A systematic review of work-integrated learning for the digital economy

VEERAPORN SIDDOO[1]
WORAWIT JANCHAI
Chiang Mai University, Chiang Mai, Thailand
JINDA SAWATTAWEE
Prince of Songkla University, Phuket, Thailand

This paper presents research related to the work-integrated learning (WIL) model. The objectives were to explore the characteristics and the techniques associated with it. The focus of this research was on model linked to the IT industry or IT department in non-IT industries. A systematic literature review was applied as research methodology and the collected data were from 2006 to 2016 from eight databases. There were 24 articles which matched the search criteria. The WIL models reported can be separated into four groups. The two key features are activities created by universities and activities offered by industry. The model techniques are knowledge, methods and tools for acquiring research problems and developing solutions. The existing models are very broad and need to be narrowed down so that prospective careers and the needs of the digital workforce are prioritized. Researchers suggest future trends in WIL models in the digital economy.

Keywords: Work-integrated learning, digital economy, curriculum, IT industry, systematic literature review

The digital economy refers to the economy using information and communication technology (ICT) to help improve productivity in all organizational perspectives (Atkinson & McKay, 2007). The application of ICT has transformed the workplace very quickly and within a relatively short period. The growth of technology and changes in human behavior in technology consumption have affected business management, and computers and technology play a significant role in the business-driven economy (Spremic, Zmirak, & Kraljevic, 2008). The use of technology in its various forms is widely prevalent and has become cheaper, effective and easy to use (Malecki & Moriset, 2007). In particular, human behavior in the consumption of technology is driving organizations and businesses to adapt themselves in order to survive in the digital era.

From a business perspective, entrepreneurs have to hire qualified workers who meet their requirements (Das & Subudhi, 2003). Firms expect their workforce, and especially those engaged in IT/digital work, to work in a dynamic environment, constantly developing their understanding of the technology and trends in customer behavior.

Universities play an important role in developing quality workers and have a responsibility for producing suitably qualified graduates to enter the labor market. Entering the digital economy forces universities to adapt their curricula and teaching approaches. However, many studies have noted that teaching theory alone is not sufficient to enable students to go on to work in the IT industry (Macklin, 2008; Sivananda, Sathyanarayana, & Pati, 2009; Fan, Liu, Su, Yu, & Li, 2011). Therefore, to produce graduates who have work-ready skills, universities need to change, and integrate their traditional approaches.

[1] Corresponding author: Veeraporn Siddoo, veeraporn_s@cmu.ac.th

According to Kolb's experiential learning model, learning is caused by the accumulation of experience, both theoretical and practical (Kolb, 1984) while the study of Iansiti (1993) introduces the concept of T-shaped people who have in-depth knowledge and skills in the specific area or discipline and have a broad ability to deal with other areas. Therefore, professionals should bring their proficiency from theory and practice to their work to fulfill their T-shaped potential. In particular, the IT/digital industry is composed of firms in which graduates have to apply their skills and what they have learned about their jobs. The industry needs graduates who have a deep understanding of the technology and can integrate that knowledge with business skills relevant to the job (Brookshire, Yin, Hunt, & Crews, 2007). Many information technology competencies have been defined, for instance by IT competency models (The Employment and Training Administration, 2016), a competency dictionary (Information-technology Promotion Agency, 2015), the *Skills Framework for the Information Age* (2015), and IT competency (Tippins & Sohi, 2003). Workers in the IT industry need behavior skills, academic and IT knowledge, working skills, and industry/business skills. Moreover, they must possess job-specific skills and management ability. There is, therefore, a need for a form of cooperative study which enables students to learn job-related experience.

Work-integrated learning (WIL) is a study program based on collaborations between universities and industry (World Association for Cooperative Education [WACE], 2013). WIL has been adopted and applied as a model or framework followed within academic curricula. The goal of such programs is for the student to achieve the maximum benefit from a course of study (Eames & Cates, 2011). There is evidence from many studies of the benefits of WIL from the perspective of the university, the employer and the student (Raymond, McNabb, & Matthaei, 1993; Staehr, Martin, & Chan, 2014). The positive results of WIL led us to conduct this systematic literature review (SLR) and to investigate whether there is a credible model for preparing students to work in the digital economy. The objective of this paper was to explore WIL models related to the IT/digital industry. The four objectives of this study were:

OJ 1: To investigate WIL models associated with the information technology sector.
OJ 2: To identify and categorize those WIL models.
OJ 3: To describe the characteristics of those WIL models.
OJ 4: To describe the techniques or knowledge that are applied in those WIL models.

