The authors further differentiate the term WIL to be only those learning arrangements associated with university curriculum where the learning takes place within the act of working.

Focusing on the objectives of WIL programs, the WIL working group Thailand (WWG 2010, 2), reflects on the basic principle of WIL as an educational approach to improve the competencies of graduates by giving them valuable practical experience which is directly related to course being studied at university.

3.2 Didactical Concept

However, regardless of various definitions, the WIL program in the following chapter is based on the seven key dimensions proposed by Cooper, Orrell and Bowden. (Cooper, Orrell, & Bowden 2010, 39-43). The seven key dimensions are purpose, context (workplace), nature of integration, curriculum issues, learning, partnership between the university and the workplace, and support provided to the student and the workplace. Each of the dimensions is discussed in details below.

Purpose: Defining clear goals, expectations and intended outcomes for all parties involved to ensure strong partnership and support students learning outcomes.

Context (workplace): Workplace includes a wide range of organizations, industries or governmental bodies that facilitate learning through guided learning, mentoring or coaching.

Nature of integration: Integration involves the application of formal theory with real-world problem solving, abstract thinking and practical action, and discipline-specific and vocational skills.

Curriculum: Defining the intended learning outcomes, choosing the teaching/learning activities and assessment that align with the requirements from professional associations, vocational or industries.

Learning: Involving students' engagement in experiential and situated learning, guided by clearly explained learning intentions and expected learning outcomes.

Partnership between the university and the workplace: Through partnerships, industry and the university can understand each other's interest and improve the quality of education.

Support provided to the student and the workplace: Support can be in various forms ranging from practical and administrative assistance to educational and emotional support. Both the Students and workplace need support in knowing what to expect and how learning takes place.

4 Implementation of WIL in Thailand

There are approximately three million students (2013) enrolled in vocational education and training and in higher education. More than 80 percent of this number are expected to graduate and support economic growth of the country. Despite this statistic, employers require skilled and job-ready graduates. The Thai government's policy makers and educators realized the mismatch between university graduates' skills with industry's expectations as evidenced by their nation-wide policies and strategies that promote WIL implementation.

4.1 The implementation of Work-integrated Learning in general in Thailand

A number of WIL programs have been carried out by education institutions in various forms. There are totally nine different forms of WIL implemented in Thailand, namely: pre-course experience, sandwich course, cooperative education, cognitive apprenticeship or job shadowing, new traineeship or apprenticeship, placement or practicum, field work, post - course internship, and joint industry-university course. All of these WIL programs have been implemented but only some of them show significant result in developing human resource for the country. Some of the assumptions for lack of success in these forms of WIL rely on the ineffective collaboration between educational institutes and industrial partners.

In contrast some arguments focused more on the basic principle of WIL programs itself. For example, the WIL Working Group in Thailand (WWG) (op. cit., 2010, 1) pointed out that Cooperative education program (one of the WIL programs implemented) only allowed students to *understand* the real working situation. But according to the didactical principle and learning goals, WIL program should be centered on working in the real work process to achieve professional competencies.

Similarly, Cooper et al., (op. cit., 2010, 25) distinguished between the old and new work-integrated learning cultures. In the old WIL cultures, they pointed out that students are considered as workers who learn how to work through observation. The new WIL cultures, on

the other hand, considered students as learners who work to learn by being included in the work process as one of the participants.

Having discussed challenges in implementation of WIL programs, this article will refer to the School-in-Factory (SIF) project as a practical approach to develop human resource in Thailand.

4.2 School in Factory (SIF): an example of good practice for Work-integrated Learning

The School-in-Factory (SIF) project is a Public-Private Partnership educational model among The National Science Technology and Innovation Policy Office (STI), Rajamangla University of Technology Lanna (RMUTL) and Michelin Siam Company Limited. Its main objectives are to solve the problem of shortage in qualified technicians and research engineers, reduce the turnover of the employees and increase the country's productivity.

This collaboration set out the responsibility for each of the parties involved. The STI, as the government body, fosters and supports this form of participatory education management. The RMUTL provides an "in kind- investment" such as lecturers, facilitators and school management. The Michelin Siam Company Limited, as the main stakeholder, offers the working venue, and an "in cash- investment" for example: students' school fees, monthly allowances, accommodation cost, payment for lecturers, facilitator and on-site trainers. Students graduating from this program receive a diploma certificate from Rajamangla University of Technology Lanna (Songthanapitak et al. 2016, 2-5).

This pilot project was launched in the year 2012. It is a two-years educational program. Each year, students spend three months studying in the university and nine months at the factory. The intake students of the SIF project have graduated from lower secondary school (general education) and vocational certificate levels. With this diversity in students' background, the university assisted them with a two month training program in basic and higher professional skills before joining the factory.

The students' learning arrangement at the factory consists of theoretical classes for 3-4 hours daily and 8 hours of work. This learning combination continues for six days a week. Since this learning program allows students to work and study at the same time, the integration between the two knowledge bodies is reinforced. Students are able to apply their theoretical knowledge in their work tasks and vice-versa.

This form of learning is possible through coaching and facilitation from the factory, lecturer and facilitator. The on-site trainers, in the factory, oversee and foster the learning toward acquiring job competencies. Simultaneously, lecturers and facilitators in the classroom promote the application of theories to real practices through the method of discussion and sharing experiences. Assessments of students learning are divided into two main parts: the practical training and the theoretical concepts learned. They are equally assessed in the forms of work done in the factory and students' monthly presentation. The monthly presentation is a

platform for students to express their learning progress to lecturers, trainers and facilitator. The comments and feedbacks given to students lead to their personal improvement.

The results of this program show that the industry is satisfied with students' performance. Students show better working results compared to regular employees because they are motivated to study in an authentic learning environment. One of the students reported "We have close contact with machineries [*sic*], employees and the working of the factory. It might be a bit tiring, but it's worth it. We have an advantage over others because we can work and study at the same time" (ibid., 2016, 6). Thus, the SIF project shows significant impact. It might be helpful in solving the lack of qualified manpower in the industry in terms of quality and productivity. Students gained their employability skills (more research is needed for specific competency), the university can provide professional development to its faculties, and together with the industrial partner, produce high quality human resources. Furthermore, the government has driven the policy for implementation of Work-integrated Learning.

5 Conclusion and recommendations

Moving toward a high-tech and knowledge-based economy, Thailand is facing challenges in human resources development. One of the major issues reflects the mismatch of skilled manpower between the demand and supply sides. The graduates do not have necessary knowledge and skills required by the industries. The government realized this problem and is trying to deal with it by promoting work-integrated learning programs throughout its educational plans and policies.

The term work-integrated learning (WIL) has no universally accepted definition. The founding principle that characterized this educational program is the integration of theoretical knowledge from classroom to practical skills at workplace. Successful implementation of the WIL programs needs several considerations as mentioned in the previous chapter. Failures to recognize these domains, especially the support to student and workplace, would easily lead to lack of qualified human resource as we have seen in Thailand.

The School-in-Factory (SIF) project, a Public-Private Partnership among governmental organization, educational institute and industry, arose as an effective educational management to solve the problem of lacking qualified human resource by producing students that meet the industry's demand.

One main factor that led to the successful implementation of the SIF project is the direct involvement of the governmental organization as one of the stakeholders. Strong evidence shows that incentives, such as tax refund for industries, are not enough: "The government institutions should collaborate with companies and universities" (Gennrich 2017, 9). This should act as a platform for the two partners to cooperate with each other. Personal contact between university and industry without the support from the government may lead to the problem in confidentiality and lack of trust between the two parties.

Although educational management supports the learning process that promotes student autonomy and life-long learning, teachers remain at the core of academic institutions. In the case of Thailand, it is necessary for teachers to update the content knowledge that is relevant to workforce and consequently develop the appropriate pedagogical skills. Vocational teacher development programs require cooperation from the private sector to train the teachers. A qualified and up-to-date vocational teacher will be able to teach students in a more work-oriented technique (Geissler 2015, 6).

Good practice for teacher training is carried out by Southern Taiwan University of Technology. (Hwang 2015, 11) They believed that teachers must be familiar with the working process of the industry first in order to teach students to meet the industry's standard. Consequently, teachers are encouraged to participate (5-40 days) in the industry to gain some experience that can reduce the gap between theoretical knowledge and industry work process.

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Article 2

Moonpa, N., **Phalasoan**, S., Gulich, J., & Beecker, P. (2019). Approaches and Structures of Work-related Learning in TVET in Thailand. In: TVET@Asia, issue 13, 1-19. Online: <https://tvet-online.asia/issue/13/phalasoan-et-al/> (retrieved 30.06.2019).

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Approaches and Structures of Work-related Learning in TVET in Thailand

Abstract

Work-related Learning (WRL) is a learning form that is discussed in many countries around the world as a means to improve the quality of TVET-systems and thus learners' competencies development. If WBL is included in an informal learning setting and is labor market oriented, the main principle of WBL is the interrelation between the two or even three learning venues, which are vocational schools, companies, and training centers. As a consequence of the relevance of WBL, there are different systematics and typologies such as work-gearred learning and work-oriented learning attempting to classify learning forms according to the proximity to real work.

This article is based on the results from focus group discussions conducted during an International Research Workshop on Work-related Learning in February 2019 in Chiang Mai, Thailand. The workshop included practitioners and experts from Rajamangala University of Technology Lanna (RMUTL), Thailand, Technical University of Dortmund (TU Dortmund), Germany, and representative from Thai companies to discuss and exchange information and knowledge regarding Work-related Learning. Best practice examples of learning forms such as School-in-Factory (SIF) in Thailand and Production Schools or Learning Bay in Germany have been systematically studied and analyzed to find out about similarities, differences and problems in the implementation of Work-related Learning.

The workshop concluded that there are needs for didactical development and scientific research in vocational pedagogies in Thailand. Another important challenge is in the area of curricula design that merge the subject-orientation with the demand of work. Additionally, difference forms of learning that fit to the demand of learners were also pointed out in the workshop. To enhance quality of TVET and for further development of TVET-systems, it is necessary to continuously exchange knowledge between scientists and practitioners from different countries and to do research in TVET especially on Work-related Learning. Therefore, the results from this analysis are presented from the perspective of identifying additional research demand on WRL in Thailand.

Keywords: *Work-related Learning, Technical and Vocational Education and Training, Learning in the process of work, Cooperation of learning venues*

1 Framework and requirements for TVET in Thailand

Innovation in TVET-systems are complex challenges, which need to respect the given socio-economic context. The following chapter provides a basic insight into the current socio-economic context and the situation of the TVET-system in Thailand. Globalization has shown a significant impact not only towards socio-economic conditions, but also to the life of the people as well as to political affairs. With the drastic economic progress, that is a result of globalization, TVET plays an important role in ensuring the social and economic sustainability and prosperity of the country, especially during the times of disruptive technological progress (BIBB 2019).

1.1 Socio-economic conditions and demographic situation

Due to strong and rapid industrialization, Thailand's entire social and economic structure has changed in recent years (Grosch 2018, 32). Thailand has been a "constitutional monarchy with a parliamentary form of government" since 1932 (iMove 2014, 10). The development of the Kingdom has progressed from an agrarian to an industrial and service society. Among various economic partners, Germany is one of the most important foreign trading partners to Thailand. With a gross domestic product of \$ 345.7 billion (National Statistical Office Thailand 2019), Thailand is one of the advanced economies in Southeast Asia and has a well-developed infrastructure, a free economy and a general pro-investment regime. It has achieved steady growth through strong exports (iMove 2014, 11).

Thailand has 64.5 million inhabitants, 78% of whom are of Thai and 11 % of Chinese descent. Other ethnic groups are of Malay, Indian, Vietnamese and Cambodian descent. The predominant religion in Thailand is Buddhism. Moreover, Thailand has a young age average of 34.7 years and an official unemployment rate of around 1% (National Statistical Office Thailand 2019), which is one of the lowest rates in the world (Grosch 2018, 32). Furthermore, there are about 2.5 million foreign workers from neighbouring countries. Thailand is an attractive country for migrant workers. Since January 2013, there is a newly introduced minimum wage in Thailand. The aim is to increase purchasing power in Thailand and encourage companies to invest in better equipment and training for their employees (iMove 2014, 11).

Due to its strong industrialization process and specific demography, Thailand also has a growing demand for suitable and qualified skilled workers. In addition, cooperation between educational institute and the private sector should be developed better in order to adapt training content to the needs of the labour market (OVEC 2008, 2). Currently, the content that is taught in the training is not demand driven. At the same time, Thailand Industry 4.0 aims to develop an innovation-driven economy that will be on par with high-income countries. The continuous labor market development is one factor that will help drive such growth. In order to develop a competitive workforce, the Thai Government recognized the significant role of Technical and Vocational Education and Training (TVET) and encouraged its improvement through various strategic policies in order to develop a competitive workforce. The

implementation of these policies pose numerous challenges for the country, especially in the area of human resource development (Gennrich 2017). Similarly, increasing technology will fundamentally change work processes. As a result, collaboration between stakeholder groups is becoming increasingly important for identifying needs and training relevant professionals.

1.2 Situation of TVET in Thailand

Formal education in Thailand comprises of basic education (Pre-primary education, Primary education, Lower secondary education, and Upper secondary-general education), TVET and higher education (Phalasoorn 2017, 2). It is managed at three different levels:

- the central level,
- the sub-national level, and
- the institutional level (Grosch 2018, 44).

The Thai Ministry of Education (MOE) is in charge of all sectors of formal education and TVET. It is divided into various subdivisions, called Offices. The main responsible body for TVET is the Office of Vocational Education Commission (OVEC). In 2019, the Office of Higher Education (OHEC) has become a new Ministry of Higher Education. The detailed information about TVET within Ministry of Education in Thailand is illustrated in the graphic below.

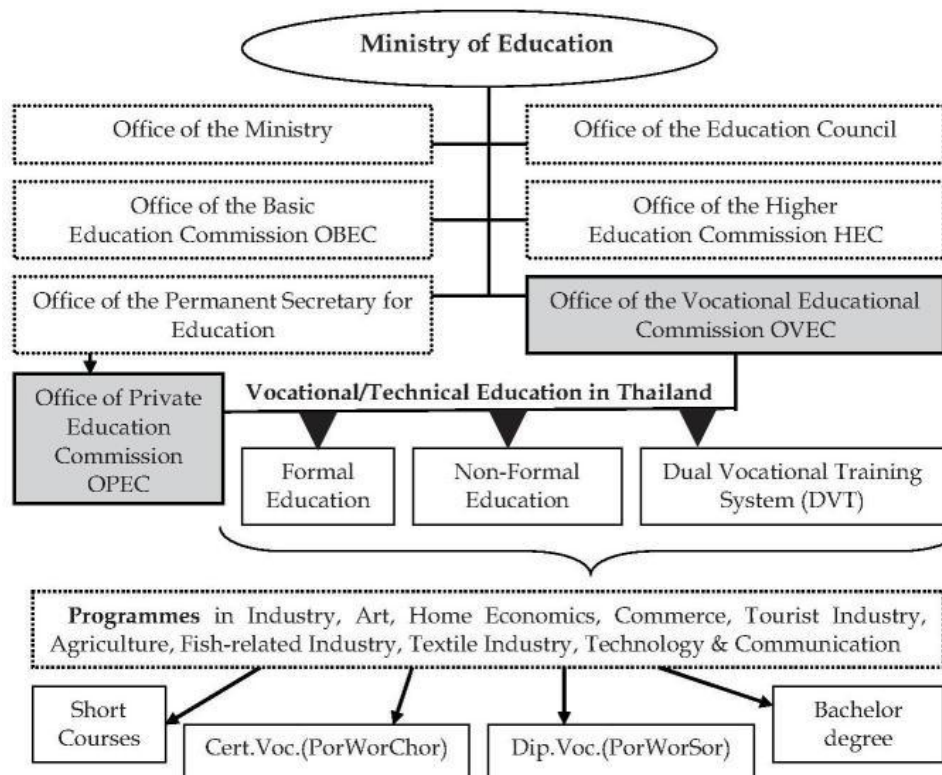


Figure 1: Organizational chart of Thai Technical and Vocational Education (Chupradit & Baron-Gutty 2009, 61)

Since 2008, Technical and Vocational Education and Training (TVET) has been regulated by the National TVET Act. TVET can be obtained in a variety of ways, mostly in what are commonly referred to as Technical and Vocational Colleges:

- Formal Vocational Education. Formal Vocational Education consists of two different three-year full-time study programs: the "Certificate Vocational" (PorWorChor), and the "Diploma Vocational" (PorWorSor) (Grosch 2018, 64). According to the Student statistics summary Academic Year 2019, there are approximately 1,012,580 students enrolled in the formal Vocational education (including students from PorWorChor and PorWorSor programmes) (Information Technology and Vocational Manpower Center, OVEC 2019).
- Non-formal Vocational Training. The programmes are more flexible. "The curricular, period of time, course evaluation are set into certain conditions according to the needs of targeted groups" (Chupradit & Baron-Gutty 2009, 61). Certificate is acquired after completing the training.
- Dual Vocational Training System / Apprenticeship. The "Certificate in Dual Education" is acquired for different level of training programmes. In 2015, there were 91,448 students in total who were trained in the DVT system. (Dual Vocational Education Center, OVEC 2019).

