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Developing the potential of work-based learning: New challenges in Thailand's TVET system and the public-private partnership at Rajamangala University of Technology Lanna

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ABSTRACT

This study examines the role of work-based learning (WBL) in meeting the evolving demands of Industry 4.0 and digital transformation within Thailand's Technical and Vocational Education and Training (TVET) system. It assesses the current state of WBL implementation in Thai TVET and proposes models to enhance its effectiveness. Using a qualitative approach, the research focuses on two public-private partnership models at Rajamangala University of Technology Lanna (RMUTL): the school-in-factory (SiF) model and the Tripartite Education System. Insights were gathered through semi-structured interviews with five TVET experts, identifying key areas for WBL improvement. Despite increased recognition of WBL in Thailand, challenges remain, including limited industry engagement, inadequate infrastructure, and insufficient teacher training. The study emphasizes the need for stronger public-private partnerships, greater industry participation, and ongoing enhancement of WBL programs. The findings provide valuable insights for policymakers, educators, researchers, and industry leaders in Thailand and the ASEAN region. By advancing effective WBL models, such as the SiF model and the Tripartite Education System, Thailand can cultivate a skilled workforce essential for economic growth and innovation. Furthermore, the study highlights the importance of ongoing evaluation and improvement to ensure that WBL programs remain relevant and effective in the dynamic context of Industry 4.0.

Contribution/Originality: This study investigates the potential of WBL in addressing Industry 4.0 challenges within the Thai TVET system. Focusing on two specific public-private partnership models and conducting in-depth qualitative research provides actionable insights to enhance WBL implementation and workforce development in Thailand and the broader ASEAN region.

1. INTRODUCTION: PROGRESS AND DELAY IN THAILAND'S TVET

Work-based learning (WBL) is a widely recognized approach in technical and vocational education and training (TVET), famous for fostering creativity and innovation—skills essential to national development strategies amid digital transformation and Industry 4.0 (Billet, 2021; Cedefop, 2015; Interagency Group on TVET, 2017). In Thailand, current initiatives, including Thailand 4.0 and the Eastern Economic Corridor (EEC)[1], underscore the need for a workforce that is not only creative and innovative but also capable of driving transformative change towards advanced industrialization (OVEC (Office of Vocational Education Commission), 2017). Here, WBL is theoretically

[1]Both programs cannot be explained in detail. See the informative interview to the Secretary General of the Thai Office of the Vocational Education Commission (OVEC) in: The Nation, Thailand, July 13, 2020. URL: https://www.nationthailand.com/business/30391235516 (July 16, 2023).

promising as a strategy to cultivate precisely these competencies, aligning with the objectives of Thailand 4.0 (Gennrich, 2017).

Despite strong efforts from government agencies (such as the Office of the Vocational Education Commission, OVEC, and the Office of National Higher Education Science Research and Innovation Policy Council, NXPO) alongside the TVET sector, including institutions and administration, and some private industries, Thailand's work-based learning (WBL) implementation remains limited. The current approach has yet to realize WBL's full potential, leading to both a lack of quality and an insufficient number of WBL programs.

This limitation is partly attributable to the fact that WBL initiatives in partnership with industry largely rely on individual efforts. Universities in major cities, often collaborating with international firms, find it easier to implement such programs compared to vocational colleges in rural areas, where enterprise opportunities are limited. Additional challenges include a lack of industry engagement, due to insufficient public support, inadequate training equipment, a shortage of qualified instructors, and particularly, limited financial resources—issues that are especially pronounced in rural regions.

Despite these challenges, Thailand hosts successful WBL projects that illustrate the potential of industry-oriented TVET. Notably, two programs at Rajamangala University of Technology Lanna (RMUTL) – the School-in-Factory (SiF) initiative and the Tripartite Education System – highlight the effectiveness of strong private sector support, largely motivated by the industry's demand for a skilled workforce. This study argues that sustained corporate engagement, alongside continued governmental backing, including the establishment of a new research center for TVET (RCTVET) at RMUTL, are critical factors underpinning the coordination efforts of the TVET hub at this institution.

It is important to acknowledge, however, that these seemingly successful implementations may not fully harness the potential of a comprehensive WBL approach and may represent isolated cases rather than standard practice within Thailand. While this analysis does not overlook the advancements achieved in Thailand's TVET system over the past two decades, it raises concerns about whether the current state of WBL can adequately produce the highly skilled graduates required for Thailand's ambitious development goals. There remains a concern that the most innovative aspects of WBL have yet to be fully integrated into Thailand's TVET framework.

Chapter 2 will portray the WBL approach as a complex method of learning, which is much more than only "elaborating competencies in a practical setting". Rather, work-oriented or work-related learning facilitates a holistic acquisition of professional competencies, contributing not only to the learner's professional and personal growth but also to the return on investment for companies and society's capacity to address economic and social challenges. From this perspective, WBL transcends basic skills acquisition in workplace contexts; indeed, some scholars suggest that WBL possesses an emancipatory potential, empowering learners in profound ways.

Chapter 3 provides an in-depth examination of Thailand's TVET system, with particular emphasis on dual vocational education (DVE) as a primary setting for WBL. Compared to other ASEAN countries, Thailand's system is relatively advanced and includes best practice models, such as those discussed in this study. However, Thailand's recent history as a developing nation continues to shape its approach, resulting in a well-developed yet not fully comprehensive formal TVET system. This system includes key actors who actively promote WBL and support dual vocational education, though disparities persist. In certain regions, WBL programs are absent, with training limited to classroom settings, while others attempt work-related learning yet face significant resource and equipment constraints. To gain relevant insights into the partly hidden conditions of TVET in actual Thailand semi-structured interviews with five highly regarded TVET experts were employed.[2]

[2] Online interviews with six open-ended questions were conducted to explore the current challenges of implementing WBL programs in Thailand's TVET system. The author is aware of the fact that this data basis has to be expanded for further work.

In contrast to the broader state of WBL across much of the country, certain projects are advancing toward models that could serve as best practices within Thailand's TVET system and the ASEAN region. *Chapter 4* discuss two such initiatives: the School-in-Factory (SiF) and the Tripartite Education System at RMUTL. These examples[3] demonstrate that effective WBL implementation centers on collaboration between educational institutions (universities and TVET colleges) and industry partners (Moonpa, Sonthanapitak, & Daroon, 2022). However, they also illustrate the need for a balanced partnership among education, industry, and government within public-private collaborations to fully realize WBL's potential.

The concluding *chapter 5* emphasizes that establishing a WBL best practice model for Southeast Asia necessitates, above all, the development and institutionalization of autonomous vocational education research at a supranational regional level, along with the widespread dissemination of collaborative outcomes. This essay underscores the significant progress made by RMUTL projects toward sustainable WBL implementation, particularly through participation in the German Ministry of Education and Research (BMBF)-funded project "*Progressing Work-based Learning in Thailand's TVET-System*" and the founding of its research institute in 2020. However, notable challenges persist, including noticeable inequalities. The TVET landscape markedly declines outside central regions, where universities and major international firms are concentrated. Ultimately, realizing the comprehensive WBL model outlined in Chapter 2 requires substantive sociocultural changes within Thai society.