METHODOLOGY

SLR is a methodology which reviews published works related to a research question or an area of interest (Petticrew & Roberts, 2005). The objectives of SLR are to identify, evaluate and reach conclusions regarding quality research related to problematic issues of interest. The benefits of SLR are reducing bias from validated results, helping to summarize analyses, systematically emphasizing the research process and providing a formatted process or case study procedure capable of evaluating the quality of work (Noblit & Hare, 1988; Petticrew & Roberts, 2005). In this study, the SLR procedures proposed by Kitchenham (2004) was adapted

Review Objective

This research studies published papers relating to WIL in ICT industries and ICT departments in non-ICT industries in the past ten years. The WIL models offered by universities are explored and gaps and trends in digital workforce development for the digital economy are discussed.

Research Questions

Population, intervention, comparison, outcome, and context (PICOC) criteria were used in this SLR (Petticrew & Roberts, 2005). The PICOC framework helps researchers to identify specific target issues which they need to address. However, this SLR does not involve a comparison phase. The PICOC criteria (with comparison omitted) related existed WIL models are as followed:

Population:	WIL as applied in universities
Intervention:	WIL curricula that are utilized
Outcome:	WIL model, type, characteristic, technique or knowledge description
Context:	University ICT programs related to IT industries and IT departments in other sectors

This SLR seeks to answer four questions derived from the objectives mentioned above, namely:

RQ 1: Which WIL models relate to the IT sector?
RQ 2: What are the categories of those WIL models?
RQ 3: What are the characteristics of those WIL models?
RQ 4: Which techniques or knowledge are applied in those WIL models?

Searching for and Identifying Relevant Research

The searching process is important in SLR. The method of searching by keyword was employed and commences by first deriving the keywords from the PICOC criteria, as well as deriving synonyms to extend the search to related findings. The keywords used in each component of PICOC and the alternative terms are listed in Table 1. The searching on research databases or similar on-line resources was done and investigated which terms or alternative terms researchers used to present their work; for example, curriculum can be replaced for example by course, model or structure. The alternative terms for WIL were derived from three previous studies (WACE, 2010; Gibson et al., 2002; Kramer & Usher, 2010).

TABLE 1: Terms derived from synonyms used in the PICOC analysis

Basic Term Derived	Alternate Term
WIL	Work-Integrated Learning, CO-OP, Clinical Rotations, Cognitive Apprenticeship or Job Shadowing, Community Service, Cooperative Education, Fieldwork, Industry Attachments, International Co-Op Exchanges, Internships, Joint Industry-University Courses, New Traineeships and Apprenticeships, Placement or Practicum, Post-Course Internship, Pre-Course Experience, Professional Work Placements, Research, Sandwich Courses, Semester in Industry, Service Learning, Student Teaching, Study Abroad
University	Academic Sector, Institution, Higher Education, College
Curriculum	Approach, Procedure, Guideline, Model, Framework, Practical Guide, Strategy, Structure, Process, Characteristic, Technique, Knowledge
ICT	Information Technology, Computer, IT

The search was then constructed by concatenating all the terms with the Boolean operators, "*OR*" and "*AND*". Table 2 shows the final search statements employing those operators, respectively.

TABLE 2: A query statement used in the article searching process

Full Term
(WIL *OR* Work-Integrated Learning *OR* CO-OP *OR* Clinical Rotations *OR* Cognitive Apprenticeship or Job Shadowing *OR* Community Service *OR* Cooperative Education *OR* Fieldwork *OR* Industry Attachments *OR* International Co-Op Exchanges *OR* Internships *OR* Joint Industry-University Courses *OR* New Traineeships and Apprenticeships *OR* Placement or Practicum *OR* Post-Course Internship *OR* Pre-Course Experience *OR* Professional Work Placements *OR* Research, Research in Project *OR* Sandwich Courses *OR* Semester in Industry *OR* Service Learning *OR* Student Teaching *OR* Study Abroad) *AND* (University *OR* Academic Sector *OR* Institution *OR* Higher Education *OR* College) *AND* (Curriculum *OR* Approach *OR* Procedure *OR* Guideline *OR* Model *OR* Framework *OR* Practical Guide *OR* Strategy *OR* Structure *OR* Process *OR* Characteristic *OR* Technique *OR* Knowledge) *AND* (ICT *OR* Information Technology *OR* Computer *OR* IT)

