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Employee Competencies in the Age of Artificial Intelligence: A Systematic Review from Southeast Asia

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Abstract

Artificial Intelligence (AI) in the industry 4.0 based technologies is becoming omnipresent and changing the workforce environment from traditional to digital and virtual. While technology continues to evolve, new jobs will be created and the job landscape requires advanced competency elements for new employment forms and processes. The demand for some occupational skills will decline, while others grow, and the transition is likely disruptive, with skill requirements shifting significantly. In the Southeast Asia (SEA) region specifically, there has been a rapid increase in the adoption of AI but empirical approach to competencies is still underdeveloped. Hence, this study sought to fill this gap by conducting a systematic literature review on the competencies required during the intervention of AI in the SEA region. This study conducted a systematic review following the PRISMA publication standard. The articles were selected from two main databases of Scopus and Google Scholar. Based on the thematic analysis, the results revealed four main themes, namely i) technological competency; ii) cognitive competency; iii) social and emotional competency; and iv) change management competency. The four main themes have further produced 15 sub-themes highlighting the uniqueness of human soft skills that are still required although AI is adopted. Based on the pattern of past research, the review presented several recommendations for further consideration by scholars, organisations and communities.

Keywords: Artificial Intelligence, Employee Competencies, Southeast Asia, Systematic Literature Review, Industry 4.0

Introduction

Industry 4.0 is fundamentally changing how businesses create, improve and distribute their products. There is a constant growth in the business by the fact that AI technology increases with industry 4.0. While technological innovation is far-reaching in general, a substantial body

of literature demonstrates that AI in particular can significantly impact organisations (e.g., Nortje & Grobbelaar, 2020). AI is a broad category of intelligent technologies and tools involving machine learning (Glikson & Woolley, 2020), deep learning models (Samek et al., 2018), genetic algorithms, the Internet of Things (Ghosh et al., 2018), smart robots, and virtual and augmented reality applications (Abou-Zahra et al., 2018). According to the PricewaterhouseCoopers survey, an increasing number of global businesses are beginning to see the value of AI in assisting workforce management (PwC, 2018). In fact, more than half of businesses around the world practice some kind of AI in their operations.

With the advances in technology, significant interest is raised due to the potential influence on society. Embracing AI can potentially provide significant benefits to organisations and economies through its contributions to productivity growth and innovation (Manyika & Bughin, 2018). Advanced technology changes how organisations work and the skills they seek (Hupfer, 2019). Implementation of AI in management and operation is expected to augment human capabilities and improve productivity at the workplace (Dignum, 2018; Stone et al., 2016). Notably, AI can imitate human beings by thinking the same way a natural person does and making a rational and optimal choice from the available alternatives to accomplish a specific goal (Mehrotra, 2019). This enables machines to complete tasks independently with minimal human intervention (Sharma & Pandey, 2020). As a result, organisations can make more timely decisions, manage resources more efficiently, and monitor as well as forecast demands. This will result in improved productivity and provide greater control over the whole supply chain, significantly reducing costs and increasing revenue for businesses.

The emergence of Industry 4.0 and Coronavirus (COVID-19) pandemic have highlighted the need to accelerate technology adoption, particularly AI, in order to futureproof economies (Kearney-EDBI, 2020). The report by McKinsey Global Institute (2018) emphasised the huge adoption costs of deploying AI systems. Interestingly, most organisations expend their government's fund or incentives, meaning only countries that are able to secure significant investment of AI can lead in the race – creating different challenges and opportunities. Some scholars have grouped countries based on their AI adoption: (i) leading countries – China and the United States; (ii) second group – Germany, Japan, Canada, the United Kingdom, Belgium, Singapore, South Korea and Sweden; and (iii) third group – Brazil, India, Italy and Malaysia (McKinsey, 2018). There is noticeable gap in SEA states' progress, as they are "still in an early stage AI" (Kearney-EDBI, 2020, p. 3) and still lagging behind in AI adoption except for Singapore. This could explain why the SEA region has only just started expressing their concerns about the talent gap needed in unleashing the full power of AI. Overall, SEA states face almost the same AI opportunities and challenges in socioeconomic issues, especially in terms of talent and capabilities.

In exploring AI adoption at the workplace, it is important to understand how the ongoing development of AI digital technology has resulted in the creation of new occupations and competency demands based on the current progress of the country. Competencies are broad descriptions of the collection of knowledge, abilities, and skills required to succeed in one's career (Wuim-Pam, 2014; Zobrist & Brandes, 2017). Zaim et al (2013) have defined competencies as the ability to perform a work role following the standards of the working environment. Generally, competencies are comprised of three components; intelligence quotient (IQ), emotional quotient (EQ), and personality traits (Yurdakul et al., 2008).