2. BECOMING A COMPETENT PROFESSIONAL WITH AUTHENTIC WORK PROCESSES – THE WBL CONCEPT

This section provides insights into the work-based learning (WBL) concept, which has gained substantial global recognition as a practical complement to traditional, theory-centered classroom education, underscoring the significance of experiential learning ("WBL is learning at the workplace") (see again (Billet, 2021; Cedefop, 2015; Interagency Group on TVET, 2017); additionally see Zhao (2016)). WBL must be distinguished from simpler work-integrated learning (WiL) models, which often adopt a narrower educational scope. Unlike programs characterized by extensive work hours supplemented by brief company-based sessions or isolated skill-focused courses, such as a four-week welding course, WBL aims for a more comprehensive integration of practical experience into the educational process. Here, the workplace serves as a primary learning environment, fostering both professional and personal growth.

A comprehensive WBL concept entails the development of a wide array of technical and social competencies through engagement in complex work processes. From a more philosophical perspective, one might argue that external work processes, beyond individual control, equip learners with essential vocational and social competencies and, under appropriate conditions, promote autonomy and (critical) self-reflection. The overarching goal of TVET, as articulated by the German Vocational Training Act (Federal Ministry of Education and Research (BMBF), 2020) is the development of "(ganzheitliche) berufliche Handlungskompetenz" (holistic vocational action competence). This framework envisions an educational process that fosters an autonomous, socially responsible, and emancipated individual within the vocational context. However, WBL inherently navigates a tension between the pursuit of autonomy through professional competence acquisition and the influence of production processes themselves. Idealized WBL theories often overlook this inherent conflict.

From a functionalist viewpoint, predominant in German discourse on TVET, the primary objective is the mastery of technical processes essential for productive efficiency. This approach posits that vocational training's sole valid aim is the cultivation of technical proficiency. In contrast, a second perspective, grounded in critical reasoning, foregrounds the emancipatory potential of TVET, advocating for a broader developmental scope that echoes the

[3] The projects include diploma and bachelor level, i.e. in part TVET at the university-level (HE). The standard TVET system includes upper and post-secondary level.

humanistic traditions of "academic education" (Arnold, 2020; Kutscha, 2017) These two frameworks—one focused narrowly on functional, action-oriented learning, and the other emphasizing a critical, emancipatory dimension—shape the international discourse on WBL. Both perspectives are evident globally, though the distinction between them is sometimes insufficiently recognized.

Before addressing the emancipatory potential of "learning at work," it is essential to recognize that WBL is inherently tied to the realities of work processes and organizational structures. Competence development through work-based experiences offers unique opportunities yet comes with inherent limitations. Work environments may support or hinder emancipatory learning, depending on specific conditions. While work serves as a critical context for learning, it does not inherently guarantee it; rather, most WBL cases require additional support, such as a "social stimulus" through mentorship or participation in a community of practice. Workplace learning can also be enhanced by appropriate methodological and didactic structuring, as seen in "work and learning tasks" (Schröder, 2009a, 2009b, 2009c). Importantly, this support should not alter the organization of work, which must remain authentic to achieve intended learning outcomes (Schröder & Dehnbostel, 2020, 2021). Such an approach, where work organization is carefully integrated with a learning structure, also underpins the validation and recognition of informal learning—an increasingly important educational policy goal in the context of growing digital work demands (Schröder, 2012).

WBL, as an action-oriented and project-based method, is particularly suited to fostering mastery and cultivating professional and personal autonomy, provided certain workplace conditions conducive to learning are in place. These conditions are typically absent in repetitive, Taylorized work environments; however, even in modern, holistically structured production processes, obstacles to authentic learning through work experiences may arise. Most practical implementations of WBL can be refined to better balance the benefits for individuals—such as autonomy and emancipation—with the functional demands of work processes. Some scholars argue that digitization can enhance this balance (Schröder & Dehnbostel, 2020, 2021), while others suggest that significant shifts in the nature of work, "Beruf" (profession), and education strongly influence WBL's framework (Dernbach-Stolz, Eigenmann, Kamm, & Kessler, 2021). Current WBL models vary in emphasis: some foreground its emancipatory potential, others focus on the mastery of technical processes from a functionalist perspective, and still others prioritize managing the conditions of learning—such as mentorship and work organization—to optimize the learning experience.

The prevailing international perspective on WBL reflects a pragmatic synthesis of the diverse dimensions associated with WBL, positioned between its emancipatory potential and purely functional learning. Rather than simply supplementing classroom education with practical components, WBL is recognized as a distinct approach with mutual benefits for individuals, employers, and society. Importantly, this global endorsement of WBL extends beyond the German dual model, demonstrating that WBL's advantages can be achieved across varying societal structures governing the relationship between labor and education.

Within this pragmatic framework, international discourse has identified several key conditions essential for the effective and sustainable integration of WBL within formal training systems. Stakeholders are encouraged to support WBL by:

- "Granting a significant role to employers' and workers' organizations in designing and implementing programs, and involving both in WBL assessment;
- Promoting WBL across all educational levels and in sectors with growth potential;
- Providing customized support services to facilitate WBL in SMEs;
- Preparing in-company trainers and school educators to implement WBL effectively;
- Communicating the benefits of WBL to employers, students, and parents". (Interagency Group on TVET, 2017).

The following graphic illustrates the "tripartite benefits" of work-based learning (for individuals, employers, and society as a whole) which are gained by satisfying these recommendations:

Figure 1 demonstrates the tripartite benefits of work-based learning.