The final search statements arrived at in this study were then used to search in two primary online resources being online databases and a search engine. The online databases used were ACM Digital Library, IEEE Xplore, ISI Web of Science, Emerald Insight, Science Direct, Springer, Taylor and Francis Online. The online search engine used was Google Scholar.

Inclusion and Exclusion Criteria

Certain inclusion and exclusion criteria were used in this SLR. We focused on peer-reviewed articles and papers published during the period 2006-2016. The inclusion criteria were that the research was published in a journal or conference proceedings and presents practice or training approaches related to ICT students. The exclusion criteria were that the report of the research presented only the advantages or limitations but did not offer guidelines or any new ideas. Non-English research reports or reports where only the only an abstract in English was published were also excluded.

Quality Assessment

This step ensured that the quality of the research retrieved was relevant to the SLR. The questions from Tong, Sainsbury, & Craig (2007) and Petticrew & Roberts (2005) with some questions being adjusted to be relevant to the context of our SLR was adapted. The checklists are shown in Table 3. To assess the quality of the research, the criterion on three levels namely: 'yes', 'partially' and 'no' with two points being assigned to 'yes', one to 'partially' and zero to 'no' were descripted. The maximum score was 18 and the minimum was zero. Research with the highest points total is the most relevant research to our questions. The minimum acceptable rating score was nine (50% of the maximum score). The results of the research quality assessment are shown in Table 4.

TABLE 3: Quality assessment checklist for publication research

No.	Question	Answer
1	Does the research clearly state the problem or objective of the study?	Yes/Partially/No
2	Is the methodology used compliant with the research questions?	Yes/Partially/No
3	Does the research discuss previous work or literature?	Yes/Partially/No
4	Has the research determined the population properly?	Yes/Partially/No
5	Did the research collect the appropriate data?	Yes/Partially/No
6	Does the research present the WIL framework model or technique?	Yes/Partially/No
7	Do the results or findings answer the original research questions?	Yes/Partially/No
8	Does the research relate to an ICT industry or ICT in a non-ICT industry?	Yes/Partially/No
9	Does the research explain/document the procedure used to validate its findings?	Yes/Partially/No

Data Collection, Extraction and Synthesis

The data collected was separated into two main areas: the general details of the research and the research's specific details. For the general details, a unique number to each study was allotted, and noted the publication year, author/s, title, reference type (Journal/Conference/Report), publisher, country of study, participant and type of study (ES: empirical study, SR: systematic review, ER: experience report, CSR: case study report, QS: qualitative study, PF/M: proposed framework/model, SV: survey).

A summary of the results is presented in Table 4 and the specific details of the research are reported in the Results section based on the four research questions.

RESULTS

Search Results

The study's aim was to identify previously reported WIL models including the techniques that they employed. The search statement was not too specific and the results of the first search produced a large number of studies. A considerable effort was made to refine the results by carefully reading the abstracts and introductions of the studies identified. Some articles where the relevance to our aims was unclear, but possible, were gone through in detail. Any unclear issues were discussed so studies which were relevant to our research questions were not missed. After considering the inclusion and exclusion criteria, the results are shown in Table 4. The database name in which the study was identified, the number of studies found on the first search, those found on the second round of searching, and the final number of relevant articles were identified. The abstracts and introductions of a total of 3,859 articles were scanned. After the inclusion and exclusion processes, 297 articles were included in the second round, which consisted of evaluating their research quality. Finally, 24 published papers were included which were examined in-depth.