Intelligence quotient includes acquiring knowledge and hard skills or technical aspects of expertise such as critical thinking, problem-solving skills, and concentration. On the other hand, an emotional quotient is the ability to manage internal and external emotions. It also serves as the foundation for the development of four critical skills for individual behaviour, namely (i) self-awareness, (ii) self-management, (iii) social awareness, and (iv) social management (Le et al., 2020). According to Le et al (2020), cognitive, emotional, and personality traits are important factors to consider in developing high-demand competencies in the labour market.

It is clear that AI has a big impact on the labour market, creating demands for new jobs that require a special set of skills and knowledge (Manyika et al., 2017). Due to technological innovation, the criteria or components of competencies may change progressively. For instance, Hecklau et al (2016) developed several competencies – technical competencies, methodological competences, social competencies, and personal competencies – in response to the challenges faced due to industry 4.0. McKinsey Global Institute (2018) proposed five critical competencies required to deal with automation and AI. They are physical and manual skills, basic cognitive skills (e.g., basic data input and processing; basic communication), higher cognitive skills (e.g., creativity, complex information processing, and interpretation), social and emotional skills (e.g., entrepreneurship and initiative-taking, leadership and managing others) and technological skills (e.g., advanced IT skills and programming, basic digital skills). Changes in competencies are crucial to narrow the skill gaps and ensure that the workforce is competent enough to complete the task.

Therefore, organisations are caught in a race between technological advancement and human capital competencies to keep up with emerging technologies (Ariffin et al., 2020). According to the Oxford University survey, in the next 25 years, all developed nations will face job loss with a worrying rate of up to 47% (Ismail & Hassan, 2019). It is expected that AI-based technologies will free employees from data processing and information search tasks while upskilling them in high-value tasks such as reasoning and decision making. Due to that situation, employees are forced to re-skill or upskill to equip themselves with new competencies to fill new job opportunities that require more creative and high-strategic tasks. However, finding people with the right combination of technological expertise, industry knowledge, and soft skills is challenging. This situation demands the industry and academics to identify what competencies are needed to meet the labour market's demands in the era of AI (Howard, 2019; Acemoglu & Restrepo, 2020a). Hence, this study this study aims to explore employees' competencies required in the age of AI using the systematic literature review method.

Southeast Asia: Catching Up to the World in the Artificial Intelligence Race

The SEA region has emerged as a booming digital hub with a thriving sector of technology start-up and smartphone super apps devoted to e-commerce, digital payments and food delivery. It is important to note that most of the SEA region falls under Association of Southeast Asia, also known as ASEAN, except for Timor-Leste. The aggressive adoption of AI technology in the SEA region is probably due to the introduction of ASEAN blueprints such as ASEAN Economic Community Blueprint 2015, ASEAN ICT Masterplan 2020, and the Masterplan on ASEAN Connectivity 2025 to name a few (Box & Lopez-Gonzalez, 2017). These strategies and policies are aimed towards providing incentives, facilities, infrastructure, and

resources to the SEA region under ASEAN to enhance economic integration through automation and digitalisation. Many countries are aware of this digital economy and have launched national responses such as Thailand 4.0 and Singapore's Smart Nation initiative (Menon & Fink, 2019).

The success of technology adoption in enhancing the economy around 10 to 18 percent GDP uplift across SEA region by 2030. Around 83% of the region is in the early stages of AI adoption while only 15% of the region is at the advanced stages, with Philippines, Singapore and Malaysia leading the race (end-to-end scaled implementation of AI) (Kearney-EDBI, 2020). Yet, given the accelerating speed and breadth of technological change, handling talent is becoming harder. The International Labour Organisation estimates that 56% of the jobs in five countries in the SEA region (Cambodia, Indonesia, Vietnam, Thailand and the Philippines) are at high risk of automation (Chang & Huynh, 2016). Kearney-EDBI report on AI in SEA region identified five main issues; (i) overemphasised concerns for talent gap; (ii) fragmented and nascent AI ecosystem; (iii) evolving data governance and infrastructure; (iv) new regulations that impact AI development; and (v) user resistance to AI.

The most critical issue is the talent gap, where findings report a mismatch between skills and AI requirements in up to 85% of workforce. Therefore, organisations that wish to deploy AI models in their operations should understand the importance of upskilling their internal workforce rather than acquiring external talent. In summary, the SEA region was selected due to two main reasons. First, despite the increased adoption and strong commitment to adopt AI-based technology, SEA countries are still lagging in making AI a strategic agenda compared to any other Asian or developed country. Second, SEA is reported to have a shortage of human resources which are capable of using AI technology optimally (Acemoglu & Restrepo, 2020b). This issue has been raised repeatedly in the literature, alluding to the necessity of identifying the competencies required for human resource upskilling and re-skilling.