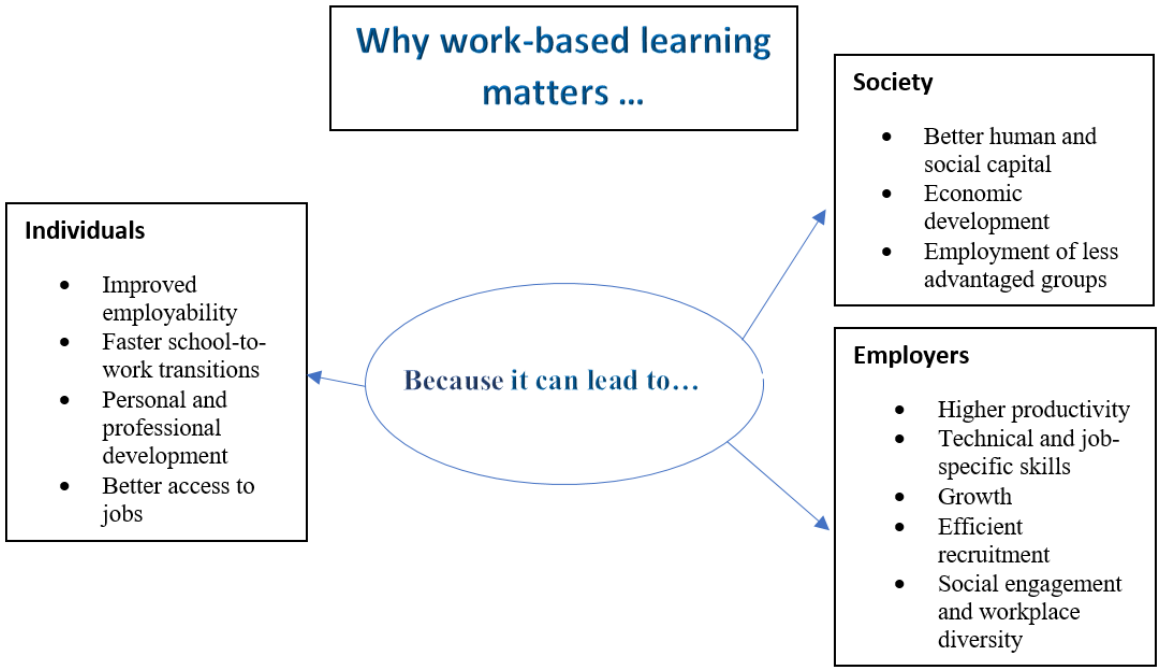

Figure 1. The tripartite benefits of work-based learning.
Source: Interagency group on TVET (Interagency Group on TVET, 2017) slightly modified.

While this perspective highlights the benefits of WBL for individuals, employers, and society, an alternative classification delineates seven types of WBL programs, blending educational and work environments along a continuum. This spectrum ranges from entirely school-based vocational education and training at one end to ad-hoc on-the-job training at the other (Donor Committee for Dual Vocational Education and Training, 2022). Within this framework, the SiF and Tripartite Education System programs at RMUTL align with the German dual model, as both integrate classroom-based instruction with practical workplace learning (type 2.2 in the graphic below).

Figure 2 categorizes work-based learning according to the place of learning and learners' status.

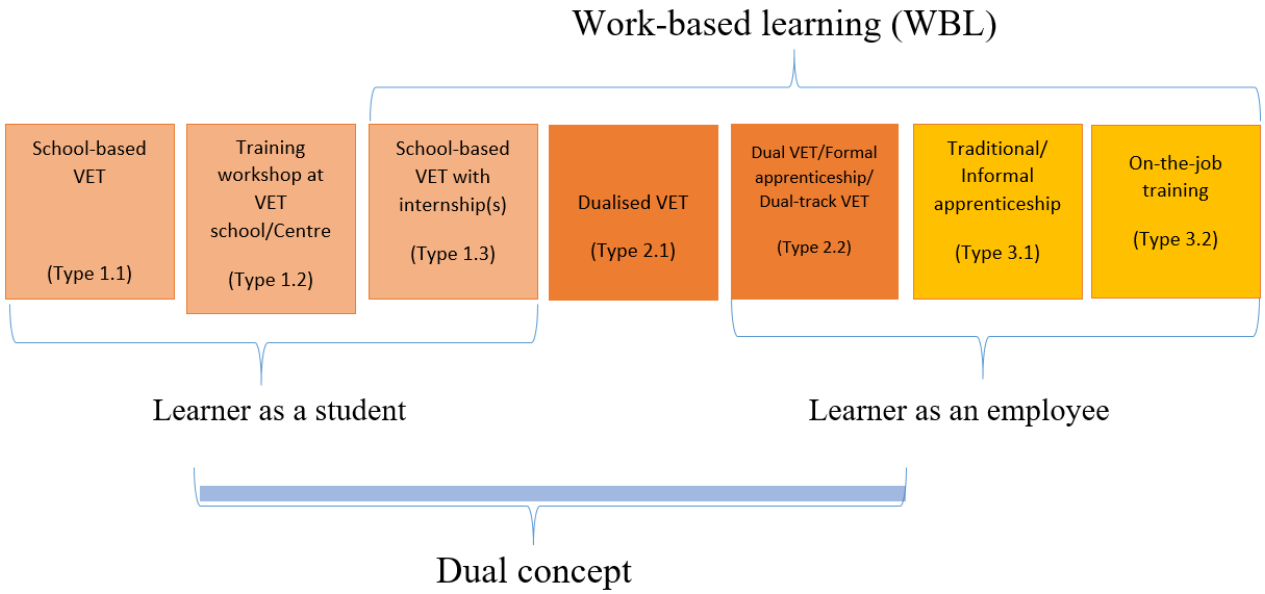

Figure 2. Work-based learning according to the place of learning and learners' status.
Source: Donor Committee for Dual Vocational Education and Training (2022).

An alternative framework for categorizing WBL programs, proposed by Comyn and Brewer (2018) considers three key elements: contractual status, formal recognition, and training modality (on-the-job versus off-the-job). Within this model, the German apprenticeship system exemplifies a WBL program encompassing all three

elements—formal contracts, recognized qualifications, and a combination of workplace and classroom training. Similarly, the SiF and Tripartite Education System programs reflect this model by incorporating contractual agreements, formal recognition, and a mix of on-the-job and off-the-job training.

These formal, pragmatic approaches view WBL as a structured sequence of learning experiences within a professional workplace setting, often supported by a community of practice. Emphasizing practicality, they aim to guide professional development variants and encourage participation in WBL initiatives and TVET programs among key stakeholders, including employers and students. While these approaches provide little insight into the fundamental nature of WBL, they appeal to potential participants by offering tangible organizational structures for learning through work experiences.

A distinctly different approach to conceptualizing WBL is offered by Schröder and Dehnbostel (2021). Rather than assuming that WBL must occur solely within a physical workplace, this framework posits that the unifying characteristic of WBL is its intrinsic connection to authentic work processes, irrespective of the learning setting. Such environments could include vocational schools, training centers, or universities. From this perspective, WBL encompasses *work-oriented learning* in educational institutions, *work-connected learning* in partial contact with workplaces, and *work-integrated learning* directly within workplace settings. This broader, more open view of WBL emphasizes it as a tool for meeting the demands of the modern workforce and fostering the development of 'holistic professionals' through immersion in authentic work processes.

Figure 3 outlines a typology of forms of work-based learning for learning from or within authentic work processes.