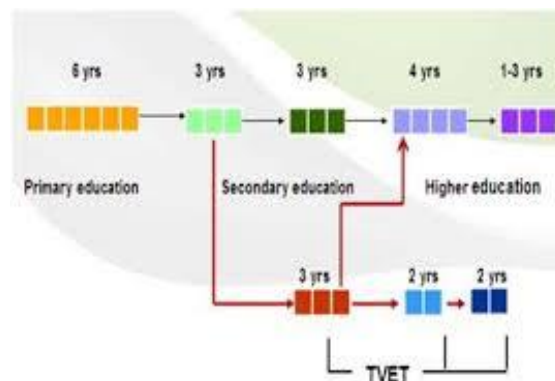


Figure 2: Formal Vocational and Training System in Thailand (Researching Virtual Initiatives in Education 2014)

Basic education constitutes of six years of elementary school, three years of lower secondary school and three more years of upper secondary school. After completing three years of lower secondary education, there are two possible pathways to continue the upper secondary education: general education and TVET. The upper secondary- general education (3 years) is offered to develop learners with regard to their aptitude, interest, potential and special talents as a basis for higher education. The upper secondary- vocational education (in Thai: PorWorChor) is designed to develop learners' knowledge and skills in careers to be skilled labor force or to continue study in a higher professional level (Ministry of Education- Thailand 2016, 1). For further education, learners can continue on their respective stream of education that is from upper secondary- general education toward academic undergraduate

and from upper secondary- vocational education toward diploma vocational level (also known in Thai as PorWorSor). This PorWorSor programme is usually completed in two years. However, it is also possible for learners from the upper secondary- general education to apply for TVET at diploma vocational level. Additionally, learners from TVET will continue two more years to achieve the bachelor of technology.

TVET in Thailand is based on the prevailing market conditions. The aim is to impart professional knowledge into occupations. The curricula of TVET depends on the occupational field, the provider and the respective mode of implementation (iMove, 2014). In the end, the students have to pass a national examination, the so-called Vocational National Education Test, which is administered by The National Institute of Educational Testing Service (NIETS 2019).

The Dual Vocational Training (DVT) was introduced in 1988 (B.E. 2531) (Office of the Official Information Commission, Thailand 2013) and informed by the German model. The training courses, which are organized in full-time programs in vocational colleges, also provide internships in companies (Grosch 2018, 77). In DVT, learning takes place in college and in the workplace, with practice sessions taking place either at weekly intervals or within the semester. However, the teaching staff is often poorly trained, and the workshops of the schools are often equipped with outdated machines (ibid.).

In the in-company workplace too, learning predominantly takes place by imitation, because the trainers in the companies have no pedagogical qualifications (Grosch 2018, 77). To counteract this, the Thai government has been trying to support the cooperation between vocational colleges and private companies through various plans, for example the 15 years Implementation Guideline for the Office of Vocational Education Commission: Strategic policy on the development of vocational manpower 2012-2016. However, this has not been successfully implemented (Phalason 2017).

There are about 900 private and public institutions offering vocational training programs and about 1.05 million students in the formal education system (as of 2012) (Australian Education International 2013). However, TVET in Thailand is oriented towards academic disciplines or branches of industry and does not include the principle of vocations and its work processes as it does in Germany (ibid., 71).

The demand for qualified skilled workers in Thailand is steadily increasing. Nevertheless, the quality of training has not yet been adequately adapted and accommodated to this demand. Rising wage costs led to a so-called "middle income trap" (Grosch 2018, 71). Based on competitiveness and demand, reform approaches promote "the initiatives which include pathway concepts through recognition of prior learning approaches, professional development for technical teachers to underpin competency approaches, and the improvement of the profile and parental perceptions of vocational education" (Australian Education International 2013, 22). Increasing and intensified cooperation between companies and groups of professional (such as Chamber of Crafts) is intended to increase the existing quality of training.

Moreover, the OVEC and the state have developed guidelines to introduce high quality employment standards. The Thailand Professional Qualification Institute is responsible for checking and monitoring these standards.

In general, there is a lower appreciation of vocational education in Thailand. This difference in appreciation of mental and physical work is due to cultural aspects prevalent in the country (Grosch 2018, 72). This is apparent, e.g. clearly in the number of learners who move to secondary education which is generally higher than in the vocational schools. The strong conservatism limits the implementation of innovations, especially in the field of education. The flow of information is still hierarchical in Thailand and is controlled accordingly.

2 The in-company workplace as a venue for experiential competence development

The following chapter will describe different typology of Work-related Learning as well as related didactical requirements, educational regulations, and best practice examples for learning and competence promoting forms of learning.

The place of work as a place of learning becomes increasingly important. "In the company, self-directed and experiential learning is promoted in the process of work, and more strongly linked to organized learning" (Dehnbostel 2019, 6). By learning at the workplace, especially from a business perspective, work processes should be improved and optimized in order to increase the effectiveness and efficiency of the work (ibid.). Thus learning and working must be linked together, but this approach requires an adequate didactic conception.

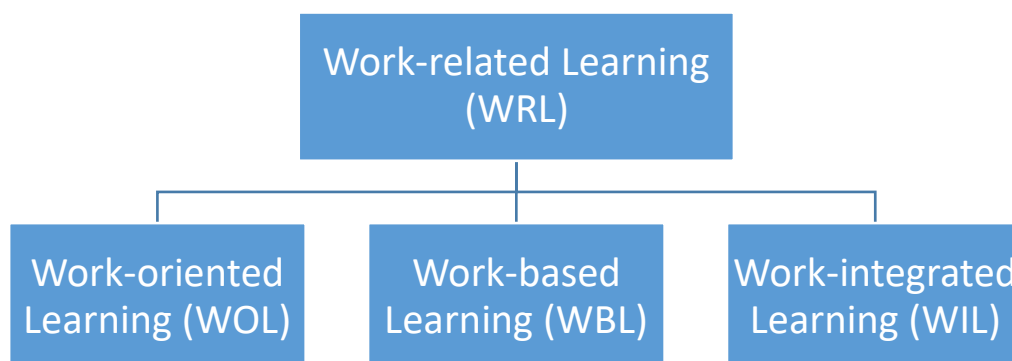


Figure 3: Typology of Work-related Learning (adapted from Dehnbostel & Schröder 2017)

The concept of Work-related Learning (WRL) takes an important role. "The term Work-related Learning refers to learning in enterprises, training centers, schools and academia. This includes learning at work and learning within work process and through work" (Dehnbostel & Schröder 2017, 1). By considering the relationship between place of learning and place of work, three different types of Work-related Learning can be identified. They are Work-oriented Learning, Work-based Learning and Work-integrated Learning. By combining the

formal and informal forms of learning that are based on experiential learning, this can contribute to learners' competence development.

- Work-oriented Learning (WOL): "WOL takes place in formal learning venues. Learning is made up of simulation of work organization, work tasks and processes" (Dehnbostel & Schröder 2017, 5). This learning form is often used at vocational schools and training centers. Some of the examples are production school and junior company.
- Work-based Learning (WBL): Originally termed as Work-connected Learning. Learning venue and workplace are separated. However, in terms of work organization they are connected. It usually takes place at the workplace. Examples are school in factory and student company.
- Work-integrated Learning (WIL): Learning venue and workplace are identical: the actual learning takes place at the workplace or in the work process (Dehnbostel & Schröder 2017, 5). Good examples of this learning form are learning bay and job rotation.

The aim of the different forms of work-related learning is the development of appropriate skills. For having good occupational skills, an adequate theoretical knowledge and experience are necessary. They have to be combined and reflected. In addition to the practice, the teaching of theoretical knowledge takes place parallel to the work in the vocational schools. This organized educational learning, which pursues specific learning goals, is also referred to as formal learning.

In contrast to this is informal learning, which according to Dehnbostel has been recognized as a part of occupational learning. Informal learning is characterized by self-determined, semi-conscious learning, which is based on experience (Rohs & Dehnbostel 2007, 1-2). Thus, there are existing interfaces with forms of learning that have both formal and informal learning characteristics. Formal and informal learning are interlinked and co-dependent on each other mutually (ibid., 1).

In education and training, informal learning has become more important against the background of changing competence requirements. Thus, the necessary experience for complex work tasks can only be acquired directly in the work process (ibid., 2).

There are many advantages for learning in the process of work. "The work process-oriented teaching and learning in the dual system provides young people with an opportunity to acquire specialist skills, knowledge and abilities, in addition to personal competences, through exposure to professional experiences at the workplace" (Gennrich 2017, 4). The further development of professional skills is required to remain competitive and to maintain a job. "Dual or workplace-based training is not outdated, but rather strongly needed to fill the gap of well-qualified workforces with target-related technological qualifications and work experience" (ibid., 6).

2.1 Didactical requirements

To ensure that the place of work is suitable for learning and produces the best learning outcome, the quality of a workplace as a place of learning is significant. It is important to recognize learning in the process of work as this leads to competence development while maintaining his employment status. Furthermore, the quality of workplace has to be considered as an important factor contributing to lifelong learning that will benefit society at large (Dehnbostel 2019). Additionally, it can also be counted as an economic factor, particularly in the competitiveness of a company.

Since learning occurs in the workplace, different dimensions should be taken into account when assessing the learning support of the workplace. According to Dehnbostel (2019), the following elements must be considered:

- Complete action/project orientation: confront employees with tasks that require many "action operations". Holistic work action and self-directed learning of the individual are thus supported (Dehnbostel 2019, 66).
- Freedom of action: The employee should have the opportunity in the work process to "act appropriately, purposefully and independently" (ibid.).
- Problem orientation and complexity experience: This dimension relates to the complexity and scope of a given task. If these become higher and the task becomes more extensive, the problem and complexity experience of the employee also increases (ibid.).
- Social support: interaction and communication play an enormous role in the work process and should not be neglected. However, these also depend on the particular culture that prevails in the company. Through group work, "learning turns from an individual to a collective process" (ibid.).
- Individual development: this is the orientation of the respective task, which is placed on the individual. It should neither be over-demanding nor under-demanding (ibid., 67).
- Development of professionalism: individuals who are involved in the work process benefit from increased professionalism in their careers. Moreover, "feedback and experience constantly improve the professional ability to act and the expertise of the individual" (ibid.).
- Reflexivity: "Reflectivity is about reflecting on work structures and environments as well as oneself. Reflexivity means the conscious, critical and responsible assessment of actions based on experience and knowledge" (ibid.).

The successful implementation of learning at the workplace relies not only to the quality of workplace and learning support but also depends on the training regulations, as in the case of Germany. The following section will briefly provide information about different learning venues for Technical and Vocational Education and Training (TVET) in Germany.

2.2 Three different places of learning in Germany

There are three different locations for learning in TVET in Germany, namely vocational school, workplace and training center.

2.2.1 Vocational school

Vocational school is included in two different forms of vocational trainings; in the dual system and in the full-time learning in vocational school.

In the dual training, roles of vocational school are to provide learners with basic and specialized vocational training and to extend prior knowledge in general education. The teaching is allocated in cooperation with other relevant bodies, such as training centers and industrial partners. While the duties of vocational school in full-time learning at vocational school are to introduce students to one or more occupations and train them for those occupations (Schneider et al. 2007).

2.2.2 Workplace as place of learning

In Germany, training places are also offered in the workplace. Companies enter into a contract with trainees. To enhance trainees' professional competence, these companies are responsible for providing trainers to train the employees with relevant educational or skill courses.

For the dual vocational training, the company provides in-company training to learners (approx. three to four days per week depending on the occupation) and makes sure that the training courses are relevant to the training directive and a framework curriculum.

2.2.3 Training center

Some of the small and medium enterprises do not have enough specialized trainers to cover all of the content in the training courses, lack suitable training equipment, etc. Therefore, the training center is designed to supplement in-company training.

2.3 Learning and competence-promoting forms of learning

In Germany, there are forms of learning that promote experiential learning in the work process. Good examples are the production school and the learning bay. In these two examples, the learning places are optimally linked and also well established and successful implemented. They are explained in more detail below.

2.3.1 Production school:

According to Mertens “the pedagogical concept of the production school is a constitutive part of the work and production processes for the promotion and competence development of young people. Learning processes are purposefully linked with work in structures close to the company with tools and contents. This is precisely what develops and promotes the

knowledge, skills and behaviors necessary to start and carry out vocational training” (Mertens & Stang 2016, 1).

Besides the social view, production schools also have an economic perspective to provide a return on investment. Therefore, young people learn by creating marketable products. However, production schools attach particular importance to their own experience of effectiveness and the self-motivation of the learners. Therefore, production schools are a good example of work-based learning, as informal learning takes place in an institutionalized setting.

The production schools in Germany originated at the beginning of the nineties, inspired by the Danish production schools. Currently there are about 200 production schools in Germany with 7,500 places for apprentices per year. Despite the similarities between Germany and Denmark, the production schools in Germany are not unified.

2.3.2 *Learning bay:*

In the aftermath of the 3rd industrial revolution, which triggered significant changes in information and communication technologies, there is an increased demand in the workplace for learning forms that directly connect learning and work.

The learning bay, as one approach of combining learning and working, directly connects learning opportunity to the work process. The learning bay is a sub-department of the production line at the center of company work processes (for example in the car industry), in which learners work independently or in groups on real or digital products. This learning form ensures a high practical orientation. Learners have more time to explore the learning objects and the learning processes are supported by facilitators who are well-resourced with occupational, methodological and didactical knowledge (Forschungsinstitut Betriebliche Bildung, 2019).

Moreover, the learning bay can contribute to the improvement of learning processes and to the learning ability of individuals and social groups. If they are involved in vocational training, a higher quality work can be achieved. The willingness to learn and the learning ability of the learners are directly increased. Using the workplace as a venue for learning intends to link learning and working together to develop experiential competence. To ensure this form of learning, didactical requirements for learning in the process of work such as a complete action oriented is one of the substantial factors. The training regulation that states roles and responsibilities of each party involved is to guarantee that the training framework is up-to-date and relevant to the demand of labor market. Production school and learning bay are the two examples provided in this article to demonstrate the forms of learning that promote competence in Germany.

2.3.3 *Work- and Learning Tasks*

Work- and Learning Tasks (WLT) were developed and implemented in the Advanced IT Training System in Germany, where informal forms of learning prevail. WLT are being

employed in fluid work-processes and aim at the enhancement of selected competences (Schröder 2009). WLTs are based on real in-company work tasks, which must fulfil certain criteria such as a certain degree of complexity, identity and uniqueness. The learner is given the chance to anticipate the work process with respect to a final objective or product. Deviation from the original planning forms the basis for reflection and learning.

From these examples, it could be seen that Germany has a long-standing history of research on Work-related Learning. These examples were employed at all relevant learning venues of TVET and therefore might be regarded as a benchmark system. Nevertheless, there are forms of WRL in Thailand, which prove to be innovative in the context of Thailand.

3 Example of established forms of Work-related Learning in Thailand

3.1 School-in-Factory (SIF)

The School-in-Factory (SIF) is a form of learning that provides learning opportunities for TVET in different learning venues. SIF is the result of collaboration between the Office of National Higher Education Science Research and Innovation Policy Council (former National Science Technology and Innovation Policy Office - STI), Rajamangala University of Technology Lanna (RMUTL) and Michelin Siam Company Limited. The respective stakeholders make different contributions to this program. RMUTL supports by offering the facilitators and lecturers and the Michelin Company provides the place of work or the in-company learning venue (Phalasoorn 2017, 8). The STI supports the program as a state cooperation partner.

School-in-Factory (SIF) is one of the best practice examples for Work-related Learning in Thailand. The aims are to better qualify skilled workers, to decrease the lack of qualified engineers and research engineers, and to reduce staff turnover, thus improving the productivity of the country (ibid.).

The School-in-Factory started for the first time in 2012. It is a program that has a duration of two years. In every year, the learners spend three months at the university and work nine months in the factory or company. However, these learners have a different educational background. There are learners with a lower secondary school degree or learners with a vocational certificate. Because of this diversity, the students have to undergo a two-month training program before being included in the SIF (Phalasoorn 2017, 8).

The course of work in the company is structured as follows: The learners have 3-4 hours of theoretical lessons every day in the factory and 8 hours of work for 6 days a week. Therefore, the theoretical knowledge and the work tasks are well aligned with each other. Learning in the work process should be encouraged in this way. In addition, once a month the learners present their own learning progress to the teachers and facilitators and are thus also reflecting on their learning progress (ibid.).

Overall, SIF encourages learning in the process of work. Therefore, as a representative of Work-Related Learning, SIF's success is proof of the benefits of implementing Dual TVET in Thailand.

3.2 Tripartite TVET System: cooperation among University, Vocational School and Company

The School-in-Factory project was implemented as an initiative from RMUTL to develop another possible solution to solve the problem of lacking skilled labor in Thailand. The project later evolved to include a few more private partner companies such as Betagro, Bio Story Group and Benya Tractor. In addition, the RMUTL has become a significant player in sharing the knowledge acquired from this project with other TVET institutes. RMUTL and TVET schools collaborate through teacher training and joint project. Hence, TVET

schools are here the implementation unit of this education program. The graphic below shows the cooperation among different stakeholders.