Summary of the Systematic Literature Review Results

Twenty-four articles were found which fell within the inclusion criteria and were not excluded by the exclusion criteria. The results relating to the WIL model, the article's publication year, the quality score and the category of WIL are shown in Table 5 based on their allotted SLR number. Researchers carefully read and synthesized their findings in order to answer the research questions

TABLE 4: Databases searched and number of articles found in each round of searching

Database Name	Number of publications		
	1st Round	2nd Round	Relevant
ACM Digital library	344	16	4
IEEE Xplore	89	11	5
ISI Web of Science	28	28	0
Emerald Insight	422	81	0
Science Direct	573	24	2
Springer	27	27	0
Taylor and Francis Online	896	27	6
Google Scholar	1,480	83	7
Total	3,859	297	24

Research question 1: Which WIL models relate to the IT sector?

There were 24 models which were relevant to our study questions as shown in Table 5. All the papers are related to IT industries or IT in non-IT industries. Most of the articles related to IT related faculties at universities or educational institutions. Only one of the papers included solely concerned a private company (Sivananda, Sathyanarayana, & Pati, 2009). It is significant that most of the models focus on cooperation between academic institutions and firms. The co-operations involve activities both inside and outside the university/institution. However, overall the aims of the models are increasing students' employability and closing the gap between industry demands and current student abilities.

Research question 2: What are the categories of those WIL models?

The WIL models were classified into four groups based on their primary activity namely: collaboration models, curriculum design, practice methods and teaching approaches. There were seven studies relating to collaboration models, seven relating to curriculum design, nine relating to practice methods and only one relating to teaching approaches.

The studies relating to collaboration models that were retrieved related to how to fulfill industry requirements and how to produce the right balance in gains to the participants, i.e., benefit equality. The studies of curriculum design models related to course arrangement, the objectives focusing not only on the knowledge but also on the skills the students would gain during their lectures. The studies examining practice methods were more concerned with student activities. This type of model seeks to enhance student abilities in both knowledge and working skills. The models' results are generally presented as guidelines, frameworks, and structure processes. The one study dealing with teaching approaches (Al-Mahmood & Gruba, 2007) examined how to teach and increase the students' practical skills related to the subject or within the curriculum. The objective of this study was to help instructors to plan their teaching approach and maximize student outcomes.

TABLE 5: Work-integrated learning models from systematic literature review study

SLR	Model	Published Year	Quality Result Score	WIL Category
01	Synergia (Pimentel, Paula Filho, Pádua, & Machado, 2006)	2006	10	Collaboration model
02	Generic graduate attributes (Al-Mahmood & Gruba, 2007)	2007	18	Teaching approach
03	OEIS (Brookshire, Yin, Hunt, & Crews, 2007)	2007	14	Curriculum design
04	Computing Curriculum (Nikolov & Ilieva, 2007)	2007	15	Curriculum design
05	Problem-based learning (PBL) approach to teaching and reinforcing ICT skills (Macklin, 2008)	2008	17	Practice method
06	Industry-Academia Collaboration via Internships model (Sivananda, Sathyanarayana, & Pati, 2009)	2009	12	Collaboration model
07	Triple-I curriculum model (Chang, Dell, & Lane, 2009)	2009	12	Practice method
08	Cooperative Education Learning Framework (Janchai, Derrouiche, & Chakpitak, 2009)	2009	16	Practice method
09	Work-Ready Learning Activities (WRLA) (Sixsmith & Litchfield, 2010)	2010	17	Practice method
10	Industry–university collaboration for game development (Mikami et al., 2010)	2010	17	Collaboration model
11	2C+E model (Fan, Liu, Su, Yu, & Li, 2011)	2011	16	Practice method
12	Model-Driven Engineering (MDE) (Cabot & Tisi , 2011)	2011	14	Curriculum design
13	Cross-cultural project approach (Welch, Vo-Tran, Pittayachawan, & Reynolds, 2012)	2012	17	Practice method
14	Learning Objectives and Models of WIL (Pilgrim & Koppi, 2012)	2012	16	Collaboration model
15	Competency-based curriculum (Motta, Barroero, & Pignatelli, 2012)	2012	13	Curriculum design
16	Gradually Industrialization approach (LIU, MA, & Li, 2012)	2012	12	Curriculum design
17	Education mode (Liang, Huang, & Yang, 2013)	2013	16	Collaboration model
18	Multiple WIL model (Staehr, Martin, & Chan, 2014)	2014	13	Collaboration model
19	CDIO-based hands-on inquiry based learning curriculum (Zhang, Zhang, Ai, & Li, 2014)	2014	14	Practice method
20	Agile-driven internship framework (Vakaloudis & Anagnostopoulos, 2015)	2015	12	Practice method
21	WIL innovation ecosystems (Rampersad, 2015)	2015	12	Collaboration model
22	PiE (de Beer & Angelov, 2015)	2015	11	Practice method
23	Educational IS expert in practice (Pitner & Ministr, 2015)	2015	10	Curriculum design
24	MSwDEV and MEP (Carnegie, Andreae, Watterson, & Bubendorfer, 2016)	2016	14	Curriculum design