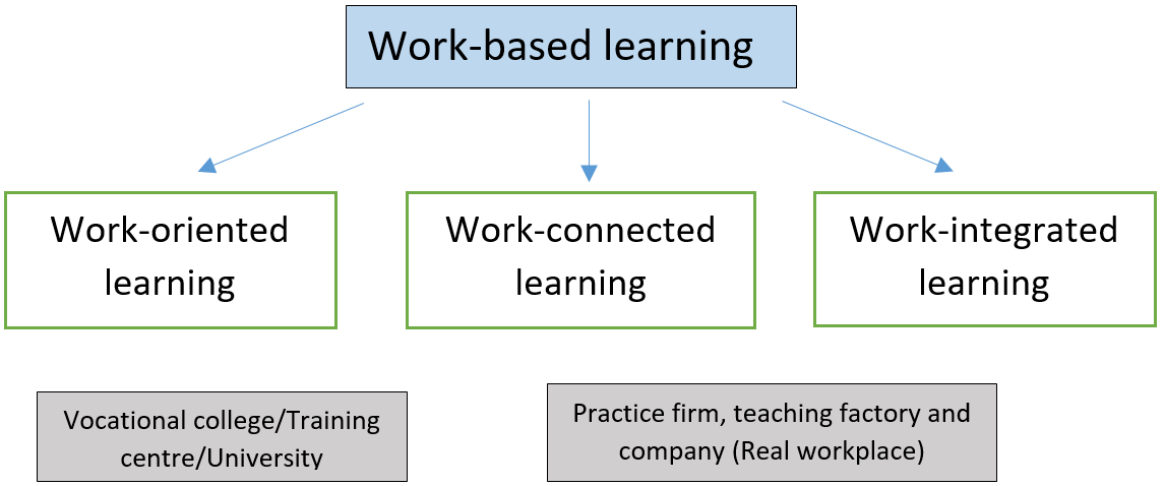

Figure 3. Typology of forms of work-based learning for learning from or within authentic work processes.
Source: Schröder and Dehnbostel (2021) slightly modified.

This conceptualization of work-based learning (WBL) avoids the oversimplification of equating learning exclusively with the physical workplace, while also positioning WBL as more than a broad descriptor. It includes various forms, such as structured, work-oriented learning within vocational colleges, which—though requiring specific didactic strategies to maintain connection with authentic work processes—still constitutes WBL (Bahl & Dietzen, 2019). These diverse approaches converge on the goal of developing competent, autonomous, and self-reliant professionals (Hoepfner & Koch, 2015). For a comprehensive approach, WBL must involve contact with authentic work processes, guided by the overarching aim of fostering a professional identity within one's community. While categorizing WBL based on proximity to the workplace can be useful, this view overlooks the essential emancipatory dimension of WBL. Fundamentally, WBL serves as a pathway for individuals to become autonomous, responsible participants in the professional world. Furthermore, emphasizing individual growth aligns with the frequently cited

goal of creating an Industry 4.0-ready workforce—one that is creative, reflective, and capable of taking calculated risks in decision-making.

WBL becomes a more complex concept when explored through advanced historical, sociological, or philosophical lenses common to in-depth learning theories. One perspective suggests that the contemporary resurgence of WBL is linked to historically variable forms of work organization and production processes. The development of a "holistic professional personality" within the workplace is more feasible in environments with complex, challenging tasks that promote relevant learning experiences. Reflexive mastery by individuals can emerge when intricate production processes cultivate critical thinking and self-reliant problem-solving. Although the structure of production processes may assert an objective reality to be navigated, individuals can rise to these challenges by engaging with and learning from authentic work processes (Bremer, 2005).

In considering WBL as an emancipatory process that fosters individual empowerment, it is relevant to acknowledge its connection to knowledge management discussions from the 1990s. From these discussions emerged a distinct "WBL type"—a creative, risk-taking leader capable of navigating uncertain and unpredictable environments where active decision-making is ongoing (Raelin, 2008). This approach aligns with Etienne Wenger's concept of Communities of Practice, which challenged traditional hierarchical and bureaucratic management models (Wenger, 1998). However, it is essential to note that while Raelin and Wenger highlight WBL's potential for individual agency and development, their perspectives remain rooted in a managerial context, with an ultimate focus on achieving organizational goals.

Böhle (2017) introduces additional considerations by addressing the evolving demands of the workplace, the rising importance of tacit knowledge—implicit understanding gained through experience—and the need to bridge the divide between theoretical and practical skills. Like Raelin, Böhle acknowledges the role of creative individuals in navigating uncertainty, a trait increasingly essential within complex, digitalized production environments. However, rather than viewing digital transformation as an automatic path to "emancipation," Böhle emphasizes that contemporary production settings present new opportunities for personal growth, contingent upon individual initiative and effort. He suggests that work-based learning may serve as a means for individuals to distinguish what needs to be done and how to approach it, grounding learning in direct experience rather than viewing it as an inevitable outcome of digital transformation.

A final essential characteristic of WBL is its 'social dimension.' Across the perspectives of Schröder, Dehnbostel, Raelin, and Böhle, there is consensus that WBL is inherently a social process. This is evident, for instance, in the role of professional guidance, whether through mentorship or integration within a community of practice. Moreover, the foundational production and work processes themselves are socially constructed. Contrary to the common view that such processes are primarily shaped by technical advancements and thus external to human influence, they are deeply embedded in the social and cultural organization of a given society.

The *complex, multi-dimensional concept of WBL* outlined here serves as a preliminary framework, one that invites further exploration. However, it provides a foundational guide for analyzing Thai WBL variant(s) and can be summarized as follows:

- WBL is a learning method that relies on (formal, non-formal, and informal) work experiences as primary sources of knowledge.
- WBL emphasizes authentic work processes, even when not occurring directly within real workplaces.
- WBL must balance benefits among individuals, employers, and society.
- WBL can serve as a tool for either functional vocational training or a more humanistic, emancipatory education.
- WBL is inherently social: it includes professional guidance throughout learning processes and reflects the social nature of work and production as central to workplace learning.
- WBL is not synonymous with Germany's dual vocational education model, though the German model is heavily reliant on it.

The focus of the following section will move from theoretical discussions to an examination of Thailand's TVET system, particularly Dual Vocational Education (DVE) and WBL. Emphasis will be placed on a form of WBL that extends beyond mere workplace proximity or contractual arrangements between industry and educational institutions. Thailand requires a WBL model that enriches not only employers and society but also supports individual learners in achieving meaningful, fulfilling lives.

3. LOOKING FOR AN INDUSTRY-INTEGRATED TVET PROCESS IN THAILAND

Thailand has achieved remarkable economic progress over the past 25 years. Two decades ago, the country was classified as a relatively low-income, developing nation. However, through a dedicated path toward industrialization, Thailand has experienced substantial economic growth. This economic success has been accompanied by notable social development, as reflected in the Gini index—a key measure of income inequality, where a value of 0 indicates perfect equality. Thailand's Gini index declined from 0.43 in 2000 to 0.35 in 2020 (The World Bank, 2024a). Although this remains above Germany's Gini index of approximately 0.30, it represents a significant reduction in income disparity within Thailand. Furthermore, poverty rates have decreased markedly since the early 2000s. In 2000, over 40% of the population lived below the national poverty line; by 2021, this figure had dropped to just 6.3% (The World Bank, 2024b). This substantial reduction in poverty highlights the effectiveness of Thailand's economic development strategies.

With Thailand's economic and social advancements, TVET have also developed. The country now has well-structured formal TVET programs, a supplementary non-formal TVET sector, and a small but well-established dual vocational education system (DVE). However, it remains questionable whether the Thai TVET system can yet be compared to the TVET systems of highly industrialized nations. This analysis does not aim to present a comprehensive overview of Thailand's TVET landscape but seeks to identify the emerging role of WBL within a still-developing TVET framework.