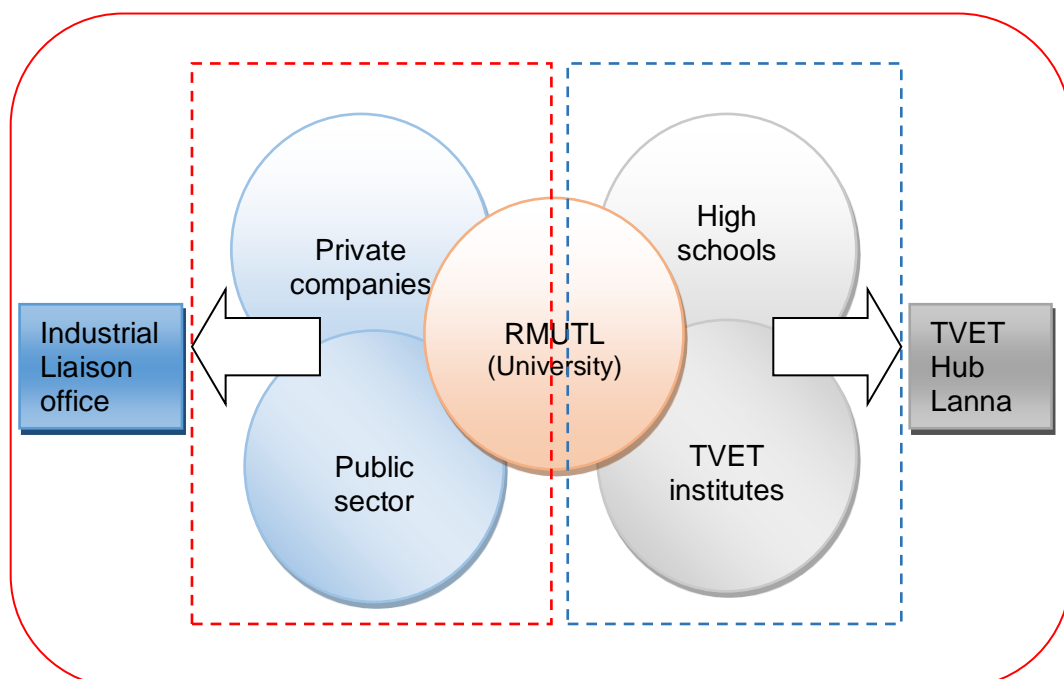


Figure 4: Tripartite TVET System (adapted from Moonpa 2019)

This Tripartite TVET System is operated by two main bodies. On the one hand, the Industrial Liaison Office is responsible for the cooperation among public sector, private companies and university. Its main tasks are managing financial support, Talent Mobility Project and several other projects like Betagro WIL TVET Academy Project and SIF: Star Holding Group. On the other hand, the Lanna Technical and Vocational Education and Training Hub (TVET Hub Lanna) coordinates among university, high school and TVET colleges. The major duties of TVET Hub are administrative work and academic work, such as executive committee meeting, financial management, training projects and Fabrication Lab. From Figure 4, it can

be seen that the university is playing an important role in doing action research in TVET education and coordinating with its partners. Therefore, Tripartite TVET system supports for the implementation of the Dual TVET System in Thailand.

4 Findings and recommendations

The international research workshop on Work-related Learning provided some thoughtful insights that are summarized in this chapter. The three-day workshop was organized at RMUTL with totally 25 participants from different level of experiences and background. These participants were mainly teachers, lecturers, researchers in TVET areas, and observers from the private companies. The main objectives of the group discussion were to discuss and exchange ideas regarding “concepts of TVET”, “learning facilitator”, “comparison of didactical approaches”, and “different learning forms in Thailand” which were documented by researchers from TU Dortmund. The following conclusions show the central issues/questions for the improvement of the TVET system in Thailand.

- Interviews of teachers and students from School-in-Factory (SIF) project revealed that “students show better working results compared to regular employees because they are motivated to study in an authentic learning environment” (Phalasoorn 2017, 9). Nevertheless, the training duration should be adapted to create a suitable learning environment.
- SIF is a way to design experiential learning in the work process. However, teachers involved in this project reported that the ability to study and concentrate is limited for many students. Questions discussed included how to increase students’ motivation by using other learning forms and how to design the learning task that link to the work task were raised. There was also a need to consider individualized forms of learning that are adaptable to the different levels of students’ knowledge.
- It is also shown that this form of learning yields better outcome if there are enough teachers and facilitators to take care of, as well as to transfer their expertise and experiences, to these learners. However, the most important issues were about the specific roles and responsibilities of teachers, lecturers and facilitators.
- Regarding the qualifications of in-company trainers, Germany has shown a well-defined and concrete structure about the trainers’ duties and how they should be produced. In-company training staff who are provided by the company and are personally and technically qualified bear the responsibility for providing the training content in the respective occupations according to § 28 Vocational Training Act trainees (The Federal Institute for Vocational Education and Training, 2019).
- For learning in the process of work, there need to be several dimensions fulfilled to receive the best learning outcome. The School-in-Factory concept already has some dimensions for the learning support. Thus, the dimensions of complete action, reflexivity and the development of professionalism can be rediscovered. These starting points should be further developed and complemented by the other

dimensions in order to strengthen both the learning support in the workplace and the workplace as a place of learning.

For further research, the workshop concluded that it is necessary to conduct research about work process analysis, work process documentation and as well as career research. This task should be developed in further international TVET research.

5 Summary and Outlook

Thailand is in the middle of a transition from an agrarian to an industrial society. The biggest challenge is the modernization of the education system. Dual vocational training plays the key role to meet the threat of a shortage of skilled labor and to live up to the conditions of the labor market. For the implementation of these, however, a "cooperation culture" between vocational schools and companies must emerge in order to be able to implement dual training settings. In addition, qualified trainers are needed for the implementation. As concluded in the focus group discussion, Thai TVET teachers need pedagogical improvement. There is also a strong demand for scientific research in vocational pedagogy. Moreover, the question of establishing TVET as a self-reliant academic discipline in Thailand is seen as another possible solution.

TVET research finds itself in Thailand only in a very weakly developed form (see Grosch 2018, 91). "The resulting lack of knowledge is one of the main weaknesses of the TVET system and a key reason for its slow quality development" (Grosch 2018, 91). In his essay, Gennrich (2017) has well summarized the most concise recommendations that fit into this context. The three most important are the following:

- "Bridging the gap between the world of work and the world of education by promoting Dual Vocational Education and Training (DVET) and various other types of experienced vocational learning systems (such as WIL, etc.)" (Gennrich 2017, 8).
- "New investments in the business sector also need new investments in vocational education and the labour market sector focused on Industry 4.0" (Gennrich 2017, 9). As mentioned by Rukkiatwong (2016) that Thai vocational education is severely lacking in resources, particularly qualified teachers and training equipment.
- "Government institutions (MoE/OVEC/MHESI) should collaborate with leading companies and universities" (Gennrich 2017, 9).

With Thailand 4.0, the impact of globalization and evolving technology has contributed to the transformation of Thailand's economic structure. Accordingly, the vocational education and training of teaching staff needs to be adapted. This could "narrow the gap between the high expectations of the industries and the current performance of education and training" (Gennrich 2017). TVET has to be more geared to the needs of the labour market.

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Article 3

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Tripartite Education: a collaborative structure of learning venues conducive to the improvement of TVET system in Thailand

Abstract

Thailand Industry 4.0 aims to develop an economy that is driven by innovation to advance to the level of high-income countries. One factor that would help drive such growth is continuous labour development. The Thai government recognized the significant role of Technical and Vocational Education and Training (TVET) in developing a competitive workforce and encouraged its improvement through various strategic policies. This paper discusses a TVET model that seeks to enhance the implementation of a Dual TVET system that involves work-based learning in Thailand through a collaborative structure and the application of action research. The study employed two research methods: relevant document analysis and a semi-structured questionnaire. Seven Memorandum of Understanding (MOUs) signed among Tripartite system partners were examined to find out their roles and responsibilities. The semi-structured questionnaire comprised ten open-ended questions and was sent to nine representatives from TVET colleges, companies, and universities to identify their experiences and recommendations for further development. Different roles and responsibilities of partners in the Tripartite education system model (TVET colleges, university, private sector) which are based on participatory management will be discussed in this article. Learning venues of work-based learning, learning activity, learning processes, project evolution and assessment are part of this discussion. Better communication and a common understanding among partners can lead to the meaningful implementation of this project. The cooperative model of different learning venues with the application of action research strengthens the Thai TVET system, as well as contributing to systematic and societal innovation.

***Keywords:** Tripartite Education, Learning venues cooperation, Thailand 4.0, Participatory action research in TVET*

1 Situation of TVET and perspectives in Thailand

The goal of Thailand Industry 4.0 is to develop an economy that is driven by innovation to advance the nation to the level of high-income countries. To achieve this goal, the Thai government announced the development of ten industries (S-Curve and new S-Curves). These ten industries will transform Thailand's comparative advantage into competitive advantage through knowledge, technology, and innovation. The first S-Curve industries are: agricultural and biotechnology, next generation automotive, smart electronics, affluent medical and Wellness tourism, and food for the future. The new S-Curve industries include robotics, aviation and logistics, biofuel and biochemical, digital economy, and medical hub. For the

first S-Curve, the government promoted innovative improvement and research to keep up with competitive global development and to enhance the five new industries' capacity to manage future competitiveness. The demand for a knowledgeable and highly skilled workforce in these ten industries cannot currently be supported by the Thai labour market. According to Chalamwong (2019), the Eastern Economic Corridor (EEC) development plan requires approximately 173,000 people with vocational qualifications but the country is still 32% short of this number. The shortage of high-quality technical and vocational graduates in the service and industrial fields extends to the areas of 1) machine shop mechanics, 2) electrical and electronic technology, 3) mechatronics, 4) mould engineering, and 5) welding (Mongkhonvanit 2017).

Thai's TVET faces challenges both in terms of quality and quantity. The biggest problems in Thai's TVET are the quality of vocational teachers and the lack of essential resources and training equipment at TVET Institutes (Chanwit 2014; Rukkiatwong 2016; Subcommittee on vocational education reform 2017). Other challenging issues are 1) learning content and curricula that are not consistent with employability skills, 2) lack of intermediary organization for the expansion of dual vocational training, and 3) ineffective quality assurance at TVET Institutes. One of the recommendations identified by Chanwit (2014) to cope with these problems is to strengthen cooperation between vocational schools and the enterprises.

TVET is a key element of the national agenda for development in Thailand. The following section outlines the structure of the Tripartite system. It employs a collaborative network of different learning venues, companies, university and TVET colleges to foster work-based learning in Thailand.

2 The Tripartite Education System

This section describes theoretical background on learning venue cooperation and explores the general structure of the Tripartite education system, which includes university, TVET colleges and the private sector.

2.1 Theoretical background on learning venue cooperation

Technical and Vocational Education and Training (TVET) in Thailand can play a significant role in developing a competitive workforce (Wattananarong 2012). One of the main supporting factors is the "link between the world of education and the world of work" that can increase the quality and attractiveness of TVET related training (Vroonhof et al. 2017, 3).

This section explains the theoretical background of learning venue cooperation. According to Pätzold (2003), learning venue cooperation is a "technical-organizational and (...) pedagogically based interaction of the teaching and training staff of the learning venues involved in TVET" (Pätzold 2003, 72). The objective of this collaboration is to connect

theory and practice across learning venues in order to train qualified learners, and to contribute to the continued improvement of the training programme.

Pätzold (1991) identified four levels of learning venue cooperation: 1) pragmatic understanding of cooperation, 2) practical understanding of cooperation, 3) didactical and methodical aspects of cooperation, 4) educational-theoretical understanding of cooperation.

In 1) pragmatic understanding, cooperation is based on “formal” or administrative requirements on an essential level. This level is prominent in training practice among partners. In 2), practical understanding is based on personal experience derived from problems and challenges. The initially one-sided need for cooperation can always be expanded. This level of cooperation is also popular for training practice. 3) Didactically and methodically founded understanding is based on occupational learning contexts. Motivation is pedagogically guided. Finally, 4) educational-theoretical understanding of cooperation expands on didactic-methodological cooperation with central aspects (e.g., formation of action competence) of educational theories.

Successful training across different learning venues also depends on conditions such as the coordination of learning processes, agreements, and how different learning venues view and understand cooperation. The next section explains the structure of the Tripartite system and the roles of the partners involved.

2.2 The Structure of the Tripartite Education System

The structure of the Tripartite education system model of Rajamangala University of Technology Lanna (RMUTL) is shown in figure 1 below, developed from Moonpa et al. (2019, 11). It is divided into private and public (partnership) sectors and the education sector, which includes high schools and TVET colleges respectively. The relationship of the two sectors is primarily driven by university (RMUTL).

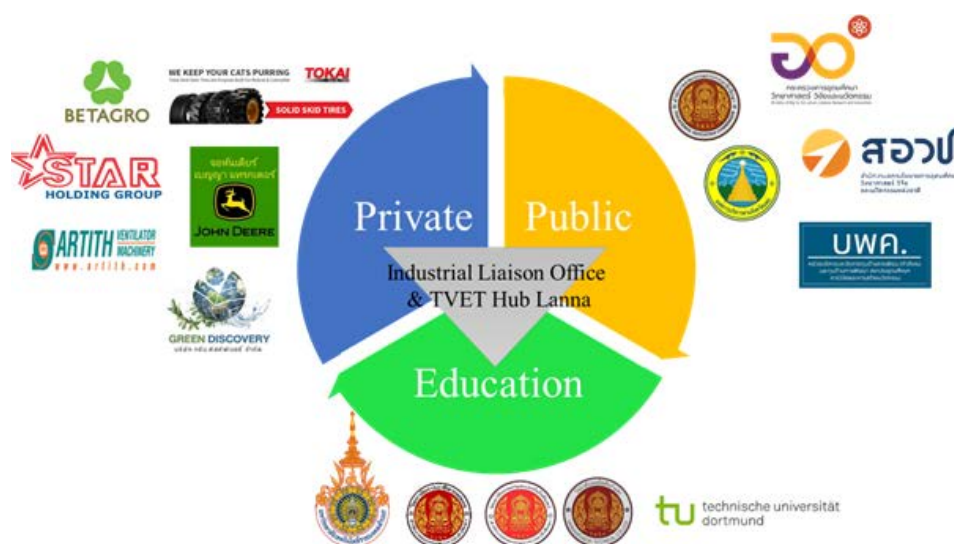


Figure 1: Tripartite Education System model (developed from Moonpa et al. 2019)

This Tripartite education system model brings together the roles of each responsible party. Close cooperation between the private sector and the educational sector (including vocational and higher education levels) seeks to develop scientific and technological resources, increase manpower, strengthen innovation and production models, and upgrade the level of technicians and technologists needed to meet demand in the private or industrial sector. So, this public sector should be encouraged to collaborate with each sector to enhance national or Thailand policy (THAILAND 4.0).

The role of scientific research for the development of TVET through the Tripartite education system can help to drive Thailand 4.0 policies forward. With participation from education, private and public sectors, knowledge of work-process based learning can be shared among partners. Information or challenges from the field or companies can be shared with education partners. The education sector can then create a model to solve those problems. Through participatory action, the education model can be implemented to evaluate the impact in actual working contexts.

Action research, according to Bradbury (2015), is a democratic and participative orientation to knowledge creation (Bradbury 2015). Moreover, participatory action research allows joint knowledge production and is therefore relevant to a specific community such as TVET in Thailand. This cycle of action can lead to knowledge innovation that meet the demands of all stakeholders. The figure below shows the interconnection between practice and action research within the Tripartite education system.

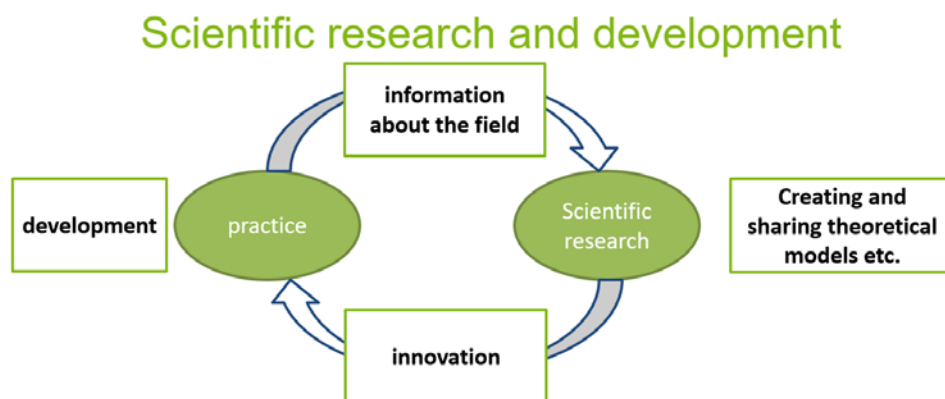


Figure 2: Scientific research and development (Kräenbring 2019)

The next chapter explains the research methodology included in this study.

3 Research Method

To understand the structure of the Tripartite education system model through the roles of different learning venues, this study employed a) document analysis and b) a qualitative questionnaire.

3.1 Document Analysis

This method was used to understand the objectives, roles and responsibilities of all stakeholders within the Tripartite education system model and to study the evolution of cooperation between partners, as well as the elements that contribute to this development.

Table 1: **List of the Memorandum Of Understanding (MOU) signed under the Tripartite education system.**

No.	Partners involved in the MOU	Date/month/year of MOU
1	- National Science Technology and Innovation Policy Office (STI office) - Michelin Siam Co., Ltd. - Rajamangala University of Technology Lanna (RMUTL) - Prince of Songkla University (PSU) - Kasetsart University (KU)	21 May 2013
2	- National Science Technology and Innovation Policy Office (STI office) - Office of Vocational Education Commission (OVEC) - Rajamangala University of Technology Lanna (RMUTL) - Michelin Siam Co., Ltd.	21 May 2013
3	- Rajamangala University of Technology Lanna (RMUTL) - Sankamphaeng Technical College (SKPTC)	23 April 2018
4	- Rajamangala University of Technology Lanna (RMUTL) - Betagro Public Company Limited	19 February 2018
5	- Rajamangala University of Technology Lanna (RMUTL) - WIRIYA ENERGY CORPORATION COMPANY LIMITED - Harvester Sales And Service (Thailand) Co., Ltd - Phrae Provincial Administrative Organization	23 April 2018

6	- Rajamangala University of Technology Lanna (RMUTL) - Chiangrai Industrial and Community Education College (CRIC)	26 October 2018
7	- Rajamangala University of Technology Lanna (RMUTL) - Phrae College of Agriculture and Technology (PCAT)	26 October 2018

3.2 Qualitative questionnaire

The questionnaire helps to better understand the roles and responsibilities, experiences, and recommendations of the stakeholders in the Tripartite education system project. The semi-structured questionnaire is sent to respondents who are representative of different learning venues: TVET colleges, companies and RMUTL. Specifically, there are five respondents from TVET colleges, two representatives from companies and two respondents from university. The semi-structured questionnaire contains 10 open-ended questions.