Research question 3: What are the characteristics of those WIL models?

The published papers which were grouped together as collaboration models can be divided into two aspects. The first are activities that have been created by the university, for example, classroom teaching by invited guest lecturers, practical training by the establishment of an internship program, events or field visits. The second are activities offered by industry such as offering positions for interns, IT projects and case studies linked to student projects, research for business, shared experience programs, support or funding for events, and experts acting as consultants or project team coordinators. Some universities invest in laboratory facilities with the aim of joining collaborations with industry.

Since the focus of curriculum design models is to enhance students' skills, not only from the perspective of their core knowledge and expertise in the area of IS/IT but also their graduate skills or employability, curriculum design models start by integrating industry requirements with international education, the enterprise culture, and current trends in technology. Curricula seek to balance technical and business requirements with the aim of students graduating with work-ready skills. One interesting idea mentioned in this category is asking academics and practitioners to cooperate in designing curricula, resulting in courses being redesigned based on ideas derived from industry practitioners. One study, for instance, balanced the syllabus based on the amount of the time students would spend on certain core elements, consisting of a technology base, a scientific base, an applications and systems thinking base and a personal and business skills element (Nikolov & Ilieva, 2007).

Models falling under the heading of practice methods have similar objectives to those under the heading of curriculum design models but focus more on practice to fulfill student needs. Twenty-first-century skills including ICT competencies, core knowledge skills, and attitudes are some the skills mentioned. Among the approaches recommended under this model are group working, event enrolment and case study simulation. Working in inter-professional teams allows the students to observe experts and the way they learn. Working in cross-disciplinary teams on a project also encourages students to be pro-active and shared project and work collaboration between faculties and industry can give students a broader view. One study classified as falling within the teaching approach model (Al-Mahmood & Gruba, 2007) focused on different ways of fitting graduate skills to subjects within a course or curriculum. Each method considered was noted to have different characteristics and advantages

Research question 4: Which techniques or knowledge are applied in those WIL models?

Most of the techniques and methodologies implemented in the articles traced were aimed at dealing with an existing problem and developing a solution to it. Many methods were used to encourage students to learn, to guide the university in planning strategy, to encourage instructors to better understand their teaching role, and to improve relations with industry. The techniques comprised both the agile and scrum methodologies, the CDIO (conceive, design, implement, operate) method, communities of practice, cross-cultural workshops, experience learning, expert sharing, the hands-on technique, learning in action theory, model-driven teaching, multi-functional project teams, outcome-based teaching and learning, problem-based learning, project management software, project-based teaching, reflective practice, literature reviews, existing model reviews, surveys, expert discussion, gap analysis, in-depth interviews, and situation observation.

The areas of knowledge that were noted to be important related to essential skills, industry demands and strategies to combine existing situations with new perspectives. Also highlighted were twenty-

first-century skills, employability skills, graduate skills, and ICT skills, studies of industry demand and markets, the concept of the relationship between knowledge and graduate attributes, university experience, win-win strategies, and work-ready skills.

DISCUSSION

The design of existing WIL models is quite well suited to application in the IT industry; nevertheless, these frameworks do not take account of new economic perspectives as would be expected and need to be broadened to focus on graduate employability in the current industry circumstances. The goal of WIL models is to benefit all stakeholders and the critical objective is helping students to gain employment. Table 6 illustrates the skills on which each model focused, based on Iansiti's, (1993) T-shaped model, which considers both the breadth and depth of people's ability.