3.1. Duality and WBL in the Thai TVET System

More than half of Thailand's workforce operates within the informal sector, with little to no vocational education or training. Nevertheless, for those who access it, the Thai TVET system offers a well-structured pathway through formal, non-formal, and dual VET programs. The formal education system primarily administers a three-tiered vocational education framework, conferring vocational certificates, diplomas, and bachelor's degrees. Students participating in dual VET programs, involving enterprise partnerships, remain a minority, though their numbers are gradually increasing.

Dual vocation education in Thailand was first introduced in 1984 with a 'school-in-factory' model, supported by German collaboration. This approach was strengthened through cooperation with GIZ (Deutsche Gesellschaft für Internationale Zusammenarbeit) and formally established as a legally recognized VET modality in the 2008 Vocational Education Act (Dual Vocational Training, DVT). Since then, the Office of the Vocational Education Commission (OVEC) under the Ministry of Education has overseen both public and private vocational institutions in Thailand. Additionally, the National Commission of Vocational Education, comprising representatives from both the public and private sectors, is tasked with setting national TVET policies. Recently, in 2019, the newly established Ministry of Higher Education, Science, Research, and Innovation assumed responsibility for the higher education segment of TVET provided by universities, including the Rajamangala Universities of Technology and King Mongkut's University of Technology North Bangkok.

Unlike the well-known German model, where TVET is inherently structured across multiple learning venues, in Thailand, dual vocational education is one of several modalities. At the upper secondary level—the entry level in a three-tiered system that also includes the post-secondary diploma and bachelor's levels—students can pursue TVET leading to a "Certificate in Vocational Education" through various pathways: the Certificate in Vocational Education,

the Certificate in Dual Vocational Education, and the Certificate in Vocational Education with a Credit Accumulating System (OEC (Office of the Education Council), 2020). Similarly, dual modalities at the diploma and bachelor's levels are offered as one of several available options.

According to the Vocational Education Act of 2008, a DVE (dual vocational education) program in Thailand must include at least 50% of training time within the workplace. Courses that provide less than this proportion of workplace training are not officially classified as dual vocational education. Consequently, WBL, as a workplace-oriented learning approach, is a fundamental component of dual vocational education but can also be incorporated into non-dual programs. WBL in Thailand's education system spans a variety of experiences: it is integral to dual education at all three TVET levels but can also be embedded within vocational certificate and diploma programs that do not follow the dual modality. Additionally, WBL may be part of "cooperative education"—a term used in higher education, such as in bachelor's degrees and post-secondary diplomas offered by the Rajamangala Universities of Technology, to denote learning across multiple venues.

Efforts to enhance WBL in Thailand encompass a wide array of work-based learning experiences, ranging from internships within vocational certificate programs to cooperative components of bachelor's degrees. A significant milestone for all educational pathways was the alignment of Thailand's National Qualifications Framework (NQF) with the ASEAN Qualifications Reference Framework (AQRF) in 2020, underscoring Thailand's commitment to harmonize vocational qualifications with regional standards. Today, the Thai TVET curriculum is aligned with occupational competency standards that meet international benchmarks.

All initiatives aimed at advancing WBL within Thailand's TVET system must be viewed within the broader framework of national educational reforms. According to Thailand's 20-year National Strategy (2018–2037) and the Education Reform Plan (2019–2022), several critical areas for improving the education system—including TVET and WBL—are prioritized as essential elements in human resource development (OEC (Office of the Education Council), 2020):

- Align qualifications (NQF) and curricula with 21st-century skills through competency-based approaches in curriculum design and assessment;
- Strengthen teacher capacity to enable them to act as facilitators and coaches, using methods such as STEM, project-based learning, blended learning, constructionist learning, and work-based learning, to effectively implement the curriculum;
- Foster lifelong learning among graduates and the workforce to address global competition and disruptive technologies; reconfigure the recognition of prior experience and training;
- Emphasize competency-based education and training (NQF) to enhance overall quality standards.

Achieving these ambitious goals requires robust collaboration between educational institutions, such as TVET colleges and Universities of Technology, and private industry. Thailand's Vocational Education Development Plan (2017–2036) underscores this collaborative strategy, promoting industry-integrated education through targeted projects and initiatives (OVEC (Office of Vocational Education Commission), 2017). These efforts, aligned with the Thailand 4.0 initiative, are complemented by additional measures aimed at strengthening core competencies, increasing budget allocations, and reforming teacher education and training (Mongkhonvanit & Choomnoom, 2022).

Moreover, theoretical frameworks for advancing DVE and WBL are well-established, frequently drawing on the German model as a benchmark (Mongkhonvanit, 2017). There is also an emphasis on raising awareness of the advantages and positive impact of DVE programs; enhancing the public perception of DVE can increase student interest and, ultimately, strengthen demand for WBL, thereby driving quality improvements (Choomnoom, 2022a).

The role of Higher Education (HE) within Thailand's TVET landscape warrants careful consideration, as certain TVET programs, including bachelor's degrees offered by technical universities, fall under the HE sector. Consequently, WBL is also highly relevant in this context. Recent initiatives aimed at strengthening collaboration between educational institutions and industry underscore the importance of WBL in higher education. The

"Reinventing Thailand's Higher Education" strategy, outlined by the NXPO (Office of National Higher Education Science Research and Innovation Policy Council) (2022), aligns with the Thailand 4.0 agenda, advocating for a stronger integration of HE with work-based learning processes.

This approach extends beyond merely elevating TVET to the level of traditional academic programs; it envisions a more comprehensive shift towards work-orientation across the entire HE system. This transformation aims to not only enhance TVET offerings but also to ensure that traditional academic pathways retain a meaningful link to industry-relevant skills. Collaboration with industry partners remains crucial to this vision, with promising initial progress already evident at certain universities.

3.2. Problems with Implementing DVE (WBL)

While Thailand has embraced WBL in theory and continues to work towards advancing DVE and WBL initiatives, the Thai TVET system—including its dual vocational education—lacks cohesion when compared to the structured German model. Although the Vocational Education Act of 2008 absorbed the dual education framework, it has not fully materialized as an integrated system. Instead, Thai DVE operates as a series of individual projects, often driven by the initiative of specific actors, with German-Thai collaborations serving as prominent examples.

The Thai government has set an ambitious goal to increase DVE enrollment from 20% to 50% of the total TVET cohort by 2025. However, participation remains comparatively low, with current enrollment in DVE programs at just 20% (around 140,000 students) (Choomnoom, 2022a). This may reflect a continued preference for traditional, classroom-based TVET programs, though it could also highlight regional disparities in development. While Thailand leads within the ASEAN community, its successful, high-level DVE initiatives are primarily concentrated in certain areas, contrasting sharply with peripheral regions that face significant challenges such as outdated curricula, under-qualified instructors, and insufficient training resources. These deficiencies limit the essential conditions for effective learning through work experiences, contributing to persistently low enrollment numbers.