Data analysis includes 1) preparing the data by putting it into different themes according to the questions: motivation for joining the project, goals and objectives in joining the project, roles and responsibilities, challenges, problems, opportunities, recommendations, opinions on the Tripartite project, 2) comparison of data from each stakeholder, 3) identification of most common or expected answers, surprising elements or ideas, and 4) results presented in the form of quotes.

4 Research findings and outcomes

4.1 Findings from document analysis

Results from the analysis of seven MOUs signed under the Tripartite system from 2013 to 2018 found that the roles and responsibilities of each stakeholder had improved constantly. The findings below are separated into two main parts: roles and responsibilities of partners and the evolution of this partnership.

4.1.1 *Roles and responsibilities of different parties involved in the Tripartite education system.*

The following section explains the roles and responsibilities of education and private sectors.

Role of Education sector

The Tripartite education system model features two educational partners, namely university and TVET colleges. The university is responsible for learners at undergraduate and graduate

levels. TVET colleges take responsibility for teaching management on vocational certificate (Por-Wor-Chor) and high vocational certificate levels (Por-Wor-Sor). University will be discussed first, then the roles of the TVET colleges.

RMUTL university focuses on education management, research, academic service and resource development based on science and technology through participatory action research with other partners. Therefore, RMUTL is a key power agent collaborating between the private/public and education sectors. Active collaboration is coordinated by the Industrial Liaison Office and TVET Hub Lanna.

The Industrial Liaison Office (ILO) coordinates between public and private sectors which include state enterprises, public organizations, juristic bodies, partnerships, limited and public companies and the education sector. ILO is also responsible for project and activity management, such as the community of practice (CoP) committee and executive management meetings.

TVET Hub Lanna was established through the Thailand Partnership Initiative, known as Chevron's Enjoy Science Project. The five-year timeline of this project was to develop Science, Technology, Engineering, Mathematics (STEM) and vocational education at TVET colleges. TVET Hub Lanna is a coordination centre for TVET colleges and high schools in the northern region. Additionally, TVET Hub Lanna oversees administrative and academic work (Moonpa et al. 2019, 12), including a seminar project for the Tri-Curriculum Challenge: designing and creating FIRST Tech Challenge (STEM for Robotics) using Project Based Learning (PjBL) with a team of RMUTL lecturers. The aim of this seminar was to put high school teachers' skills to the test to prepare STEM for TVET classrooms at Prince's Royal College.

In addition to the Industrial Liaison Office (ILO) and TVET Hub Lanna, universities also play an important role in the development of teachers or facilitators who are expert in higher vocational technology and have extensive practical technical knowledge. Teachers/facilitators who come through this process can act as mentors for TVET colleges, helping to counterbalance TVET colleges' lack of industrial machinery and instruments or higher technology. They can also contribute to appropriate assessment for learning processes. The university thus plays an important role in the development of the Tripartite education system. RMUTL university has greater freedom and enjoys the flexibility to work with private industries, for example with regard to laws and regulations for educational staff working with private companies and also in conducting action research. (Moonpa et al. 2019, 12).

TVET colleges who grant educational degrees could offer appropriate curricula for the demand sector that align with professional standards of the Thailand Professional Qualification Institute (TPQI). Joint planning and organization of study plans would help to determine the criteria and qualifications of students, enrolling them according to the rules and declarations of vocational colleges and universities. Coordination of teaching/learning management and supervision of educational institutions in the project could also be

conducted on a joint basis. Full-time teachers or teachers from vocational colleges could teach in basic professions, specialized professions, field work, internships, and other projects through close collaboration with facilitators. Moreover, TVET colleges also provide experienced teachers to support facilitators in the field of professional education, from the curriculum to teaching and learning, and monitor educational quality in accordance with the standards of the Office of the Vocational Education Commission. TVET colleges have to ensure the adequate provision of qualified staff, not only teachers, trainers and supervisors but also career advisors and coordinators to support cooperation. In addition, TVET colleges have to prepare machines and instruments necessary for basic vocational skills training.

Role of Private sector

To develop new engines of growth, Thailand 4.0 is pivoting to a value-based economy. Industry needs to transform and prepare human resources for this shift. In the Tripartite education system, private companies prepare learning venues for students and teachers or facilitators from the education sector. It also accompanies in-company trainers with industrial experience in their development of competency, academic qualifications, coaching and mentoring skills. In order to produce qualified technicians to meet industrial demand, private companies provide the necessary tools for work based-learning.

Private sector demand has certain problems that need to be solved such as lack of the skilled workers and high turnover rate of the employees. A common goal would help to focus skills development for qualified workers. The private sector takes part in developing action plans to facilitate and prepare for work-based learning arrangements with the education sector. Private companies share the required criteria and levels of competency with vocational colleges and universities in the selection process for students. They evaluate the performance of students and facilitators on site and participate in overall project evaluation. They also create evaluation criteria, assess the skills development of technicians and technologists, and participate in curriculum development.

In addition, the private company provides a support team responsible for taking care of students' learning progress and their remunerations. They also provide project managers/administrators to coordinate related activities between company and university, resolve conflicts that may occur, and monitor cooperation.

To summarize, the Tripartite education system of RMUTL is at the level of educational-theoretical understanding of cooperation. University has an important role to play in enhancing the dual system of TVET education. Participatory action research has emphasized the dynamic nature of this structure.

4.1.2 Evolution of the Tripartite education system throughout its implementation.

The initial foundation of the Tripartite education system began in 2012 in the pilot project of the Office of the Vocational Education Commission (OVEC) by Sattahip Technical College (Thai-Austrian Technical College) together with STI office, Michelin Siam Co., Ltd to

implement the dual TVET system in Thailand. During this period, the two universities: KMUTNB and RMUTL were supporting the implementation process. However, the beginning of the Tripartite education system began when the two MOUs signed in May 2013, between 1) National Science Technology and Innovation Policy Office (STI office), Michelin Siam Co., Ltd., Rajamangala University of Technology Lanna (RMUTL), Prince of Songkla University (PSU), and Kasetsart University (KU) and 2) National Science Technology and Innovation Policy Office (STI office), Office of Vocational Education Commission (OVEC), Rajamangala University of Technology Lanna (RMUTL), and Michelin Siam Co., Ltd.,. These two MOUs were signed and agreed by all partners to support the Thai national policy in developing the competencies of human resources based on science, technology and innovation.

The first signed MOU referred to the undergraduate university students in the cooperative education for engineering programme organized at the private companies for at least 10 months. The university provides training courses before the students enter their respective companies. The interesting point for the Tripartite education system is in the second MOU when the School-in-Factory (SiF) project which was mainly established by RMUTL. In this project, the vocational students under the WiL project work at a private company. Thus, RMUTL has been acting as a hub for this cooperation. The contents and expectations with regard to the acquisition of skills in the job, practice, learning development, progress at work, and evaluation of the programme. Coordinators are put in place to work on a more intense level of detail between private companies and university. The private companies support travel budgets for university lecturers who are mentoring the students during training inside the company.

In 2018, RMUTL and Sankamphaeng Technical College conducted a joint educational programme for vocational training in mechatronics. This joint programme was implemented to address manpower demand as detailed in Thailand 4.0 policy. As a demonstration project with learners at vocational certificate level, there are many lessons to be learned for future development in terms of understanding management functions, teaching methods, and communication between organizations. The evolution of the Tripartite system is shown below.

Evolution of the Tripartite Education system at RMUTL

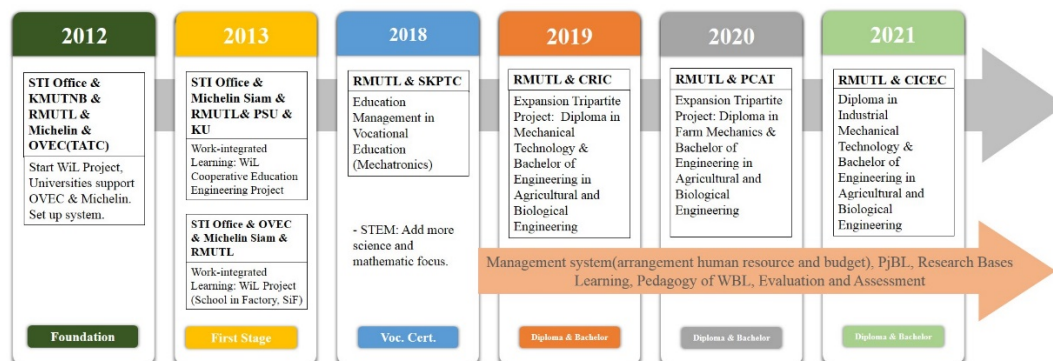


Figure 3: Evolution of the Tripartite Education system at RMUTL
(Authors' own graphic)

The Tripartite education system at RMUTL has shown the improvement in the role and responsibility of each partner. During the first stage of collaboration, roles of individual partners are outlined in the MOU, with each element described in more detail: the arrangement of human resources in each sector, budget contributions from the private sector, budgetary management in the project, learning venues for student and teacher are all on the list. Knowledge of work-based learning and technology from enterprises are transferred to the education sector. Participatory problem-solving via a research-based approach comes to the fore among participants. Curriculum development, evaluation and assessment methods have been developed through the combined effort of partners.

4.2 Findings from the questionnaire

Findings from the questionnaire are categorized into common responses and new ideas. With regard to motivation for joining the project, most of the respondents are motivated to enhance the quality of education, improve the working skills of learners, to learn from the working process, and to establish a partnership with other organizations. One respondent, however, was included in the project on the basis of a policy level agreement.

The objectives of the partners in joining the project are: to create a network in vocational education for learners, to develop curriculum & teaching and learning activities, to share teaching and learning resources including personnel, facilities and training equipment, to support the improvement of education, and to recruit employees who match the field of work.

Respondents to the questionnaire see the roles and responsibilities of partners in the project as follows: to offer guidance and support to learners during their training, teach learners in cooperation with other partners, train basic technical skills, provide human resource support, and manage budgets according to Ministry of Education policy.

Challenges faced during implementation were reported by respondents as follows: 1) teaching and training learners to be qualified according to the demands of the labour market, 2) recruiting learners to work later in the company, 3) the alignment of training with institutional regulations, establishing frameworks for collaboration, communication with partners, and other common activities.

Meanwhile, the most common problems are: 1) unclear communication and collaboration among the partners, 2) partners do not understand their roles and responsibilities, 3) difficulties in supporting learners during their training at companies that are sometimes located across multiple sites, and 4) lack of social welfare.

Opportunities arising from participation in the programme are: 1) the ability to train learners according to specific needs and demands, 2) development of the required skills of the learners, and 3) strengthening positive relationships with private companies and TVET colleges.

Partners in the project recommended that 1) there should be more communication among partners (including parents) to create a common understanding, planning and shared goals, 2) the government should further expand such kind of education model, and 3) there should be more financial support, social welfare, and a secured job position.

Finally, opinions toward the Tripartite education project are: 1) the Tripartite education system can support the implementation of work-based learning that requires cooperation with TVET colleges and private companies, 2) it is a good project for learners and it can support the development of manpower according to labour market demand, and 3) through this collaboration, learners gain their competencies and partners can develop a competency-based curriculum.

The table below shows the responses from the questionnaire under different themes.

Table 2: Responses categorized into different themes

Themes	Responses
Motivation for joining the project	To enhance the quality of education and improve the working skills of learners.
	To learn from the working process and to create partnerships with other organizations.
	It is a collaborative project agreed by policy makers
Goals and objectives in joining the	To create a network in vocational education for learners. To develop

project	curricula, teaching and learning activities
	To share teaching and learning resources, including personnel, facilities and training equipment.
	To support the improvement of education and to recruit employees who match the field of work.
Their roles and responsibilities in the project	Offering guidance and support to learners during training
	Teaching learners in cooperation with other partners
	Train basic technical skills, human resources support, budget according to Ministry of Education policy
Challenges	Teaching and training learners to be qualified according to labour market demands
	Recruiting learners to work later in the company
	Training according to institutional regulations, frameworks for collaboration, communication with partners, and other common activities.
Themes	Responses
Problems	Communication and collaboration unclear among partners
	Partners do not understand their roles and responsibilities
	Companies that offer training are located across multiple sites. It is difficult to give them support and advice in person.
	Lack of social welfare
Opportunities	Train learners according to specific needs

	and demands
	Development of required skills of the learners
	Strengthening positive relationships with private companies and TVET colleges
Recommendations	There should be more communication among partners (including parents) to create a common understanding, planning and shared goals.
	The government should expand this kind of education model further
	There should be more financial support, social welfare, and a secured job position.
Opinion on the Tripartite project	The Tripartite education system is a good project that supports learners through work-based learning.
	It is a good project for learners and it can support the development of manpower according to the demands of the labour market.
	This is a good project. Learners gain competencies and partners can develop a competency-based curriculum.

5 Experiences, conclusion, and recommendations

Based on the analysis of the seven MOUs signed under the Tripartite education system from 2013 to 2018, it can be concluded that practical collaboration and the implementation thereof are the defining principles to emerge. The objectives, roles and responsibilities of each sector to be managed in the collaborative process include learning activity, learning venues, timelines, regulation, modification and abrogation.

Based on the data gleaned from the questionnaire, all partners showed strong motivation to develop and intensify partnerships that can support learners' competencies through work-based learning processes. Clear communication and common understanding among partners still represent the main challenges facing the Tripartite education project. Nevertheless,

partners found that this collaborative programme can develop required skills for learners. In addition, it can bring partnerships closer together.

5.1 Experiences and lesson learned from implementing the Tripartite partnership

- Laws and regulations concerning the minimum age of learners to take part in the training at the private companies. In the Sankamphaeng model, partners support learners through their respective resources: for example, a university provides training at a mechatronics laboratory and teachers from different vocational colleges teach basic technical skills. However, the average age of the learners at vocational certificate level is 16-18 years. Below the age of 18, working in a company is not allowed.
- Some partnerships signed the MOU first and implemented cooperation later. This was the case with the MOU signed between 1) Rajamangala University of Technology Lanna (RMUTL) Chiangrai Industrial and Community Education College (CRIC) and 2) Rajamangala University of Technology Lanna (RMUTL) and Phrae College of Agriculture and Technology (PCAT). The two MOUs were both signed on 26 October 2018. However, CRIC activities were implemented before PCAT, due to the fact that the CRIC project team was already prepared to support learners in the programme.

In summary, it can be said that the collaborative structure of the Tripartite education system enhances the quality of TVET in Thailand. As one of the respondents stated: “it is a good project for learners and it can support the development of manpower according to the demands of the labour market”. Nevertheless, another respondent suggested that “the government should expand this kind of education model further.”

This study is based solely on findings from partners in the Tripartite education system, including TVET colleges, private companies and RMUTL university. Other important partners such as learners and their parents were not included. In future research work, the scope of respondents could be widened to include opinions from learners and parents.

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Article 4

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Article 5

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The Impact of Work-Based Learning on Graduate's Job Performance: Insights from School-in-Factory (SiF) Project

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Abstract

The School-in-Factory (SiF) is a pilot project for implementing dual technical and vocational education and training in Thailand by using a Work-based Learning approach with the combination of learning and working in the real process of work through the collaboration between the private company and educational institute. This study aims to evaluate the output and outcome of the SiF project by analyzing the program completion rate and the impact of the SiF project on the graduates' job performance in the labour market. The study employed both quantitative and qualitative approaches. The quantitative data is collected from official project records. The qualitative data is collected by using an open-ended. It is found that 85% of the learners from the year 2017-2020 successfully completed the SiF program (100 out of 117 learners). The impact of the SiF program has mostly contributed to the development of subject-oriented competence, that is technical knowledge and skills of the learners. The graduates reported that the SiF program has a positive impact on their performance where knowledge of the work process, ability to adapt to the workplace, and valuable work experience gained during training are the most valued impact. Moreover, from the perspective of the employers, the employees who graduated from the SiF program have shown their competencies in technical proficiency and job professional behaviour, constructive communication and expression, teamwork, job-related problem-solving skills. The results of the study stressed the importance of work-based learning where training at the company and learning at the classroom are combined, like the SiF program, to support learner competency development. The SiF program has shown a strong collaboration with the private company partner in implementing work-based learning in Thailand. Further studies should be conducted to find out the financial benefits of the project.

1. Introduction

1.1 Shortage of Qualified Technical and Vocational Manpower in Thailand

The lack of qualified workers in Thailand is attributed to several factors, including low educational levels, a lack of connection between educational institutes and the labour market demand, and the rapid evolution of technology. The swift pace of the technology change directly influences the structure of the labour market, resulting in increasing mismatches and shortages of technical skills (Alinea, 2022). If the education sector fails to align training programs with the demands of advanced technology, the Thai labour market may face a shortage of skilled workers, and semi-skilled workers could be displaced by robots and automatic systems.