Models in the collaboration category rarely discussed the skills that WIL needs to develop since the goal of most models was to collaborate and digital economy related issues are not relevant to cooperation. Most studies adopting the curriculum design, practice method and teaching approaches primarily mentioned broad skills for IT students that were very general. For example, the study of Al-Mahmood and Gruba (2007) focused on graduate skills such as communication, teamwork and presentation and the model of Sixsmith and Litchfield (2010) paid great attention to teamwork skills.

From the perspective of depth of skills, studies were selected in the systematic literature review based on the condition that they were ICT-related, so IT-specific skills were featured in almost every model. Atkinson and McKay (2007) in discussing the digital economy, noted that IT helps employees to work more productively and that digital workers will be assumed to be capable of solving problems in their work, as well as being very familiar with the hardware, software, applications and telecommunications in the current dynamic environment. WIL models for the digital economy should include skills related to the requirements of the digital age or how the digital age affects the WIL model.

From the SLR results, we noted that many studies did not incorporate digital skills or require their implementation as specific skills for IT professionals in the digital economy. With the exception of the three models of Chang, Dell and Lane (2009), Machlin (2008), and Motta, Barroero, and Pignatelli (2012) researchers tended not to pay sufficient attention to the shortage of ICT skills and ICT literacy as they relate to the demands of the digital age, nor to the ability of digital services to cooperate across the discipline.

The work-integrated learning model in the digital economy

WIL in the digital economy, whilst focused on graduates' qualifications, must also take into account job-specific requirements and working competency. Universities must be constantly aware of the characteristics required by the digital workforce and the nature of the on-going digital environment, and particularly which digital skills are required by which business or industry sectors. Academics have to keep in mind that in the IT industry, technology develops exponentially and becomes obsolete more quickly. Therefore, for universities, co-operation with industry is crucial to remaining abreast of technology and being capable of designing curricula for sustainable learning.

TABLE 6: Integration of T-shaped skills in work-integrated learning models

Model	WIL Category	T-shaped skills		Digital and related requirements
		Breadth	Depth	
Synergia	Collaboration model	N	N	N
Industry-Academia Collaboration via Internships model	Collaboration model	N	N	N
Industry–university collaboration for game development	Collaboration model	N	Y	N
Learning Objectives and Models of WIL	Collaboration model	N	N	N
Education mode	Collaboration model	Y	N	N
Multiple WIL model	Collaboration model	N	N	N
WIL innovation ecosystems	Collaboration model	N	N	N
OEIS	Curriculum design	Y	Y	N
Computing Curriculum	Curriculum design	Y	Y	N
Model-Driven Engineering (MDE)	Curriculum design	Y	Y	N
Competency-based curriculum	Curriculum design	Y	Y	Y
Gradually Industrialization approach	Curriculum design	Y	Y	N
Educational IS expert in practice	Curriculum design	Y	Y	N
MSwDEV and MEP	Curriculum design	Y	Y	N
Problem-based learning (PBL) approach to teaching and reinforcing ICT skills	Practice method	Y	Y	Y
Triple-I curriculum model	Practice method	Y	Y	Y
Cooperative Education Learning Framework	Practice method	Y	Y	N
Work-Ready Learning Activities (WRLA)	Practice method	Y	N	N
2C+E model	Practice method	N	Y	N
Cross-cultural project approach	Practice method	Y	N	N
CDIO-based hands-on inquiry based learning curriculum	Practice method	Y	Y	N
Agile-driven internship framework	Practice method	Y	Y	N
PiE	Practice method	Y	N	N
Generic graduate attributes	Teaching approach	Y	N	N

Note: Y = Yes: the model includes the skills; N = No: the model does not include the skills.

According to Moore (1993), the future trend in WIL is the ecosystem and the concept of the productive WIL environment. Other important areas include emerging technologies such as social media and the use of the smartphone as a learning tool, the participation of community and government organizations in WIL promotion, international sharing in innovation practice and knowledge resources being extended to ecosystems. In addition, local and national government policies towards the digital economy in each city or country need to be considered when building and deploying new ecosystems. Figure 1 shows the concept of a WIL model for the digital economy.