Employee Competencies in the AI Age

AI technology has arrived at the right time. It functions in the same way that the most objective analytical mind does, but on a scale and at a speed that humans cannot match. Bhar et al (2019) explained that the employee competencies required heavily depends on the types of AI practised in the organisations. This means that organisations only need certain competencies depending on what AI technology they adopt in their business operation. A number of studies have also revealed that new technology applied in organisations will always require a new set of competencies (Deloitte, 2019; Saniuk et al., 2021). These competencies can include both the employee's requirements (namely knowledge, skills, education, and experiences) and the employee's personal attributes (including cognitive abilities, traits and interests) (Guenole & Feinzig, 2018).

Since AI has emerged as a viable source in today's industry, the success of its implementation and acceptance is heavily reliant on the employees' ability to work with AI. The consensus recognises that people need to learn values and skills that will help them live and work in an AI world (Shiohira, 2021). This signifies the urgent need to identify when and what skills are needed when the labour market changes, so that relevant agencies are aware and update their requirements accordingly. Scholars are interested in determining the competencies necessary for individuals in the age of AI in a variety of contexts (e.g., Le et al., 2020); hence, it is vital for this paper to discuss the competencies needed in the context of the SEA region specifically.

Theorising Employee Competencies

This study adopts Crawford's Integrated Model (Crawford, 2005), a combination of the model competence by Boyatzis (early 1980s cited in (Boyatzis, 2008; Spencer and Spencer, 1993; Crawford, 1999). The model defines the competencies that professionals and organisations must possess in order to function to the competency standard. An integrated model of competence was established in order to respond to fast changing technology and workplace environments that require abilities that many individuals lack (Crawford, 2005). Crawford (2005) divides competencies into three categories:

(i) input competencies – the knowledge, understanding, skills, and abilities that an individual brings to a job;

(ii) personal competencies – the fundamental personality characteristics that underpin an individual's ability to perform a job; and

(iii) output competencies – the ability to perform the activities within an occupational area at the levels of performance expected in employment.

Yang (2015), referring to Crawford's Integrated Model, identifies the development of appropriate competencies as an important strategy for industries implementing new technologies. According to Caredda (2020), one critical component of successful transformation is preparing people and management with the necessary skills, vision, incentives, resources, and action plan. Numerous experts have argued that the appropriate competencies should include up-to-date knowledge about technology, the skills necessary to manage it, and the persons' inherent abilities (Mavlutova & Volkova, 2019; Rahmat et al., 20019; Kannan & Garad, 2021).

Methodology

According to Robinson and Lowe (2015), a systematic review has various advantages over a traditional review, which has been criticised for lacking thoroughness, rarely taking into account changes in the quality of the study, and is very subject to reviewer bias. A systematic review is more comprehensive since it searches widely for studies outside the subject area using extensive searching methods, predefined search strings, and standard inclusion and exclusion criteria (Robinson & Lowe, 2015).

Additionally, the systematic review emphasises transparency because it relies heavily on the review protocol or publication standard as the methodological guidance to ensure comprehensive review (Haddaway et al., 2018). The review is guided by the central research question: What employee competencies are required in the SEA region in AI age? This study sought to bridge the gap by conducting a systematic review of previous related studies to understand employee competencies in SEA better. The researchers believe that a systematic literature review is one of the finest approaches to review the existing literature in a more systematic way.

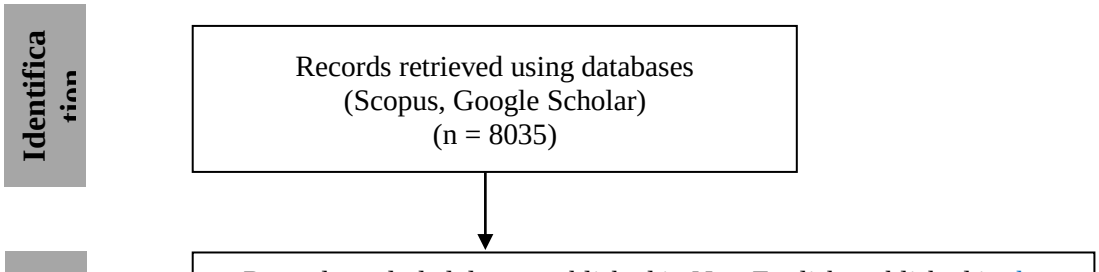

Figure 1. The PRISMA Flow Diagram

The PRISMA (Preferred Reporting Items for Systematic Review and Meta-Analyses) reporting standard guided this review. PRISMA is a data collection and analysis method that uses systematic and explicit methods to identify, select, critically evaluate, and review relevant studies (Pati et al., 2017). According to Liberati et al (2009), the PRISMA method assists the author in summarising available evidence in an explicit, rigorous, and transparent step-by-step procedure. There are three main processes in the systematic searching strategies process; identification, screening, and eligibility (refer to Figure 1).