The issue of curricula misalignment with labor market needs is not confined to peripheral regions. Current research by Mongkhonvanit and Choomnoom (2022) underscores the challenges TVET teachers face in aligning instruction with industry demands. As they note, "For a Thai TVET teacher it is still difficult to fulfill the needs of the labour market with the curricula he has to follow. In most cases, it remains a challenge for the TVET sector for teachers to link their teaching plans with competency requirements" (p. 28). Ideally, industry input is essential in developing curricula that reflect current skill requirements, as businesses are well-positioned to identify these needs. However, their participation is often depending on tangible benefits, including government support.

According to a senior TVET expert, the current system lacks integration and coordination with key partners, such as the Ministry of Labor and the private sector. The expert recommends establishing a national committee to lead WBL implementation within TVET (see also Gennrich (2017)): "DVE should have its own laws and regulations. Existing legislation, such as tax deductions for companies participating in WBL and standards for teacher training at private companies, still relies on regulations from the Department of Skill Development" (Choomnoom, 2022b).

In contrast to the structured and clearly defined German *Berufsbildungssystem* (vocational education system), Thailand's TVET landscape remains fragmented. While it provides a diverse array of skills training options, it lacks a cohesive framework to ensure consistent quality across DVE and WBL programs. This absence of standardization creates uncertainty for employers. In Germany, companies can rely on a predictable level of competence among vocational school graduates. In Thailand, however, graduate quality can vary considerably, prompting some companies to take workforce training into their own hands. This variation has led to the emergence of institutions like CP All's Panyapiwat Institute of Management, established to train employees specifically to meet the company's needs (Chalamwong & Suebnusorn, 2018). Alternatively, companies may invest additional resources to train new hires within condensed timeframes. The lack of coherence within Thailand's TVET system thus results in notable

disparities in graduate quality. To ensure consistency and better meet industry demands, a more unified approach to TVET development is essential.

Despite advanced discussions about work-based learning (WBL) occurring in universities, public entities, and the Southeast Asian Ministers of Education Organization (SEAMEO) centers, a significant gap persists between discourse and practice within TVET institutions in Thailand. The concept of WBL gained recognition in Thai academic discourse approximately a decade ago. Educational policies began to incorporate the term a few years later; however, they initially lacked concrete support mechanisms such as legal frameworks and financial incentives, which are only now becoming apparent. This limited early support has resulted in substantial disparities across the system. Nevertheless, these deficiencies have not entirely prevented the establishment of quality TVET with remarkable WBL projects in Thailand. The primary issue is the absence of an overarching system to guarantee the continuity of such efforts. Currently, the responsibility falls on individuals to navigate available options and manage associated risks.

Only recently have public entities like the Office of Vocational Education Commission (OVEC) begun developing support structures to address this gap and strengthen private-sector collaboration by establishing coordination centers and incentive programs (OVEC (Office of Vocational Education Commission), 2020) (see the section 4). Thus, while policies are starting to promote WBL through incentives and support structures, it is important to acknowledge that this approach is a recent development.

The author contends that achieving a comprehensive "holistic Industry-driven Education Framework" may remain a long-term objective, with its success largely dependent on individual initiatives within educational institutions and industry partnerships. This underscores the challenges of implementing WBL or DVE on a wider scale. A key informant specializing in Thai TVET policy points out a significant gap in policy frameworks: "At the policy level, there is only an educational directive assigning educational institutes the responsibility to advance DVE, but there is no parallel initiative from the Ministry of Labour. As a result, the private sector makes no formal contribution to Thailand's DVET landscape (Expert 5, November 2021)." According to this expert, the lack of alignment discourages private sector participation in DVET. Nevertheless, despite this policy gap and other limitations, the following section will examine valuable WBL initiatives currently in place.

4. SCHOOL-IN-FACTORY (SIF) AND TRIPARTITE EDUCATION SYSTEM: THE RMUTL PROJECTS AS WBL BEST PRACTICE

In contrast to the broader landscape of TVET in Thailand, several ambitious projects aim to enhance the quality of Thai TVET through WBL, providing valuable benchmarks for both Thailand and the ASEAN region. Established models such as the School-in-Factory (SiF) and the Tripartite Education System offer successful frameworks upon which future initiatives can build. This section will first describe the RMUTL projects and then address some associated concerns.

Launched in 2012, the SiF project was created to address the Thai manufacturing industry's demand for skilled labor by offering students work-integrated learning experiences through partnerships with private companies (Chalamwong, 2019). The program is a collaborative effort among the National Science Technology and Innovation Policy Office (STI), Rajamangala University of Technology Lanna (RMUTL), and Siam Michelin Company Limited to establish a robust educational platform for work-integrated learning (WiL) in Thailand (Moonpa et al., 2022; Phalasoon, 2017; Songthanapitak & Moonpa, 2017). Contributions to the program come from both cash and in-kind support, with primary financial backing provided by the company.

The SiF program offers learners a two-year traineeship within the company, enabling them to acquire practical skills and industry experience in a real-world setting (Moonpa et al., 2022). The structure of the program alternates between three months of classroom instruction at RMUTL and nine months of hands-on experience at the factory. Students receive foundational technical training at the university (via a 3-month program), followed by practical work

at the factory, before returning to the university for additional studies and general education coursework. Their schedule typically includes eight hours of on-the-job training at the company alongside three hours of theoretical instruction. Upon program completion, students are awarded a Diploma in Industrial Technology and gain professional recognition for their experience with the multinational company, Siam Michelin (Moonpa et al., 2022).

The SiF program, ongoing for nearly a decade, is widely regarded as a success due to factors such as professional teaching, a specially designed work-integrated learning curriculum, access to advanced manufacturing equipment, a unified approach among stakeholders, and substantial funding from public-private partnerships (Moonpa et al., 2022). Building on the positive outcomes and collaborative foundation established by the SiF project, the Tripartite Education System was introduced in 2018. Like the SiF, this program engages stakeholders from the education, private, and public sectors, but expands its scope by involving a broader range of partners within each. In the education sector, the Tripartite Education System includes TVET colleges and high schools, while in the private sector, it incorporates additional companies, such as Betagro (Agro-industry), STAR Holding Group (Air conditioners), and Artith Ventilators Ltd. (ventilator machinery) (Moonpa, Chaiyong, & Schlattmann, 2021). This expansion facilitates a wider array of training areas and educational levels. Alongside diploma programs, the Tripartite Education System offers a 3-year Vocational Certificate in Mechatronics (in collaboration with TVET colleges) and a 4-year Bachelor's degree in practical engineering from RMUTL (e.g., Bachelor of Engineering in Agricultural and Biological Engineering) (Moonpa et al., 2021).[4] This diverse range of programs at RMUTL provides learners in WBL pathways with multiple educational options.

The primary benefits of the RMUTL projects lie in the strong collaboration between industry and education, which has facilitated curriculum redesign to meet industry standards, active involvement of university instructors, an authentic practical learning environment, and financial backing from stakeholders. Another noteworthy aspect of RMUTL's role is its unique position in bridging Higher Education (HE) and TVET through its work-integrated learning (WiL) initiatives. This dual role is reflected in support from both OVEC (TVET) and NXPO (HE). Historically, the Rajamangala Universities, including RMUTL, originated as technical schools, a legacy that positions them to significantly contribute to the development of Thailand's TVET system, particularly in WBL. As a result, the SiF project began in collaboration with OVEC, a partnership that remains active in certain capacities.