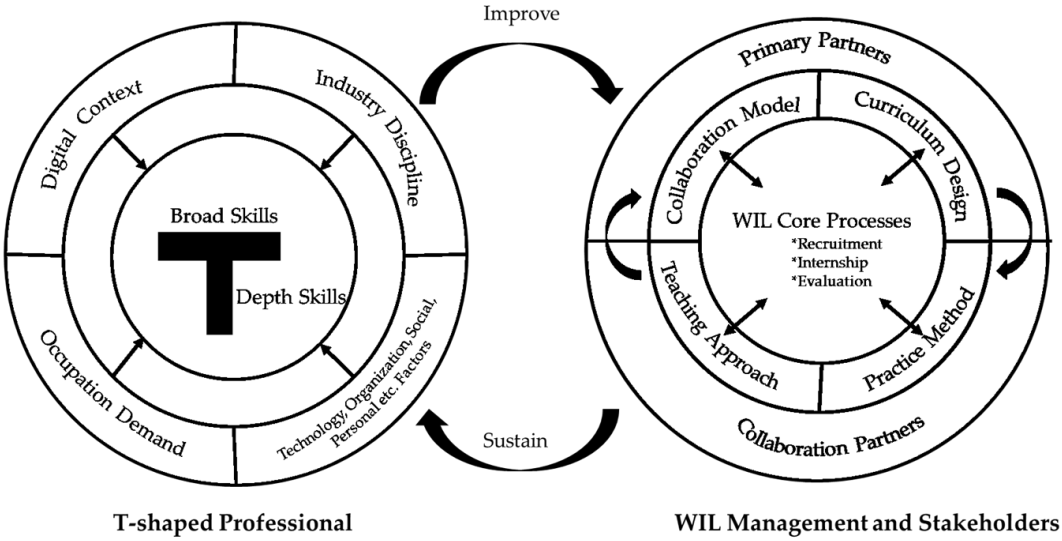

FIGURE 1: A work-integrated learning model for the digital economy

The WIL model comprises two main components and their details. First is the T-shaped professional which comprises factors such as the digital context, job requirements, the nature and characteristics of the industry and other issues (trends in technology, organization and social factors). Real situations and demands will help the organization of desirable skills, both in breadth and depth. The second component is the WIL management and stakeholders. WIL stakeholders can be separated into two main groups. The primary partners include learners (i.e., students), academics (i.e., the university management team, administrators and lecturers) and those involved in the workplace. Collaboration partners are those who do not directly interact with core processes but support WIL management. The cooperation members are government, industry, university alumni, other universities, individual experts, community experts, society and the Internet community. All primary and collaboration partners can participate in WIL management based on official roles or by performing simple functions. Generally, WIL core process activities are performed by primary partners while tasks such as recruitment, internship, or evaluation are mostly performed by students, lecturers, administrators and mentors from a workplace. In contrast, all stakeholders can contribute to the success of supporting processes such as collaboration, curriculum design, practice methods, and teaching approaches.

The T-shape Professional and WIL Management and Stakeholders components are joint. The T-shaped skills recruited based on a present-situation analysis can guide WIL stakeholders in up-grading their skills. Also the WIL management processes can be improved by paying attention to the type of skills needed and cooperative education. To sustain the WIL model, all partners have to contribute to the structure and share the vision of updating T-shaped skills. Thus, even though the demands may change, the WIL model for the digital economy can still survive.

CONCLUSION AND FUTURE WORK

This research presents a systematic literature review of WIL models related to IT industries and IT departments in non-IT industries. The study focused on establishing whether there are existing models that equip graduates to work, their adoption, and the techniques included. The results found 24 articles that met the study criteria which fell into four categories, collaboration models, curriculum design, practice methods and teaching approaches. The models focus on gaining the greatest benefits for all stakeholders. The two main aspects identified were activities created by universities and activities offered by industry. The techniques identified in the models are methods and tools appropriate for identifying problems and for developing solutions to them. Overall, the models were found not to be completely relevant to the new economic era and it is suggested that new models and ideas need to be developed which are appropriate in the digital economy.

The main limitations on the results of this systematic literature review are the restriction of the search criteria, and it is possible that the outcome may not cover all existing models. Further, judgments relating to the category of WIL into which each study fell were made by the lead researcher and it is possible that some studies could be placed in more than one category. However, it is not felt that this detracts substantially from the contribution of this study to the field.

Future research based on the results of this systematic literature review should focus on the WIL creative ecosystem, particularly in specific industry contexts.

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