Despite efforts to improve the skilled workforce, progress has been slow due to limitations in skill development. While there has been an increase the educational attention given of Thai workers, a significant portion of the workforce still possesses low educational levels. Specifically, 42.1% have no education or only completed primary education, 34.5% completed secondary education, and only 22% completed higher education. This education disparity contributes to a shortage of skilled workers aligned with objective targets and the dynamic context of the labour market. (Office of the National Economic and Social Development Council, 2021, p.15) The mismatch between labour market demands and workforce quality is partly attributed to the lack of connection between the education system and curricula design, especially in the rapidly changing technological landscape. (Chalamwong & Suebnusorn, 2018, p. 173)

When considering the Global Competitiveness Index (GCI) in terms of skills, there is evidence that the ability to adapt has decreased from a ranking of 66 in 2018 - 2019 to 73 out of 141 countries globally, or 6th in the ASEAN region in 2019-2020. Furthermore, there is a growing trend of children and youth who are not studying or working, leading to the underutilisation and underdevelopment of their potential (Office of the National Economic and Social Development Council, 2021, p.16). The 13th National Economic and Social Development Plan and the operational plan of the 20-year National Development Plan stress the objective of transforming Thailand into a progressive society. These plans emphasise the need to enhance the country's competitiveness by promoting human capital development that is aligned with the requirements of the labour market and the direction of national development. Strategies for human capital development aim at cultivating a highly competent workforce that meets the needs for competitiveness in both existing and emerging branches of the manufacturing sector. Continuous development is emphasised to ensure preparedness for evolving technological changes (Office of the National Economic and Social Development Council, 2021, p. 31).

1.2 Work-based Learning in Thailand

In this section, the term WBL will be generally defined based on international practices, and later the concepts and practices of WBL in Thailand will be discussed. From a very broad perspective, "Work-based Learning means learning for work, learning at work, and learning through work" (Bahl & Dietzen, 2019, p. 14). According to Dehnbostel & Schroeder the term "work-based learning (WBL) is used interchangeably with work-related learning (WRL)". The term/s is rather broad, has many different meanings (Dehnbostel & Schroeder, 2017, p. 5), and thus leads to confusion in the principal concept (Allan, 2015, p., 14). However, "the fundamental aim of Work-based Learning is the acquisition of knowledge, skills, and competencies in the occupational environment" (NA at BIBB, 2017, p. 6). Thus, there is a reference to the "Working environment" which distinguishes WBL/WRL from other types of education (Grollmann, et al., 2021, p., 5). Thus, vocational knowledge is distinct from other types of knowledge because it is structured by work constructed within work contexts and tasks rather than academic disciplines (Grollmann, et al., 2021, p., 6).

Furthermore, Dehnbostel & Schroeder distinguished three variants of work-based/work-related learning based on the criterion of the relationship between place of learning (vocational colleges/Training center) and place of work (in-company training) which are work-oriented learning, work-connected learning, and work-integrated learning.

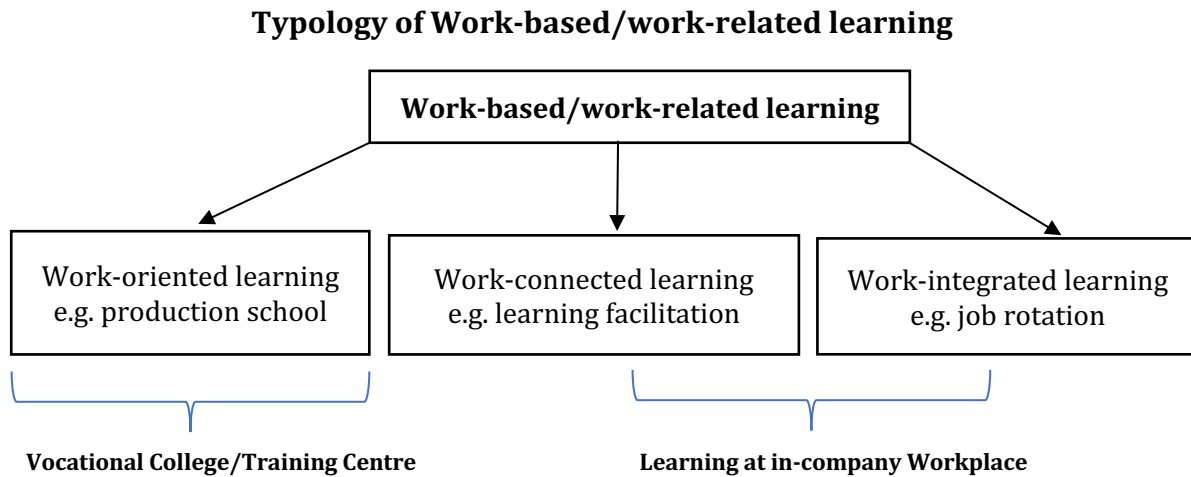


Fig. 1 *Typology of work-based/work-related learning (Dehnbostel & Schroeder, 2017)*

According to the graphic above, work-oriented, work-connected, and work-integrated learning can be explained in detail below:

- Work-oriented learning (WOL) takes place in formal learning venues such as vocational schools or colleges, training centres or universities. Learning is made up here of simulation of work organization, work tasks and processes. As learning is the primary aim, the disparity between simulated and real workplaces cannot be compensated. Learning is through simulation of work organization, tasks, and processes in institutional settings.
- For Work-connected learning (WCL), the learning venue and workplace are separated, though spatially, and in terms of work organization, they are connected. Learning, in this case, is done through in-company observation and exploration. In practice, e.g., there is a learning area close to the production line, which focuses on educating trainees relevant to a section of the production.
- In Work-integrated learning (WIL), the learning venue and workplace are identical; the actual learning takes place at the workplace or in the work process. Learning is done through active participation in real work activities or through companionship and instruction at the workplace. Examples are Communities of Practices (CoP), work-and learning tasks, traditional apprenticeship and adaptation training” (Dehnbostel & Schroeder, 2017, p. 5). The idea behind separating each typology of WBL/WRL is to assign an appropriate type of learning or training assignments that support the learning process of the learners.

Moreover, the goal of WBL is to acquire the job competencies, which are technical knowledge and skills, social competence, individual competence, and methodological competence. According to the definition of the BIBB (BIBB, 2021, p. 39), technical knowledge and skill are the ability and preparedness to analyse and solve tasks and problems, act in a goal-oriented, efficient, and professional manner, and evaluate the quality of the work processes and the results. Individual competence refers to the ability and preparedness to adapt and be self-initiative, the ability to think about the possibilities to shape one's life, family, and occupation, show self-confidence, self-organisation, dutiful behaviour, and develop moral issues for oneself. Social competence is the capability to shape social contacts, communicate with people to solve conflicts together, sense of empathy, willingness to cooperate and ability to work in a team. Methodical competence is usually integrated among the three competencies. It refers to the ability to apply problem-solving techniques and conduct discussion and learning methods.

In Thailand, the term WBL is broadly defined. Moreover, the terms WBL and WIL are used interchangeably. However, it is recognised that WIL is more popular in academic discussions as well as among practitioners. One of the most cited definitions is proposed by the Cooperative and Work-integrated Education (CWIE). Accordingly, WIL “is the curriculum cooperated by higher education institutions and external organisations to prepare graduates for the world of work completed with the competency to meet the needs of the job market and to develop careers in the present and prepare for future positions” (Cooperative Education Network, 2018).

Furthermore, the Office of Vocational Education Commission (OVEC) has stated the implementation of work-based learning through section 8 of the general provision that “dual education shall be implemented as vocational education which is derived from agreements between vocational colleges, institutes and workplaces, state enterprises or government agencies in the areas of curricula, instruction, assessment and evaluation. Learners shall study partly in vocational colleges or institutes and practice in workplaces, state enterprises or government agencies” (OVEC, 2008, p., 3). However, this faces with a lot of challenges on the implementation level because of less cooperation from the private sector or company partner.

Most of the core element/value or understanding for WBL in Thailand, as appeared in the mentioned definitions and relevant government body, is broadly defined and only mentions the relationship between place of learning and place of training. Thus, this stresses the weak point of WBL in Thailand which is the connection or

collaboration between the place of learning and workplace. However, when looking at the guiding principles of Germany's VET system, the focus is not only on the cooperation between stakeholders for learning and training but also on the learning within the work process, acceptance of national standards, qualified vocational educational and training staff, and institutionalised vocational training research (Federal Ministry of Education and Research, 2017, p., 1)".

On the implementation level, there are two types of WBL practices in Thailand; the adopted and the industrial-led programs (Chalamwong & Suebnusorn, 2018). In the adopted program, educational institute is taking a leading role in organizing the WBL. "The private companies provide educational partners with financial contribution, equipment, staff development, experts, and other resources based on common agreement between participating partners". In contrast, "the industrial-led programs are organized independently by enterprises" (Chalamwong & Suebnusorn, 2018, p., 169). In most cases, the company established its own school/institute to train the learners. The entire teaching and learning are totally done within the company. For example, the founding of the Panyapiwat Institute of Management by the CP All, the retail arm of the Thai conglomerate CP Group, to serve as a feeder of personal for CP's businesses (Panyapiwat Institute of Management, 2018). The adopted and industrial-led programs, according to Ode-sri (2022) are also known as "factory in school" and "school in factory" respectively. Most of the successful WBL implementations are the industrial-led program. However, it is important to note here that in the industrial-led program, as the name suggested, the entire administration and management are run by the industry itself with less or no connection with other educational stakeholders.

Work-based learning (under the so-called "adopted program") has been considered one of the vocational education reform initiatives in Thailand from 2009-2018 (Chalamwong & Suebnusorn, 2018 p., 169). However, the successful implementation depends mainly on the "active relationship between partners with mutual benefits, opportunities of teachers for training in the workplace, and flexible bureaucratic school system" (Choomnoom et al., 2012 as cited in Chalamwong & Suebnusorn, 2018).

According to the category mentioned above, the SiF program is close to the adopted WBL program. The cooperation between learning and training places and pedagogical arrangements under the School-in-Factory program is illustrated in the following section.

1.3 School-in-Factory (SiF) Project at the Michelin Siam Co., Ltd. (LAEM CHABANG)

School-in-Factory, according to the Dual Vocational Education Center; DVEC (2017), is the initial form of vocational training in Thailand which was supported by the German government in 1984. The German government supported the Thai government in public relations and in the expansion of dual education (Mongkhonvanit, 2017, p. 5). Vocational training in the form of a School-in-Factory was implemented to train skilled craftsmen to meet the requirements of the enterprises and to save the government budget (DVEC, 2017, p., 7). The SiF project has achieved its goal of training the learners and later gained popularity. However, in the further development of Thai TVET, the SiF did not gain much recognition among practitioners. There is no official report of how and why the SiF was not popular for training qualified TVET manpower in Thailand. According to Ode-sri (2022), legal restrictions and lack of supporting regulations such as no legal obligation for involved partners (Educational institutes, industry federation & chamber of commerce, and industrial partners) have resulted in no cooperation between TVET colleges and the companies to support the implementation of work-based learning in the form of SiF.

School-in-Factory (SiF) Project at the Michelin Siam Co., Ltd. (LAEM CHABANG) was established in 2012 by the collaboration between the Thai's national policy office, a private company, and the university that is the National Science Technology and Innovation Policy Office (STI), Michelin Siam Co., Ltd., and Rajamangala University of Technology Lanna respectively. (Phalasoorn, 2017; Moonpa, et al., 2021). The university and private company are the two main stakeholders at SiF LAEM CHABANG in implementing the common goals for advancing human resource policies in manufacturing and service industries. Under this common agreement, the university is responsible for collaborating with the private, public, and also education sectors by focusing on educational management, research, resource development, and developing Work-integrated learning (WiL) methodology based on science and technology through participative action research with other partners. The private company supports Work-based learning venue, education fee, and administrators' management, and provide essential training equipment and training activity.

The SiF project teaches and trains the learners in the Industrial Technology program for two years. In this two-year diploma vocational training program, the workplace is the main training location while the university is the learning venue for the learners. Learners are employed as trainees in the company and are also registered students at the university. Since 2013, the SiF project has been successfully producing eight batches of qualified technicians and technologists. As it enters the 10th year of its implementation, this project serves as a model for various educational initiatives for the country and it also gets expanded to other industries. (Moonpa, et al., 2021.)

Moreover, the project aims to promote dual technical and vocational education and training. Although the concept of work-integrated learning in the school-in-factory setting bears similarities to cooperative education programs and employee scholarship initiatives, there is still a need for a system that emphasizes learning through

work to achieve tangible outcomes. Similarly, as recognized in the three handbooks of the STI there are problems in lacking qualified technicians and technologists (and practical engineers) (National Science Technology and Innovation Policy Office: STI, 2018). Therefore, the SiF was introduced to solve the problem by adopting the concepts of dual TVET, Cooperative Education, and scholarship. In addition, there is a strong demand for strengthening the collaboration between academia and industry from both adopted and industrial-led programs of WBL in Thailand.

This research is valuable in terms of informing public policy and projects of a similar nature. The objectives of this article are to share practical experiences (input and process) in implementing the SiF project and to explore the impact of the program through the experiences of the SiF graduates and their employers (output and outcome). As such, the study will analyze the program completion rate and the impact of the SiF project on the graduates' job performance in the labour market. Therefore, the research questions are:

1. What are the completion rates of the learners between academic years 2560-2563 (2017-2020)?
2. What are the impacts of the SiF project on the graduates' job performance in the labour market from the perspectives of the graduates and the employers?

This article refers to the 'Input', 'Process', 'Output', and 'Outcome' or the IPOO model as a general framework (Brown & Svensen, 1988, Heidegger, 2008, & Grollmann, et al., 2021). According to this model, the input covers all the arrangements preceding actual implementation. The process factors are those that are directly related to the intervention and the production of the targeted goals. Looking at evaluating the SiF project which has been implemented for ten years, the study mainly focuses on the output and outcomes of the project. Output, according to the IPOO model is the immediate results in terms of products created such as knowledge, skills and competences imparted to the learners. While "the medium-and long-term effects achieved through the use of the output are referred to as the outcome" (Brown & Svensen, 1988, Heidegger, 2008, & Grollmann, et al., 2021). Thus, the study analysed the completion rate and learners' performance in the labour market from their perspectives as well as from the employers. However, to provide a complete understanding of the pedagogical arrangements of the project, the input and processes are briefly mentioned in the introduction part of this article.

1.3.1 Input

Input is the arrangements preceding actual implementation that is teaching and learning of the school-in-Factory. In this article, input refers to learners, teachers & trainers, company, and Work-based learning places, curricula, timetable, financial resources, and regulation and laws which is explained in detail below.

- Learners: Learners in the SiF program have completed their prior education from both high school and technical and vocational colleges. Their ages range from 18- 19 years. They are mostly from the economically disadvantaged family from the northern part of Thailand. Therefore, these learners have a diverse educational background; vocational education and high school. Thus, these learners required additional training such as basic technical skills before joining the program. During the two-year educational program, these learners have the status of both employees and vocational students.
- Teachers & Trainers: Teachers and trainers in the SiF program consist of three different groups. 1. University lecturers from RMUTL, 2. In-company trainers from Michelin Siam Co., Ltd., and 3. Teaching assistants, research assistants, or facilitators who facilitate the learning process of the learners. In addition, it is also important to mention the technical teachers (from the university) who train the basic technical skills of these learners at the beginning of the SiF program (3 months of technical training before entering the company workplace).
- Company: Michelin Siam Co., Ltd. (LAEM CHABANG: LMC). The focus is only on the LMC site which consists of 2 factories: Michelin Moulding Solution (MMS) and Tire Manufacturing. However, there are more sites of the Michelin Siam Co., Ltd. In Thailand.

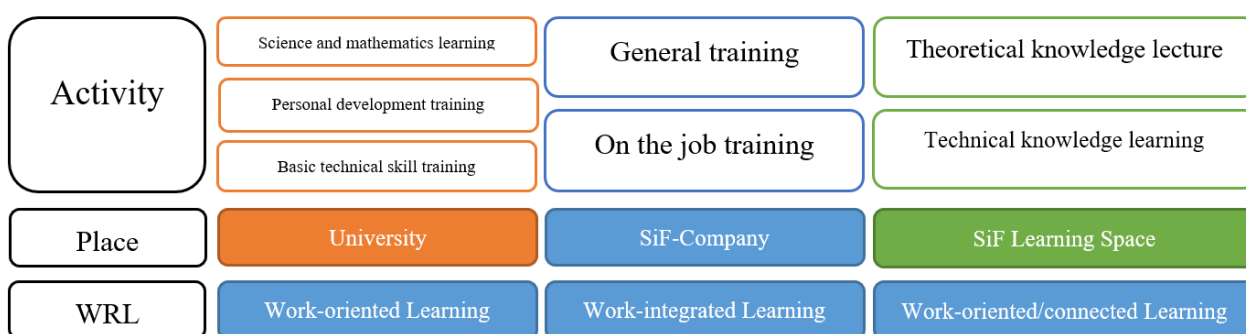


Fig. 2 Work-based learning places

- WBL places: WBL places are divided into three parts. Part I takes place in the initial period after the announcement of the selected learner. During this phase, learners need to build a foundation in science and mathematics, prepare themselves for the program, and develop basic technical skills through hands-on learning. Examples of such activities include technical drawing, bench work, basic sheet metal and welding, basic machine tools, basic electrical and electronics, and gasoline and diesel engines. In this part, RMUTL University provides learning/basic training, while the company supports the operations by providing materials and learning equipment. After completing part I, the learner proceeds to Part II, which involves training at the company to prepare them for the work-based training program. In this phase, the company takes responsibility for providing training in work processes, production tasks, technical aspects of manufacturing, organizational culture, in-company trainer roles, and learning in specific job positions under the supervision of team leaders. Part III involves classroom learning at the dormitory, where theoretical knowledge is delivered through lectures by university teachers. The learning process is enhanced through the integration of work-based learning presentations conducted by the facilitators. Additionally, a management system for student's well-being is established through weekly meetings utilizing the birdhouse methodology and utilizing the company's "SMQDCS" (Safety, Machine, Quality, Delivery, Cost, Standard) tools for management purposes.