With the recent reorganization of ministerial responsibilities within the TVET sector, which now encompasses certain university programs (including bachelor's degrees), the NXPO—successor to the National Science Technology and Innovation Policy Office (STI) and part of the HE sectors—now also shares responsibility for aspects of TVET offered at Universities of Technology. This overlap underscores the interconnectedness of HE and TVET, and it is intended as an "upgrade" to enhance TVET's appeal. Notably, while OVEC was originally envisioned as the bridge between education and industry, universities like RMUTL have proactively assumed this role. Initiatives such as the TVET Hub Lanna and the Industrial Liaison Office illustrate this forward-looking approach (Moonpa et al., 2021).

A third and arguably the most vital component of the DVE projects at RMUTL is the Research Center for TVET (RCTVET). Emerging from the collaborative experiences of two major projects, RCTVET focuses specifically on advancing WBL research. Both projects' partners emphasized the need to improve the quality of teaching and training in WBL programs, highlighting common challenges such as curriculum adaptation to support learners and preparing trainers to effectively equip students for complex work environments. RCTVET's primary mission is to address these challenges by sharing knowledge and best practices across WBL practitioners, in alignment with NXPO's objective

[4] The Vocational Certificate falls under Level 3, the Diploma falls under Level 4 and 5, and the Bachelor's degree (Practical Engineer) falls under Level 6 of the Thailand Professional Qualification Framework (TPQF), align with AQRF.

of bridging higher education and TVET.[5] NXPO's support for RCTVET underscores Thailand's commitment to revitalizing higher education to better meet the workforce development needs of society and the economy. As a central research institute, RCTVET plays a key role in facilitating Thailand's shift from a fragmented TVET system to a more cohesive structure, with one of its key aims being to ensure that even disadvantaged and vulnerable populations have access to WBL opportunities.

It is evident that the SiF project, along with the Tripartite Education System and RCTVET, has significantly impacted Thailand's TVET landscape, positioning itself as a best practice model within both Thailand and the broader ASEAN region. The positive outcomes include strengthened work-integrated learning, enhanced collaboration between industry and academia, improved skills development, teacher training and development, the integration of practical experience into TVET policies, and, ultimately, increased employability for learners within the manufacturing sector. However, it is essential to acknowledge certain challenges associated with the RMUTL projects—issues that are also broadly relevant to the TVET system as a whole. These concerns in no way reduce the accomplishments of the RMUTL team; rather, they present opportunities for refining future initiatives. The following three points worth consideration:

- The dominant influence of corporate interests, particularly those of large international firms, can sometimes overshadow the "educational interests" inherent to WBL programs.
- Significant regional disparities create challenges for TVET and WBL, often disadvantaging rural and peripheral areas.
- In certain instances, cultural factors pose barriers to the effective implementation of WBL.

Concerning the *influence of corporate interests*, it should first be noted that while OVEC, a public entity, has established coordinating centers for dual vocational education, success in these programs still largely depends on individual relationships and personal initiative—specifically, on connections between educational institutions and companies. Collaboration is maintained through individual Memorandums of Understanding (MOUs) signed between each vocational college and its participating company. As a result, the depth and nature of cooperation between educational venues and companies are almost entirely depending on the company's willingness to engage, including their authority to determine the content and structure of WBL programs:

> *"All TVET colleges follow the same guideline. However, on the implementation level, each college and company specify their roles, responsibility, and contribution depending on their context"* (Expert 2, January 2022, former director of a TVET college).

Evidence suggests that companies frequently take the leading role in WBL programs, as demonstrated by industry-led initiatives (such as those managed by Seven-Eleven and Toyota) as well as academic-led models like the School-in-Factory. Industry-led programs are often conducted solely within the company, lacking formal ties to external educational institutions. Similarly, "the SiF and Tripartite Education Systems often rely on a project director with strong personal connections to the company to succeed" (Expert 1, August 2021). In the absence of such connections, vocational colleges may struggle to implement these programs independently.

The current cooperation between learning venues presents a somewhat double-edged dynamic. While a well-functioning WBL program offers benefits, it also risks the potential dominance of companies in defining student learning needs, occasionally at the expense of training quality. Corporate priorities may diverge from educational objectives, sometimes overlooking or disregarding learners' genuine interests. Both of RMUTL's WBL models demonstrate effectiveness but reveal a substantial reliance on participating companies, creating a situation where successful collaboration often depends on aligning with corporate interests rather than fostering learner autonomy. This raises questions about the feasibility, and perhaps desirability from a corporate perspective, of adopting a more

[5] See again the already mentioned NXPO's strategy "Reinventing Thailand's Higher Education" (NXPO (Office of National Higher Education Science Research and Innovation Policy Council), 2022).

"emancipatory model." While some educational institutions may aim for trainees to become independent, autonomous, creative, and self-reliant learners—as suggested by Hoepfner and Koch (2015)—by engaging them in solving real-world challenges within their community of practice, this may not be a realistic objective within the current project frameworks.

The second challenge for WBL implementation in Thailand lies in the educational disparities between the 'center' and 'periphery.' Populations that have traditionally faced educational disadvantages are likely to encounter similar obstacles in establishing dual vocational education programs. While WBL initiatives have seen success through partnerships with large national and international companies, implementation remains difficult in rural areas. Common challenges include production disruptions, financial limitations, and restricted curriculum control, particularly in regions with smaller TVET colleges and limited access to major companies. As one former TVET college director aptly described:

> *"… The challenges for a small TVET college, are that there are fewer teachers and each of them has a lot of teaching load. In addition, these teachers have no experience in working with private companies. In most cases, students are sent to the company for practical training without any support from teachers. Training depends totally on the wish of the company. This affects the quality of training and success of the collaboration stated in the MoU […]. Small city means less company to accommodate DVE. Traveling to companies located in another city remains a challenge for teachers too. They need to invest both time and personal money in traveling […]. The budget for further professional training the TVET teachers at the enterprises is quite limited for a small college, only two TVET teachers are allowed to take part"* (Expert 2, January 2022).

WBL implementation in Thailand remains an incomplete and evolving endeavor. While RMUTL's models showcase the feasibility of ambitious WBL projects, these initiatives seem to represent an exception rather than the norm, with substantial disparities in WBL adoption across Thai TVET institutions. Many institutions, particularly those in rural areas, lack the essential resources for effective WBL implementation, such as qualified teaching staff and adequate equipment. This uneven distribution constrains the overall impact of WBL on Thailand's TVET system (see also Ode-Sri, Köhler, and Wimonthanasit (2022)).

A third concern involves *cultural constraints* that may hinder progress in WBL implementation. It is widely recognized that the success of any educational approach depends on certain cultural conditions. In this context, two relevant factors include the general value placed on 'education' and, importantly, the presence of a learning culture that fosters active, communicative, and 'self-organized' pursuit of competencies, as opposed to a passive, hierarchical reception of information from a teacher. This is but one example of the critical role culture plays in learning processes. Without delving deeply into this complex subject, it is relevant to consider the perspective of Jones and Pimdee (2017), who identify cultural constraints in Thailand as a significant challenge. They argue that traditional Thai educational principles may pose obstacles to the success of TVET within the Thailand 4.0 framework. They further suggest that efforts to replicate the German DVE model have faced challenges due to social and cultural differences:

> *"Key pillars of the program, such as skilled-worker education, open a Pandora's Box of unanswered questions. Innovation and creativity require individuals capable of critical thinking skills. Communication skills are required as well, but by definition, this requires the ability and willingness to ask questions. Lack of foreign language and culture skills are consistent problems across all sectors and at all levels."*

5. CONCLUSION: WBL QUALITY ENHANCEMENT BY VOCATIONAL EDUCATION RESEARCH

This article has presented two successful WBL models in Thailand, along with the establishment of the Research Center for TVET (RCTVET) at RMUTL. Although critiques exist regarding WBL implementation in Thailand, including the RMUTL initiatives, these efforts to advance DVE and WBL provide valuable best practices for Thailand and potentially for neighboring ASEAN countries with less developed vocational systems, such as

Cambodia, Laos, and Myanmar (CLM countries) (Moonpa et al., 2022). Key lessons for the region include fostering public-private partnerships by involving businesses in training, exposing students to authentic workplaces, aligning curricula with real-world job requirements, and training teachers specifically for WBL programs. The RMUTL programs also underscore the importance of government policies that actively support WBL initiatives, as seen in NXPO's recent higher education strategy, which aims to better align education and training with broader economic needs.

In summary, the decade-long success of the RMUTL model demonstrates the effectiveness of these approaches in equipping graduates with relevant labor market skills and enhancing their employability. However, given the challenges discussed—such as the potential dominance of corporate interests, the educational disadvantages faced by rural populations, and cultural barriers in a society that retains traditional elements—continued refinement is essential, alongside consideration of future directions for development.

Work-based learning (WBL) programs offer significant potential, but their success relies on achieving a careful balance. Although international companies are instrumental in advancing WBL initiatives, their focus on immediate workforce needs and specific skill sets can sometimes overshadow learner-centered objectives. This emphasis risks sidelining the development of essential competencies, such as professional autonomy, creativity, and problem-solving—qualities prioritized by Thailand 4.0 and the Eastern Economic Corridor (EEC). While these learner-centered goals may represent a long-term ambition, establishing partnerships between colleges and industry alone is insufficient to achieve them.

Cultural traditions add another layer of complexity to WBL implementation. Effective WBL relies on an individualistic, career-focused mindset that fosters self-organization and goal setting. While some argue that "Asian culture" inherently conflicts with this "Western" approach, such broad generalizations are unfounded. Scholars like Loh and Teo (2017) emphasize the adaptability of cultural characteristics, particularly in multicultural contexts shaped by shared economic interests.

Additionally, regional disparities present further challenges to effective WBL implementation. Rural areas frequently lack essential infrastructure—such as collaborating companies, learning equipment, and qualified instructors. These limitations place rural regions at a disadvantage, contributing to the uneven economic and social development associated with WBL initiatives. As highlighted by the United Nations Educational, Scientific and Cultural Organization (UNESCO (2022), the benefits of WBL must extend beyond privileged populations to include traditionally marginalized groups.

A critical step in addressing these challenges in WBL implementation is the establishment of autonomous regional vocational education research at the university level. Such research is essential for advancing WBL in at least two key areas. First, it must establish methodological and didactical guidelines to support high-quality WBL, such as designing work-and-learning tasks (WLT) that promote action- and project-oriented learning. Second, it must contribute to the qualification of TVET teaching personnel, who play a crucial role in disseminating WBL knowledge. RMUTL's RCTVET represents an important initial step in this direction, aiming to enhance WBL effectiveness and accessibility within the broader Thai and ASEAN TVET framework, with a particular focus on reaching disadvantaged populations.

While current research primarily targets improvements within RMUTL's programs, the ultimate objective extends beyond benefiting students in the School-in-Factory (SiF) program; it aims to disseminate best practices more broadly. This could include training SiF graduates to serve as educators in Cambodia, helping to extend WBL access to currently underserved populations. Realizing the full potential of WBL is particularly vital here, as WBL serves not only as a tool for skill development but also as a means of promoting comprehensive TVET with a humanistic, emancipatory focus that supports social mobility.

RMUTL has laid the groundwork for such efforts through its RCTVET, though further research is essential for building a more inclusive future, especially by harnessing the opportunities within supra-national research

collaboration. RMUTL exemplified this approach by joining the ProWoThai project in 2019 ("Progressing Work-Based Learning in Thailand's TVET System," funded 2021–2023 by the German Ministry of Education and Research, BMBF) (see Schröder, Schlattmann, Gulich, and Hupfer (2024)).

The ProWoThai project was a participatory, action-oriented vocational education research initiative focused on building regional TVET research competencies and capacities, primarily through a unique approach to scientific coaching. Collaborative methods, such as participatory research, are essential for the effective implementation of WBL, as demonstrated by the partnership between the Chair of International TVET Cooperation and Vocational Pedagogy at TU Dortmund University (also UNESCO Chair on TVET and Competence Development for the Future of Work) and RMUTL. In this collaboration, the author's role as a researcher helped bridge communication and foster connections between German and Thai partners, ensuring that project goals and key messages were accurately conveyed across language and cultural barriers.

The project prioritized knowledge exchange, aiming for a shared dialogue rather than a one-way transfer of expertise. Through open communication, partners could collectively identify specific challenges in WBL implementation and work together to develop the most effective solutions for the Thai TVET system. While certain research projects within ProWoThai could not be realized due to the COVID-19 pandemic, these now form part of the research agenda at RMUTL's RCTVET, continuing the mission of strengthening WBL in Thailand.

The recent German-Thai TVET Conference on Research Cooperation in Southeast Asia, held in Bangkok in September 2023, convened researchers, practitioners, and industry representatives from nearly 20 nations. This international forum concentrated on advancing work-based learning (WBL) across Southeast Asia and underscored the achievements of RMUTL's School-in-Factory (SiF) model and Tripartite Education System. These initiatives were contextualized within a broader scientific framework. Conference discussions centered on future directions for WBL research and collaboration, with an emphasis on extending efforts beyond Thailand and across Southeast Asia through established regional organizations, such as the Regional Association of Vocational and Technical Education in Asia (RAVTE).

To conclude, Assistant Professor Dr. Niwat Moonpa, Director of RMUTL programs, emphasized the critical role of research and collaboration in strengthening work-based learning (WBL) within Thailand's and ASEAN's technical and vocational education and training (TVET) systems. He noted the potential for RMUTL's initiatives to serve as a foundational model for widespread progress, stating: *"… if the model we are working on namely, the School-in-Factory (SiF) & Tripartite Education system - could be simplified, systemized, and legalized, it could significantly enhance the quality of WBL at all levels."* (August 2021).

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