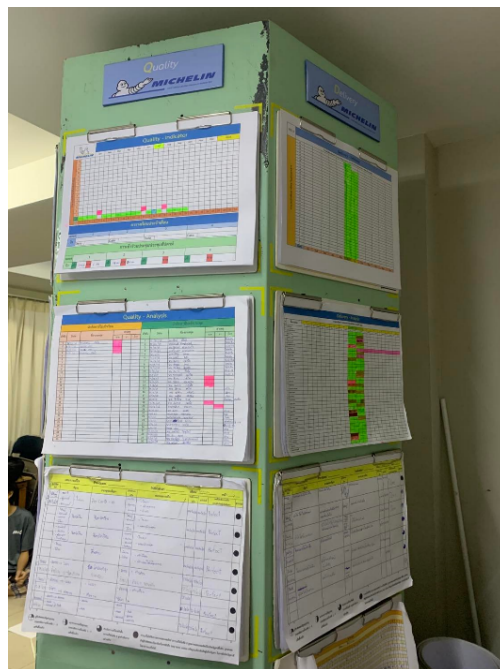


Fig. 3 The adapted concept of the "Birdhouse" process for the SiF LMC (Schlattmann, 2022)

- Curricula: From the academic year 2012 – 2022, the curricula diploma in Industrial Technology (2005) was used by RMUTL. Additionally, in 2021 RMUTL began to use the diploma in mechatronics and robotics which is the curricula developed by OVEC.
- Timetable: According to work-based learning, the time is divided into two periods that is working or on-the-job-learning and learning periods. The daily on-the-job learning period is limited to 8 hours, and learning inside classroom is 3 hours later. It is important to note that during the 8 hours of working, these students also learn something too through on-the-job-learning such as technical skills.
- Financial resources: The company contributes both in cash and in-kind. In cash, the company supports tuition fees, learning materials expenses, salary, travel expenses for students and facilitators, and remuneration for teachers and administrative staff. In-kind, the company provides a learning venue, uniform, personal protective equipment and safety equipment, accident insurance, health insurance, accommodation, and classroom.
- Regulations and laws: There are two main components of regulations and laws related to the SiF project. The first component pertains to working in the workplace and involves the utilization of Labour Protection Act and relevant regulations regarding the training and skill development of the workforce. This includes relevant royal decrees and ministerial announcements that specify the conditions for tax exemption on income earned by the company or corporate partnership. Additionally, there are agreements to be established between trainees and the company. The second component is the

management of education, which follows the regulations of the educational institutions responsible for the learners.

1.3.2 Process

The entire process of the SiF program begins with a joint meeting between the university and the private company to identify the demand from the company and the common objectives of the program. The completed processes can be divided into two main parts; the preparatory phase and working and learning period which is explained in the section below.

- (a) The preparatory phase with the recruiting and preparing processes, after the internal company meeting for planning human resources inside department, the company will collaboratively engage with the university. The recruiting processes involved several steps as shown in Fig. 4. Upon finishing the recruiting process, the university and company jointly facilitate preparation processes, which consist of two main components. First, there is a comprehensive training program designed to enhance fundamental technical skills or specific skills and uncover science-based technical knowledge. This training is conducted by senior teachers, experienced instructors, teaching assistants, or research assistants at the educational institution's workshop following the principles of Work-oriented Learning (WOL) for three months. Furthermore, this training incorporates daily life simulations close to the real-world scenarios like the concept of SiF. Later, the company provides a week-long training session addressing general topics such as company quality culture, safety cardinal rules, manufacturing process, instruments, etc. at the company.

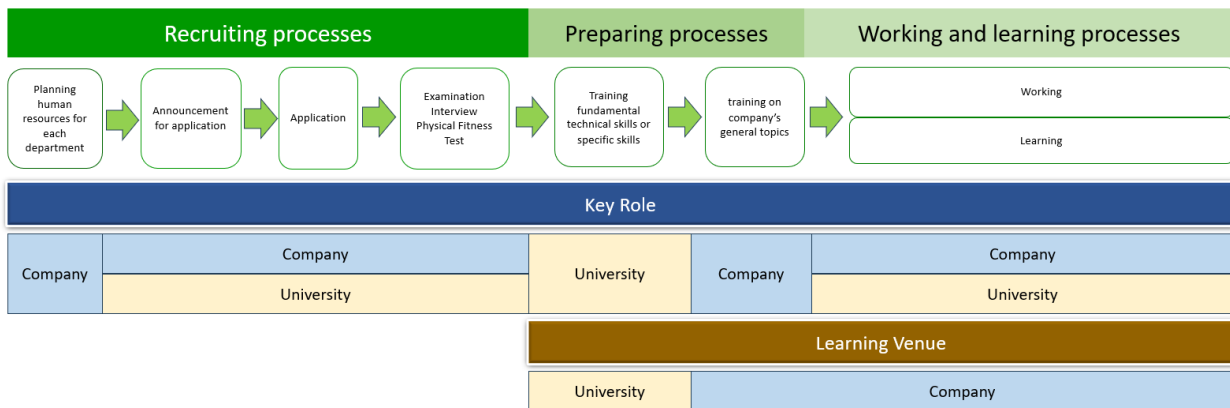


Fig. 4 Process of working and learning in SiF

- (b) The working and learning processes in SiF focuses on the principles of Work-based learning (WBL)/Work-related learning (WRL). The figure below illustrated the combination of WIL, WOL, and WCL in the SiF project. Work-integrated learning (WIL) occurred during working hours. The work procedures and training process of the learners in the company can be divided into two parts:

1. general principle and management tool in factory such as 5S, Safety, Management Development Program (MDP), principles of project management and project charter
2. Job training as shop floor at department in company such as production line, project design, purchasing, digital, maintenance department. Each of the learners is assigned to work at a different section throughout the working period without changing job position. After working hour, lectures that provides technical knowledge or basic principles that are related to work are conducted (Work-oriented learning; WOL) is implemented through lectures, and Work-connected learning (WCL) is done by work presentation as the main method.

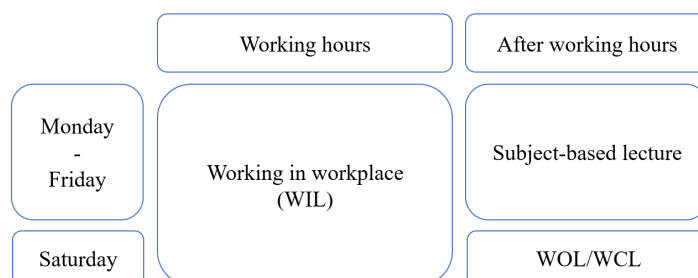


Fig. 5 Time for working and learning processes

For Learning assessment and evaluation, In the initial stage, the development of evaluation or learning assessment, a collaborative effort was made to design and enhance it to align with the standards of educational institutions and the industry. The principles were derived from the Michelin Standard which “SMQDCS” as Safety, Machine, Quality, Delivery, Cost, and Standard where university assess 35% based on classroom learning and exams, while companies evaluate 35% from practical work performance using the company's criteria, and the rest is from monthly presentation (20%) and personal behaviour (10%). (Chaiyong, 2020). Later, in 2022, the evaluation/assessment criteria were adjusted to align with the learning outcomes which focus on the competence level. The scores are divided into knowledge and skills based on the credit proportion of each subject, which is separated into theory learning credit hours and practical learning credit hours.

For ensure quality education management and foster connections between the industry and the education sector, joint meetings are held to present an overview of the project, challenges, lessons, and annual summaries. These meetings happen 1-2 times per year, aiming to enhance understanding and review project progress, and the plan. For urgent matters or specific issues, communication will occur based on a demand to address and resolve problems together with relevant stakeholders only. The following section explains research methodology.

2. Research Methodology

2.1 Research Designs

This research employed a mixed research methods approach because the aims are to 1) evaluate both the processes and the outcomes of the SiF program, 2) explain quantitative results with a qualitative follow-up data collection and analysis, and 3) augment experiments or trials by incorporating the perspectives of individuals (Creswell & Creswell, 2018, p. 341).

The explanatory sequential mixed methods, a two-phase design, is chosen for this study. According to Creswell & Creswell (2018), the main intention of this design is to “have the qualitative data help explain in more detail the initial quantitative results” (p. 347). In the explanatory sequential mixed methods, the initial data collection is quantitative data to find out the completion rate of the learners from the SiF program. The quantitative results are then analysed and used to further plan the qualitative data collection phase. The quantitative results (total number of graduates and their contact information) can then be used to identify the participants (Each participant is then asked to answer the questionnaires by informed consent process) and specify the types of questions for qualitative data collection. In the final stage, the results are interpreted on how qualitative data explains the quantitative results from the initial stage.

2.2 Data Collection Method

To examine the output of the SiF program, the quantitative data is collected by analysing relevant documents, and the qualitative data is collected from the open-ended questionnaires to explore the impacts of WBL or the outcomes of the project. The quantitative data shows the completion rate of the learners while the qualitative data explores the performance in the labour market from the perspectives of the graduates themselves and from the employers.

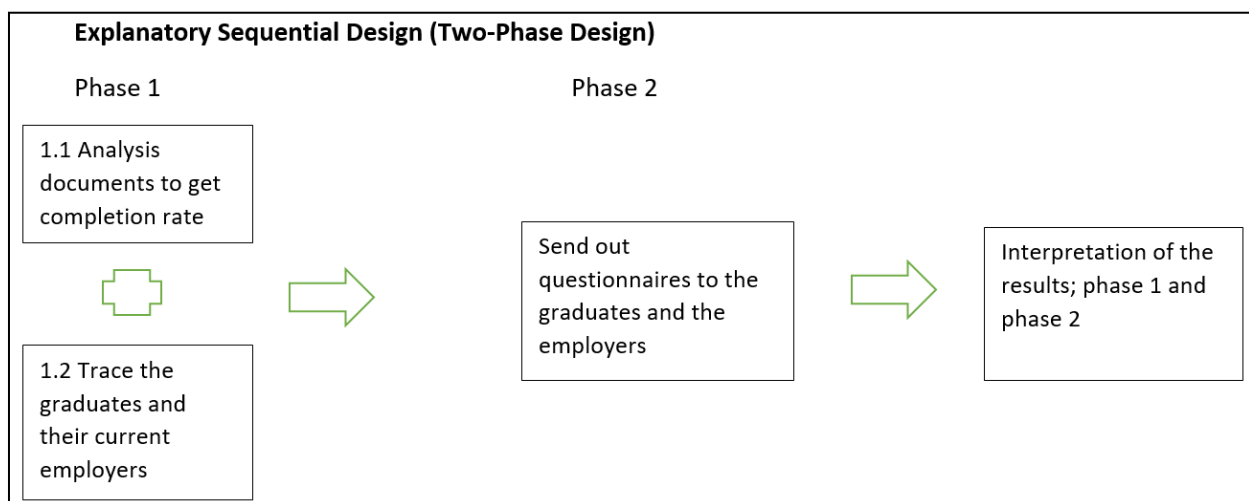


Fig. 6 Data collection procedures (Adapted from Creswell & Creswell, 2018, p., 343)

In the first phase, to find out the completion rate of the SiF program, relevant document analysis is employed. The relevant documents are the official project records from the RMUTL university and from the Michelin Siam

Co., Ltd. which included a Memorandum of Understanding (MOU), training contract, and students' registration report. Results, total number of graduates, from this phase are analysed and lead to the qualitative data collection in the next phase.

In the second phase, to explore the impact of WBL on job performance of the graduates in the labour market, two sets of open-ended questionnaires were created and sent to the graduates and the employers of the SiF program. The first questionnaire was created to find out the impact of WBL on job performance from the graduates. This questionnaire contains eight open-ended questions. The population is identified from the results of the first phase that is results from analysing the relevant documents.

The population is 100 graduates of the SiF program from the academic year 2017-2020. Out of these numbers, the contact was traced with the support from a teacher assistant or facilitators, teacher, and trainer from the company. These 100 graduates were asked to answer the questionnaire. Based on their availability and willingness, 20 responses were received. The second questionnaire was also created to find out the graduates' performance in the labour market from the perspectives of the employers. This questionnaire contains five open-ended questions.

The data is collected from the employers of the graduates from the two companies who mainly employed the SiF graduates. The questionnaire was sent to the representatives of these two private companies who supervise the SiF graduates, and nine responses were received. Due to travel restrictions during the Covid-19 pandemic, the research team was unable to conduct the face-to-face focus group interview with the representatives from the employers and the graduates.

2.3 Data Analysis Procedures

The data analysis procedures of this study are mainly divided into two parts; quantitative and qualitative data. For the completion rate of the learners, statistical analysis was used to find out the percentage of all learners who graduated from the SiF program in each year. Later, for the analysis of the results from questionnaires administered to the graduates and employers, the thematic analysis was employed by referring to the data analysis spiral proposed by Creswell (2007). To identify themes/categories according to the research questions, the following steps were included (Creswell, 2007, p., 148): 1) reducing the data into meaningful segments and name them, 2) combining the code into broader categories, 3) counting the frequency of the theme, and finally 4) displaying findings in graphic. The results of the analysis are shown in the following section.

3. Findings

3.1 Results of the Statistical Analysis

This section illustrates the completion rates of the SiF learners at the Michelin Siam Co., Ltd. (LAEM CHABANG) between the academic year 2017 - 2020. The result is shown in Fig. 7. The overall intake of students from the academic year 2560 - 2563 (2017-2020) is 117 learners, and 100 learners completed the program, which is 85%, and 15% is the dropout rate. The fluctuation in intake levels is contingent upon the specific requirement from the company. The highest intake of learners is in 2019 where 38 learners were accepted while a year later the total intake decreased to only 20.

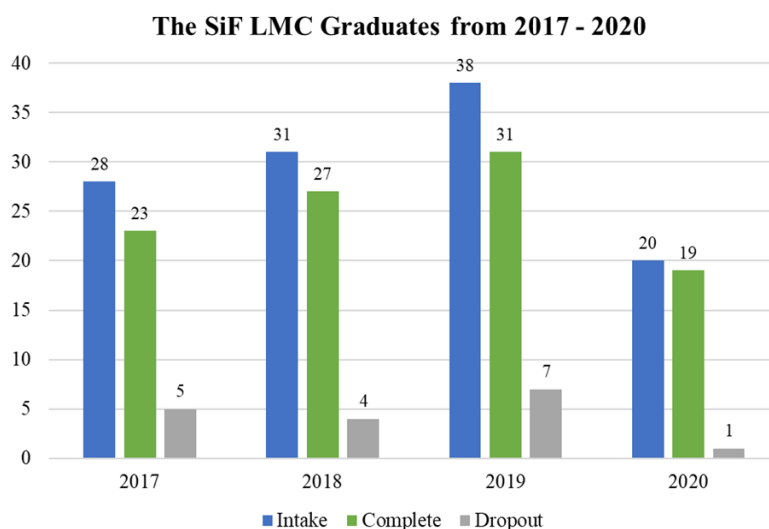


Fig. 7 Number of School-in-Factory Laem Chabang graduates (2017-2020)

From the collected data, it is shown that the highest completion rate is in 2020 with 95% and the lowest completion rate is in 2019 with 81%. In the year 2019, there are the most dropped out students with 19% while there is only 5% in the year 2020.

3.2 Results from the Open-ended Questionnaires

In this section, results of the study are divided into two parts that is the impact of the SiF from the perspectives of the graduates and from the employers which are illustrated below.

3.2.1 Impact of the SiF Project from the Perspectives of the Graduates

The questionnaire was sent to 100 SiF project graduates and 20 responses were received. From the perspective of the graduates, it is found that 70 % of them reported a positive impact of the WBL arrangements from the SiF program on their job performance, 25 % expressed negative responses, and 5 % were not sure. From the responses, it is shown that the most mentioned impact of the SiF project on the graduates' job performance in the labour market from the perspectives of the graduates is 1) knowledge of the work process, 2) ability to easily adapt to the workplace, and 3) valuable work experience gained during training with frequency of 8, 7, and 6 respectively.

For the knowledge of the work process, graduate 1 reported that he/she “understood the overall work process from several departments”. Additionally, graduate 6 further mentioned that he/she “learned specific technical knowledge and skills including mechanical tools, programs and also how to read the work plan in the factory”. However, graduate 11 showed a very critical perspective on this matter by saying that “the knowledge gained during training is not useful for the future work but rather applicable to the future study program”.

Moreover, the graduates also expressed a strong impact of the SiF program on their ability to easily adapt to their new workplaces. Graduate 5 reported that he/she is “easily adapted to the new workplace, and it is also easier for him/her to find a job”. Similarly, graduate 16 also mentioned that he/she “can immediately start working after employment and work together as a team with the new colleagues”. Finally, on the topic of work experience, graduates stressed the importance of work experience gained from the SiF program. Graduate 8 valued the work experience gained while graduate 19 specifically referred to the nice life experience. In addition to this, graduates 9 and 17 reported in a similar manner that “the work experience gained is useful. They can adapt and apply this to the new workplace. It also allows them to work promptly in the new workplaces”.

Nevertheless, some graduates do express different responses. These responses are rather negative experiences toward the SiF program. Graduates 18 and 20 reported that the learning and training of the SiF program has no impact on their job performance. Furthermore, graduates 2 and 14 pointed out their current job has no connection to their training at the SiF. Hence, there is no relevance between their training and work. Lastly, graduate 14 further showed his concern that the knowledge gained from the SiF program is not only not relevant to his work, but it also simply depressed him.

3.2.2 Impact of the SiF Project from the Perception of the Employers

The questionnaire was sent to the companies that employ the SiF graduates, and nine responses were received. Based on the responses from the employers, the impacts of the SiF project on the graduates' job performance in the labour market are 1) technical proficiency and job professional behaviour, 2) constructive communication and expression, 3) teamwork, and 4) job- related problem-solving skills with the frequency of 6, 3, 3, and 1 respectively. For technical proficiency and job professional behaviour, the employers reported that the SiF graduates showed job analytical skills and job professional and efficient manners. The SiF program has equipped these graduates with job readiness. Employer 1 mentioned that “these employees have received practical training, are familiar with the workplace environment, and have acquired basic training skill for their work tasks”. Regarding constructive communication and expression, the graduates showed creative expression, constructive opinion, constructive communication, and ability and willingness to learn at the new workplace. However, employer 4 mentioned that “a good workplace principles were not respected. Some of the employees use their mobile phones during working hours”. Concerning the teamwork of the SiF graduates, the employers mentioned that the graduates show social adaptability skills, and social integration, and act as good team members at the workplace. Lastly, on the job-related problem-solving skills, the employers reported that the graduates could solve the job-related problems. Employer 8 mentioned that “these employees have shown critical thinking ability and problem-solving skills related to their work tasks”.

The results of the qualitative data analysis, according to the four competencies mentioned earlier, can be presented that in 1) subject-oriented competence (Technical knowledge and skills) there are sub-topics such as knowledge of work process/knowledge, technical proficiency, and job professional behaviour, skills and knowledge acquisition, and lastly work experience. For 2) social competence, the sub-topics are the ability to easily adapt to the new workplace and teamwork. While sub-topics for the 3) individual competencies are

constructive communication and expression and workplace readiness. Finally, the sub-topics for the 4) methodical competence are job-related problem-solving skills and enhanced workplace experience.

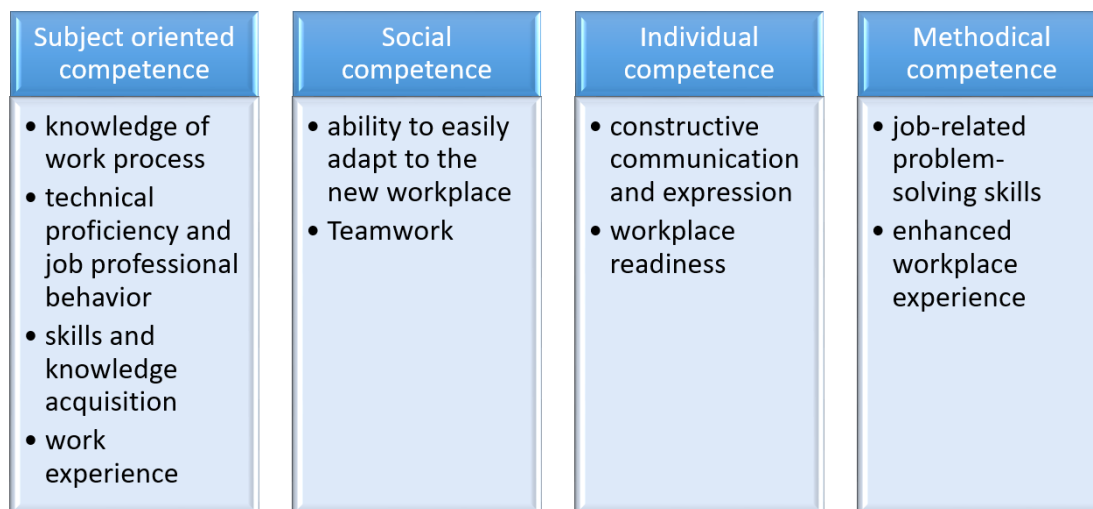


Fig. 8 The impacts of the School-in-Factory program

According to these categories, it is found that the subject-oriented competence that is technical knowledge and skills has the highest influence with the frequency of 24. For social competence, individual competence, and methodical competence are the consecutively less reported competencies with the frequency of 10, 5, and 2 respectively. Therefore, the impact of the SiF program has mostly contributed to the development of subject-oriented competence, that is technical knowledge and skills of the learners.

4. Discussion

This study aimed to evaluate the output and outcome of the SiF project in terms of quality enhancement. According to figure 8, it is implying that the technical knowledge and skills should be trained at the company where the learners are provided with the chance to train and experience the real world of work. When this is not possible, the learning process in the formal learning settings should best present the task and process of work according to the concept of work-oriented learning (WOL). As shown in the results, it is recognized that the combination of training at the workplace and learning in the classroom is highly recommended for TVET.

For the completion rate of the SiF graduates, 85% of the learners have completed the study program. In terms of its success, 85% is a very acceptable completion rate. This rate could be increased. Even though, we personally found that the combination of working and learning is rather stressful for the learners. Nevertheless, the specific reasons why the learners dropped out from the program should be studied. Workplace plays a significant role in promoting the competence development of the learners. We believe that to enhance the quality of the SiF project, it is necessary to rearrange the subject-based curriculum and have a closer look at how to systematically analyse and use the work process and work tasks for learning in formal or classroom settings. More effort should also be put on safety rules awareness inside the company. The question is how can experiential learning or experience from work be counted or recognised in the formal education scheme. Even though, culturally Thai students do not work to finance their education but rather depend on their parents or educational loans from the government. However, this form of learning and training arrangement should be further improved to support the production of qualified TVET manpower in Thailand.

After 10 years of its implementation, it is interesting to see that the SiF has shown its potential in facilitating joint responsibilities among relevant stakeholders in the industry, governmental body, and educational institutes where the company provides training venue, the governmental body provides policy support, and the university provides lecturers and experts. Importantly, the SiF program, as one of the WBL arrangements in Thailand, has promoted learning in the process of work by using the workplace as a place of learning. However, a face-to-face interview that was not possible due to travel restrictions during COVID-19 should be conducted to get a deeper understanding of the perception of the graduates and employers.

5. Conclusion and Implications

To summarise, it is shown that there were 100 learners out of 117 who completed the study program which accounted for 85% of the total number. The impact of the SiF program, as shown in this study, has mostly contributed to the development of subject-oriented competence, which is the technical knowledge and skills of

the learners. Thus, contributing to training competent TVET manpower and further development of WBL. Considering the number of all TVET graduates, this result may seem rather small. However, this has marked the beginning of further expansion of the project and the development of WBL in Thailand. Nevertheless, certain issues should be taken into consideration, such as the number of working and teaching hours and the drop-out rate among students. The focus should be put more on the concept of learning within the work process. Stronger collaboration between the university and company in aligning training and teaching curriculum where the number of study hours could be reduced.

To conclude, since its implementation, there have been a few hundred graduates from the SiF program. Even though the amount of graduates is quite small when compared with the total amount of TVET graduates at the same level in Thailand (approx. 666,000 in 2021) (Information Technology & Communication Center, 2023). Nevertheless, when these graduates enter the labour market, they do not require further training at the company and thus financial and personal investments are saved. Further research on the financial benefits is yet to be required.

Moreover, when one looks closely at the pedagogical arrangement of this program where various stakeholders (such as private companies, educational institutes, and governmental bodies) are involved in this operation, the SiF program has been successful in its implementation and promotion of work-based learning for Thai TVET. Thus, the SiF is enhancing Thailand's TVET system by further developing the "adopted programs" (a term coined by Choomnoon, 2012) by strengthening active relationships between partners with mutual benefits.

The SiF program, according to the guiding principle of the German dual system (BMBF, 2019; Fontdevila, et al., 2022 p., 601), has contribute to 1) the development of joint responsibility of the state, trade and industry, and the social partners, learning within the work process, qualified vocational education and training staff at companies and vocational schools including university. Work tasks and work processes should be analysed and integrated into the teaching curriculum for further development.

One of the missions of the RMUTL universities is to support and promote TVET colleges in Thailand in implementing dual vocational training through the WBL approach. So far, the success of WBL in Thailand still depends on the individual connection and the relationship with the private company for training the trainees/learning inside the company. Therefore, SiF at Laem Chabang is one of the starting points for the development of WBL to be more sustainable by strengthening the cooperation with private partners by training learners inside the company also and training the teaching staff as required by WBL arrangements. The great advantage of the SiF program is that it has been successfully implemented for ten years. The number of students in the project is still quite small. We suggest that similar projects should take place throughout the country. Based on this strong connection between RMUTL and Michelin Siam, the TVET college could be involved as another stakeholder from the educational partners in such a program. The RMUTL research team can assist another institute in implementing the same project as the SiF.

6. Limitations and Further Research Recommendations

The qualitative data collection of this research only included 20 graduates as participants. To gain a broader and better understanding, in future research, it is recommended to include more graduates as well as to conduct the face-to-face interview with graduates and employers. Further research should be conducted to find out the reasons why learners leave the program and to compare the performance of graduates from the SiF project with the graduates from the regular school-based TVET program.

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Conflict of Interest

The authors declare that there is no conflict of interest regarding the publication of the paper.

Author Contribution

*The authors confirm contribution to the paper as follows: **study conception and design:** Niwat Moonpa, Siriphorn Schlattmann; **data collection:** Patcharee Chaiyong; **analysis and interpretation of results:** Siriphorn Schlattmann, Patcharee Chaiyong; **draft manuscript preparation:** Siriphorn Schlattmann, Patcharee Chaiyong. All authors reviewed the results and approved the final version of the manuscript.*

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Article 6

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Developing the Tripartite Education System for the ASEAN Region: A comparative analysis of three variants of the School-in- Factory program at the Rajamangala University of Technology Lanna

Abstract

This study aims to further develop research on the Tripartite Education System (TES) for Thailand and the ASEAN region. The collaboration between governmental agencies, industries and education institutions (universities, technical colleges) in a Public-Private Partnership (PPP) has proven to be of benefit in achieving a workforce able to cope with the challenges of the labour market in an Industry 4.0 environment. However, there is still debate on how to organize the PPP specifically. This essay gives some insights into three variants of the Thai School-in-Factory (SiF) model implemented at the Rajamangala University of Technology Lanna, which will be called Collaboration A, Collaboration B and Collaboration C. The analyses are done by reviewing existing documents on the projects (such as Memorandums of Understanding), and the review will show similarities and differences in collaboration structure, elements and concepts, objectives, roles of educational institutes and industries, curriculum, and finally, criteria and processes for student selection. The three collaborations (A, B, and C) share similarities in collaboration structure, elements and objectives but differ in curriculum and student selection processes. Another difference lies in the process of selecting students to participate because Variant C does not include the participation responsibilities when the SiF was established. Despite these differences, all three collaborations involve the RMUTL acting as a facilitator between companies, educational institutions and the public. The findings of these comparative analyses will contribute to broadening the understanding of effective approaches while bridging the gap between academia and industry and preparing students for successful careers. Additionally, these analyses can be helpful as Thai best practices for the ASEAN region and especially the CLM countries.

Keywords: *Tripartite Education System, School-in-Factory, Public-Private Partnership, Collaboration, Comparative TVET Research*

1 Introduction

Vocational education encounters a challenge in how it traditionally readies people for jobs in the lower and middle skill levels. The specific problem arises from the decrease in medium-skilled jobs. While vocational education plays a role, it cannot solve this problem alone. This

issue requires economic and social strategies implemented by governments and social partners (Wheelahan & Moodie 2016). Developed within the framework of the tripartite system and involving technical and vocational institutes, employers, and the government, Thailand's dual education system aims to enhance its ability to cultivate a competitive workforce (Mongkhonvanit 2017).

Technical and Vocational Education and Training (TVET) in Thailand involves a collaborative effort among various stakeholders to ensure effective implementation and positive outcomes (OCED 2021, 108). Collaboration with TVET in Thailand typically involves the following three main partners. (1) The public sector: the Ministry of Education and relevant government bodies play a crucial role in setting policies, regulations, and standards for TVET. The collaboration among different public or government departments ensures a holistic approach to TVET, addressing various sectors and industries. (2) The educational sector: the collaboration between vocational schools, technical colleges, and universities helps create a seamless educational pathway for students. Establishing partnerships between educational institutions and industries is essential to aligning curriculum with industry needs. (3) The industry sector: collaboration with industry is vital for designing relevant and up-to-date curricula that meet the current demands of the job market. Moreover, industry-sponsored apprenticeships, internships and on-the-job training programs strengthen the connection between education and real-world applications (OCED 2021, 109).

However, the organizational structures and collaboration origin of the Tripartite Education System, within the Rajamangala University of Technology Lanna model (Moonpa et al. 2021), differ from (Mongkhonvanit 2017) in terms of partners. In the organizational structures and origin of the Tripartite Education System related to the the Rajamangala University of Technology Lanna model, collaboration is emphasized between the private and public sectors (partnership) and the education sectors (TVET College and University). This is achieved by establishing interconnected relationships, where the university, acting as the project manager and supporter, aligns the ideas and operations with the missions of each organization. This collaboration is evident through the Memoranda of Understanding (MoU) signed jointly from 2013 to 2018 and continues to the present. Challenges arising from the joint implementation include teaching and training learners to meet labour market demands, recruiting learners for employment in companies, aligning training with institutional regulations, establishing collaboration frameworks, communicating with partners, and other shared activities. Meanwhile, common problems include unclear communication and collaboration among partners, a lack of understanding of their roles and responsibilities, difficulties in supporting learners during training at companies with multiple locations, and a lack of social welfare. Despite these challenges, the government has opportunities to support the expansion of educational models, enhance mutual understanding and contribute to the country's workforce development in a unified direction.

Proposing to enhance collaboration among vocational schools, businesses, and government agencies within the Tripartite system structure is crucial for establishing a resilient model for

the Thai TVET learning system. However, in practice, this cooperative network is not implemented effectively (Permpoonwiwat & Chantith 2023).

The research on implemented collaboration between partnerships in Tripartite Education System provides insights into the perspectives, goals, responsibilities and relationships among organizations, particularly in developing the workforce to meet the specific needs of each partner. This study aims to find out the similarities and differences in three variants of School-in-Factory (SiF) in terms of collaboration structures, elements, concept and collaboration objectives, roles and responsibilities of each partner, curriculum, as well as the criteria /processes for student selection and participation. The following section will present some insights into collaboration. The first gives theoretical considerations and then the concrete collaboration in Thai's TVET system. Section 3 describes the methodology used in analyzing the three variants of SiF, while Section 4 presents the research findings. From these results recommendations are derived for a cooperative TVET in Thailand and the wider ASEAN region.

2 Literature review

2.1 Collaboration theoretical

According to Chrislip and Larson (1994), Collaboration extends beyond communication, cooperation, and coordination. Its roots in Latin, "com" and "laborare," signify "to work together." It represents a mutually beneficial relationship among two or more parties, sharing responsibility, authority and accountability to achieve common goals. Collaboration goes beyond just sharing knowledge and information (communication) or assisting each party in reaching its own goals (cooperation and coordination). The primary purpose of collaboration is to create a shared vision and collaborative strategies to address concerns that surpass the scope of any individual party (Chrislip & Larson 1994, 5).

The character of collaboration differs in cooperation and coordination according to the 3C's continuum. Collaboration is defined by strong and closely interconnected relationships. Participants understand that to achieve results, they must be willing to significantly change how they think, behave, and operate. Collaboration involves more than just making small adjustments; it requires transforming systems. This means participants are engaged in a challenging, high-risk and unpredictable environment that can produce outcomes quite different from the original intentions. Successful collaboration demands a high level of trust and extensive communication among participants. Although it involves risks, those willing to take them may find it highly rewarding. In a collaboration, the usual way of doing things ("business as usual") is no longer sufficient. Participants must establish new connections and adopt new approaches to interact with each other (Keast & Mandell 2013; Gray 1989).

Collaboration is a challenging process, and its likelihood of success relies on several prerequisites: purpose, basic requirements, process and environment, as well as resources, rewards, commitments and responsibilities (Wolff 2005). The driving force is the anticipation

of achieving outcomes that would be unattainable if the parties worked independently (Luis & Hamideh 2008).

2.2 TVET Education Collaboration in Thailand

The dual education system in Thailand was initiated in 1984 with support from the German government. The Siam Cement Group collaborated on the initial project for the Department of Vocational Education. In 1989, the Ministry of Education authorized a pilot curriculum in factory maintenance supported by Gesellschaft für Technische Zusammenarbeit (today GIZ). In 1991, dual systems were implemented at Minburi Technical College, Samut Songkhram Technical College, and Rayong Technical College. In 1992, the name of the educational management system, "School-Factory (Dual System)", was changed to a system where students received a Skilled Worker Certificate upon graduation and were allowed to work in companies. Between 1995 and 1998, the context shifted towards the Dual Vocational System. The focus was on public relations to build understanding as well as the development of teachers, instructors in enterprises, and experts. In 2002, the Ministry of Education permitted apprenticeships for half of the students in the educational program. From 2008 until the present, Dual Vocational Education has been a form of technical and vocational education and training agreements between educational institutions and the private sector. In 2014, dual education was integrated into the national agenda to enhance the quality and quantity of technical and vocational education (Mongkhonvanit 2017; Dual Vocational Education Center 2017).

In 2014, a survey conducted by the SCB Economic Intelligence Centre among 222 companies in six key sectors in Thailand revealed that 53% of employers encountered difficulties filling job vacancies within three months (OECD 2020). The challenge is most pronounced when seeking workers with vocational degrees, with a shortfall of 23% of the total workers required. This hiring gap exceeds that of university graduates (14%) and individuals with a high school education or less (11%). Various factors contribute to employers' difficulties filling vacancies, including high labour demand (56%) and a mismatch between available and required skills (47%) among Thai firms. An analysis of Thailand's skills system by Chalapati and Chalapati (2020) confirms the shortage of vocationally skilled workers, resulting in labour market shortages. Interviews conducted by the OECD team with Thai government representatives further confirmed the lack of relevant vocational skills, particularly the shortage of skilled technicians and operators in the industrial sector, partly due to impractical VET programs despite attempts to update them (OECD 2021).

Since 2014, the Thai Government has been working on reforming the vocational education and training (VET) system. This effort aims to meet industry needs, enhance productivity, improve graduates' employment prospects, and better match skills training with labour market demands. The Office of the Vocational Education Commission (OVEC) under the Ministry of Education is tasked with establishing standards and curriculum for VET teaching and learning (Australian Government 2020).

According to Chalapati and Chalapati, collaboration between vocational providers and industry is crucial to building a vocationally skilled workforce. They identify five key policies for these: (1) government commitment to expanding the vocationally skilled workforce, (2) fostering collaboration between vocational colleges and industries, (3) enhancing the involvement of private vocational providers, (4) promoting a favourable perception of vocational education, and (5) ensuring the ongoing implementation of policies (Chalapati & Chalapati 2020, 1-2).

2.3 School-in-Factory in the context of collaboration under Tripartite Education system

Due to its close connection with general and academic education and the workforce, vocational education requires collaboration and coordination with other sectors. Effective collaboration and coordination can be attained by involving vocational education in a social dialogue with social partners (Wheelahan & Moodie 2016).

The “School-in-Factory” (SiF) model was established in 2012 in collaboration and coordination between the private company Michelin Co. Ltd., a public agency National Science Technology and Innovation Policy Office (STI Office) and the Office of the Vocational Education Commission (OVEC) with the education sector as implementation actors namely Sattahip Technical College and Rajamangala University of Technology Lanna. The primary purpose of the collaboration was to solve the problem of the shortage of qualified technicians and research engineers, contributing to a decrease in employee turnover and an increase in the country's productivity (Phalagoon 2017). Meanwhile, the concept of collaboration in the Tripartite education system has been initiated (Moonpa et al. 2021). In other words, SiF is a dual system and Work-integrated Learning approach (Phalagoon 2017). According to the Secretariat of The Senate (2020), Work Integrated Learning is an educational approach that integrates academic learning with practical work experience.

Similar initiatives may exist in Thailand, such as cooperative education, apprenticeships, internships, and fieldwork (iSchool KKU 2019), although the specific details and implementation can vary. These programs aim to bridge the gap between academic learning and practical skills, ultimately better preparing students for the workforce.

At the higher education level, which includes TVET, work-integrated education is categorized into nine groups. These activities are divided based on the period before entering study, during study, the end of studies, and before graduation. This organization aligns with the guidelines for structuring education integrated with work, considering the relationship with the learning venue: pre-course experience, sandwich course, cooperative education, joint industry-university course, fieldwork, cognitive apprenticeship or job shadowing, placement or practicum, new traineeship or apprenticeship, and post-course internship (Higher Education Network: Upper Southern Division 2018; iSchool KKU 2019).

3 Methodology

This article employed pragmatic content analysis and relevant document analysis. Pragmatic content analysis is a qualitative research method that focuses on analysing textual data to identify patterns, themes, and meanings within the content. It is considered pragmatic because it involves a flexible and adaptable approach to data analysis, allowing researchers to tailor the analysis to the study's specific research questions and objectives (Ramanadhan et al. 2021).

Figure 1 below presents the results in the form of a summary analysis (Gläser & Laudel 2019; Gläser-Zikuda et al. 2020) by collecting data from field data collection on 7 Memoranda of Understanding (MoU) between the cooperation of RMUTL, private companies and TVET College between 2013 until present (see Fig.1 below). The content analyzed is divided into (1) Collaboration structure, elements, and concept; (2) Collaboration Objectives; (3) Role and responsibilities; (4) The curriculum (5) Criteria/processes for student selection and participation.

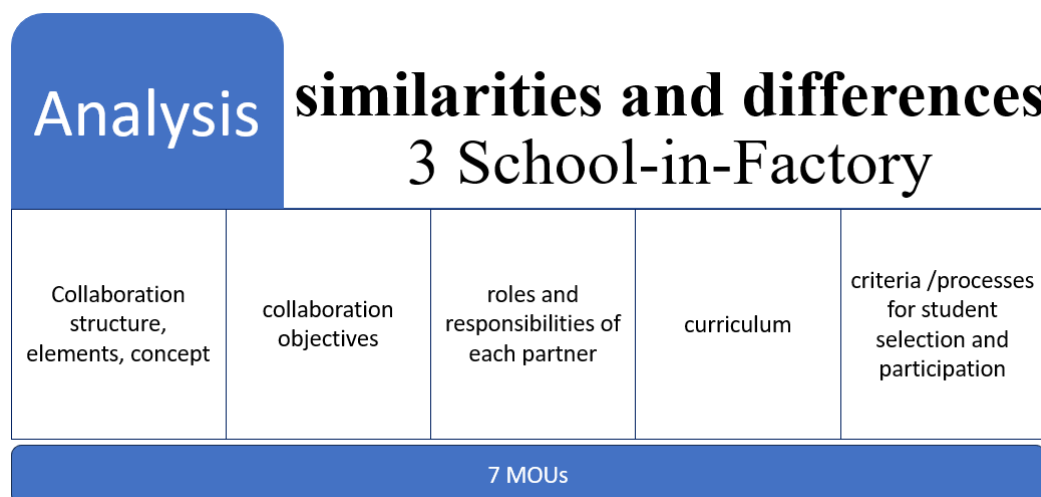


Figure 1: Analysis framework

Table 1: 7 Memorandum of Understanding

No	Partnership in MOU	Schedule time
1	- National Science Technology and Innovation Policy Office (STI office) - Office of Vocational Education Commission - Rajamangala University of Technology Lanna - Michelin Siam Co., Ltd.	21 May 2013 – 21 May 2018
2	- National Science Technology and Innovation Policy Office (STI office)	16 September 2017 – 16 September 2020

	- Rajamangala University of Technology Lanna - Michelin Siam Co., Ltd.	
3	- Rajamangala University of Technology Lanna - Michelin Siam Co., Ltd. LMC	14 September 2020 – 31 July 2022
4	- Rajamangala University of Technology Lanna - Michelin Siam Co., Ltd. LMC	5 October 2022 – 30 July 2023
5	- Rajamangala University of Technology Lanna - Michelin Siam Co., Ltd. LMC	25 July 2022 – 30 April 2024
6	- Rajamangala University of Technology Lanna - Nuovo Plus Co., Ltd. - WRENCHRE Special Tools and Services Co., Ltd.	23 May 2022 – 31 May 2025
7	- Rajamangala University of Technology Lanna - S.V.S Air Engineering Co., Ltd. - San Kamphaeng Technical College	1 June 2023 – 1 June 2028

We will not mention the government sector because the education and the private sector are the implementation agencies that follow government policy. This approach helped to explore insights into collaborations, partnerships, relationships, and industry linkages between training providers and employers.

4 Findings and discussion

These findings were documentation analysed from 7 Memoranda of Understanding during the period 2013 to 2028 and are divided into: (1) Collaboration structure, elements and concept; (2) Collaboration Objectives; (3) Role and responsibilities; (4) The curriculum; (5) Criteria/processes for student selection and participation.

This section refers to collaboration between Rajamangala University of Technology Lanna and Michelin Siam Co., Ltd. (hereinafter referred to as Collaboration A), Collaboration between Rajamangala University of Technology Lanna, Nuovo Plus Co., Ltd. and WRENCHRE Special Tools and Services Co., Ltd. (hereinafter referred to as Collaboration B), Collaboration between Rajamangala University of Technology Lanna, S.V.S Air Engineering Co., Ltd., and San Kamphaeng Technical College (hereinafter referred to as Collaboration C).

4.1 Collaboration structure, elements, and concept

The collaboration comprises private companies, the education sector represented by Rajamangala University of Technology Lanna (RMUTL), and TVET colleges. RMUTL serves as an intermediary liaison between companies, the education sector, and the public policy sector. The concept of collaboration in the "School-in-Factory" or "Tripartite Education System" was initiated in 2012 and implemented in the TVET system in 2013, and it continues to operate in various collaborative forms.

The Tripartite Education System is a collaborative approach involving three primary stakeholders: educational institutions (universities or vocational colleges), companies, and government agencies or relevant public bodies. The SiF concept denotes an educational management system akin to a boarding school, where instructors assume multiple roles. These instructors are referred to as "Research Assistants/Teaching Assistants," and their primary responsibility is coaching and mentoring.

The collaboration structure is unique to each organization, with RMUTL serving as the central facilitator in coordinating the collaboration between companies and educational institutions. The collaboration management is divided into two main components: 1) collaboration management and 2) curriculum management according to educational regulations and laws. Figure 2 below illustrates the collaboration structure.

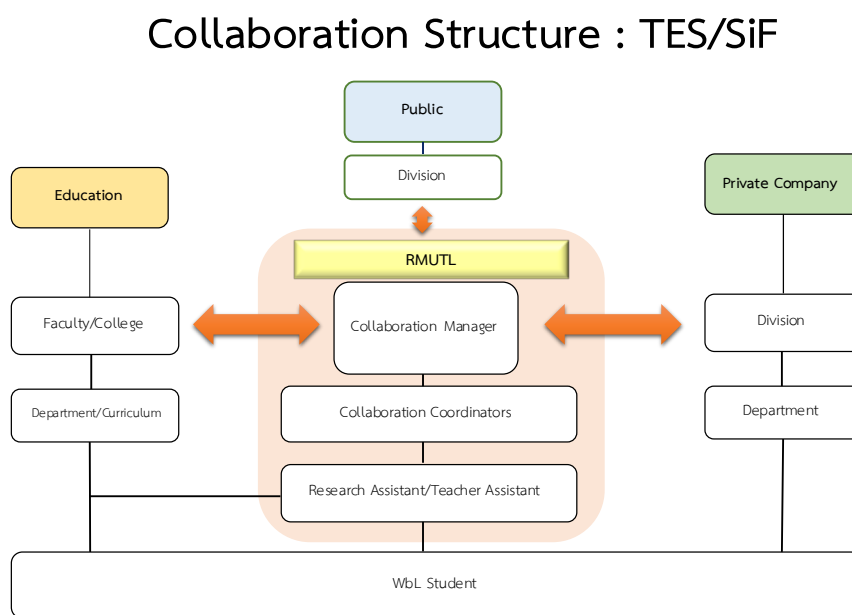


Figure 2: Collaboration structure of Tripartite Education System and School-in-Factory (Moonpa & Chaiyong 2021)

The elements of collaboration management comprise:

- Collaboration Managers, whose primary responsibilities involve communication, coordination, and facilitation of collaboration with relevant stakeholders (private companies, TVET colleges, universities, etc.).
- Collaboration Coordinators, who assist the Collaboration Managers.
- Research Assistants/Teaching Assistants, who are graduate students serving as dedicated instructors for the collaboration.
- Participating Students, who are TVET or undergraduate students enrolled in the collaboration.

In the curriculum management aspect, the Curriculum head takes the leadership role in managing teaching and learning processes in accordance with the regulations and laws of education. Consequently, the organizational structure of the three collaborative models employs a functional organizational structure and a matrix organizational structure.

4.2 Collaboration Objectives

Between 2013 and 2020, the primary objective was to promote deep cooperation between industry and educational institutions to jointly develop technical and technological human resources, including skilled technicians, technologists, and industrial researchers in science and technology fields. The collaboration aimed to strengthen the workforce by producing high-quality personnel who could meet industry demands. The goal was to create and develop models for integrated teaching and work practices in technical and technological workforce development, with the potential for broader implementation to enhance the quality of vocational education.

From 2020 to 2024, the emphasis shifted towards tripartite education management objectives through work-integrated learning approaches. The focus was on fostering research collaborations between companies and universities to develop human resources with learning outcomes and competencies aligned with industry needs.

Initially, the overarching objective was to promote deep cooperation involving public agencies, universities, and industry to create pilot project models for practical implementation in workforce development across all levels, catering to the demands of various industries.

4.3 Role and responsibilities

4.3.1 Public

Between 2013 and 2020, the role of the public sector, represented by the National Science Technology and Innovation Policy Office (STI office), was to initiate and support the development of technicians, technologists and industry researchers (mentors) to acquire competencies aligned with industry needs. This involved supporting and coordinating cooperation among relevant government agencies, industries and educational institutions. Policy-oriented studies and research were conducted to inform future project expansions. The Office of Vocational Education Commission managed teaching according to agreements,

collaborated in curriculum development, established assessment criteria, and evaluated the development of technical and technological personnel.

4.3.2 Private sector

The private sector's main responsibilities were preparing work training and learning venues for students, planning, and facilitating integrated learning-work management, collaborating in curriculum development, establishing assessment criteria, evaluating the development of technical personnel, conducting crucial skill development activities for students, such as practical skills training for work purposes, and evaluating work performance.

4.3.3 Education sector

The Tripartite education system model involved two educational partners: universities and TVET colleges, whose roles and responsibilities were mentioned in Section 4.1. Parties collaborated on curriculum development, assessment criteria, and personnel evaluation, and also planned teaching tools, selected students, developed teaching staff, appointed project leaders, managed teaching, supervised work experiences, and promoted academic, vocational, ethical and moral training. They ensured education quality, supported graduate employment, and evaluated overall performance.

4.4 The curriculum

The curriculum was divided into two levels: (1) at the vocational education level, initially, teaching was managed in the diploma in industrial technology program by a university in collaboration A during 2013 – 2020. In 2022, the dual education system was used in collaboration B and utilizing the diploma in mechatronics and robotics program of OVEC. However, education management was conducted by the university. Additionally, the dual-TVET education system was used in collaboration A also, employing the diploma in mechatronics and robotics program managed by a TVET College alongside education management at the undergraduate level with modern agricultural machinery by the university. This continued in the same manner in 2023. (2) Initially, the mechanical engineering program was used at the graduate level, and electrical engineering was added in 2023.

Creating and developing students to meet industry needs requires a partner well versed in TVET. As a university originating from TVET, RMUTL comprehends the TVET philosophy and maintains a robust connection with industry. Thus, RMUTL is a crucial player in project and curriculum management.

4.5 Criteria/processes for student selection and participation

In the initial phase, student selection follows agreements between both parties, but the specific number of students is primarily determined by the company. High school and/or vocational certificate students who are about to graduate are selected through written exams in mathematics, English, and general knowledge. They then undergo interview processes and

physical competency tests. This process is carried out in collaboration A and B, where companies and educational institutions work together. For collaboration C, the time for student recruitment and selection has passed, which means the company did not participate in the student selection process.

This shows that the university and company are mainly responsible for initial student selection processes. On the other hand, the company is mainly responsible for demand requirements. In summary, the key aspect is the implementation with industry partners who understand the sector and can focus on developing the entire system of the Tripartite education system or School-in-Factory (SiF). This approach promotes the advancement of TVET college teachers by involving them in collaboration and supporting their development through graduate programs. However, learning from the best practices of the tripartite education system or SiF extends beyond education. It requires understanding the management system, teaching management, teacher training systems, student training systems, student care, and measurement and evaluation. Additionally, it involves continuous improvement to meet the workforce development goals of Thailand 4.0.

5 Recommendations for further development of the Tripartite Education System in Thailand and the ASEAN

Based on a comprehensive analysis of the tripartite education systems implemented in the three distinct SiF collaborations, the three collaborations share similarities in the collaborative theoretical model. They represent a relationship with three partners who focus on a goal with different roles and responsibilities.

In conclusion, the tripartite education systems implemented in the SiF collaborations demonstrate innovative approaches to bridging the gap between education and industry. Despite challenges, these collaborations have contributed to workforce development, enhanced educational quality, and fostered closer ties between academia and the private sector. Moving forward, continuous evaluation, stakeholder engagement, and adaptation to evolving industry trends will be crucial for sustaining the success of these collaborative models. The following recommendations can be made for further development of the Tripartite Education System in Thailand and the ASEAN region. See Fig. 3 below for recommendations for TES/SiF.



Figure 3: Recommendations for further development of TES/SiF

However, in future, research work should present (a) a more methodological approach to measuring social impact on each sector; (b) an in-depth exploration of how to evaluate the outcome and impact of SiF; (c) an in-depth analysis of costs and benefits would be very useful to students, all partners and a sustainable education system; (d) the tangible benefits of adopting a collaborative working approach.

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Declaration of my contribution to the articles published within this doctoral dissertation

The topic of my dissertation was collaboratively formulated and suggested to me by Assistant Professor Dr. Niwat Moonpa and Professor Dr. Dr. Thomas Schröder.

All six articles in this dissertation utilize data from the SiF and Tripartite Education System projects, which are Thai government model projects in work-based learning that have been implemented since 2012 at Rajamangala University of Technology Lanna (RMUTL). Additionally, from the joint international research project “Progressing Work-based Learning of TVET System in Thailand” (ProWoThai), funded by the German Federal Ministry for Education and Research (BMBF) from 2019 to 2024.

Presentation of my contribution to the writings of the presented articles:

Article 1:

Phalasoorn, S. (2017). School in Factory (SIF): an approach of Work Integrated Learning in Thailand. In: *TVET@Asia*, issue 9, 1-11. Online: https://www.tvet-online.asia/issue9/phalasoorn_tvet9.pdf (retrieved 30.06.2017).

Conception: mainly provided by Assistant Professor Dr. Niwat Moonpa

Formulation of the text parts: complete

Literature review: complete

Data collection: with support from Assistant Professor Dr. Niwat Moonpa

Data analysis and interpretation of the results: complete

Discussion of results: complete

Article 2:

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Literature review: with support from Julia Gulich

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Data analysis and interpretation of the results: complete

Discussion of results: complete

Article 3:

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Article 5:

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Article 6:

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Data analysis and interpretation of the results: complete

Discussion of results: complete

Erklärungen

Hiermit versichere ich **schriftlich** und **eidesstattlich** gemäß § 11 Abs. 2 PromO v. 08.02.2011/08.05.2013:

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