Identification

Identification is the process of searching for any synonyms, related terms, and variations of the study's main keywords. It seeks to provide more possibilities for the selected database to search for more related articles for the review. According to Kitchenham and Charters (2007), the author can retrieve basic keywords from the research question and categorise the

research question into specific domains. The keywords are employee competencies, AI era, and SEA region.

Table 1
The search string used for systematic process

Databases	Keywords used
Scopus	TITLE-ABS-KEY (("artificial intelligence" OR "expert system" OR "big data" OR "deep learning" OR "cloud comput*" OR "internet of things" OR "knowledge engineering" OR "neural network" OR "machine learning" OR "digital technolog*" OR "digitali?ation" OR "industr* 4.0" OR "automation system" OR "autonomous robot" OR "cyber physical system" OR "advanced robotic" OR "digital ubiquity" OR "smart technolog*") AND ("competen*" OR "artificial intelligence competen*" OR "digital competen*" OR "automation competen*" OR "deep learning competen*" OR "industr* 4.0 competen"))
Google Scholar	allintitle: ("artificial intelligence" OR "machine learning" OR "cloud computing" OR "internet of things" OR "automation system" OR "industry 4.0" OR "digital technologies" OR digitalization OR digitalisation) ("competencies" OR “competency”)

Shaffril et al (2020) suggested that to enrich the existing keyword, the authors should rely on several resources such as the online thesaurus, keywords recommended by Scopus, the keywords used by previous studies, and keywords suggested by experts. Following the choice and improvement of the keywords, the authors created an entire search string (using the Boolean operator, phrase searching, truncation, wild card, and field code functions) for Scopus, the main database (Table 1). Scopus was selected as the primary digital database due to its broad coverage and multidisciplinary, comprehensive, and high-quality articles (Martin-Martin et al., 2018; Gusenbauer & Haddaway, 2020). As an additional database, Google Scholars was chosen. The use of Google Scholars as an additional database is consistent with the suggestion made by Haddaway et al (2015), who noted Google Scholars’ purpose to serve as a supporting database in the systematic review process. The searching process in these two digital databases has resulted in a total of 8035 articles (as shown in Figure 1).

Screening

This study screened all the 8035 articles using automated criteria selection based on the database’s sorting function. According to Kitchenham and Charters (2007), the selection criteria should be based on the research question. Therefore, only articles published in SEA countries were selected (Table 2). Moreover, we only included articles published in a peer-reviewed journal and contain empirical data to ensure the review’s quality. Furthermore, only articles published in English are included in the review to avoid ambiguity. This procedure eliminated 7841 articles that did not fulfill the inclusion requirements and two duplicate articles. Next, we processed the remaining 193 articles in the third stage, which determined eligibility.

Table 2
Inclusion and Exclusion Criteria in Screening Process

Criteria	Inclusion	Exclusion
Literature Type	Journal article (empirical data, peer-reviewed proceeding paper)	Review article, chapter in book, book, book series
Language	English	Non-English
Region	SEA countries (i.e. Brunei, Cambodia, Indonesia, Laos, Myanmar, Malaysia, Timor-Leste, the Philippines, Singapore, Thailand and Vietnam)	Non-Southeast Asian countries

Eligibility

Eligibility is the third process in which the authors manually review that the retrieved articles following the screening process meet the criteria. According to Shaffril et al (2020), the identification and screening processes are automated by the computer, making them susceptible to errors. Therefore, to minimise any deficiencies during identification and screening process, we read the title and abstract of the articles manually. This process excluded 180 articles due to their focus on abilities or AI competencies (i.e. algorithm, big data, natural language processing etc.) instead of employee competencies, and their focus on review rather than empirical data, location outside of SEA region, and their publication in the form of a book chapter or proceeding paper. In total, we chose only 11 articles. There is no minimum number that needs to be included in a systematic review as long as data were extracted accordingly (Whiting et al., 2008).

Data Extraction and Analysis

We thoroughly read the 11 articles to extract the data, paying particular attention to the abstract, results, and discussions sections. Data extraction was carried out to answer the research question that had been set earlier of this study and placed in a table. We then conducted a thematic analysis to identify themes and sub-themes that emerge from the extracted data. According to Flemming et al (2018), thematic analysis is the most suitable in synthesising mixed research design. A thematic analysis begins with the process of the generation of themes. In this case of the study, we adopted deductive thematic analysis based on the theory and existing literature. We started with the defined research question, all keywords and the search string. Then, we identified patterns (Table 3) that appear across the data, specifically looking at the findings and discussion sections, extracting the relevant information from all reviewed articles during this process.

The following process involved re-examining the accuracy of these themes. We re-examined all main and sub-themes generated to ensure their utility and accurate representations of the data. The analysis revealed four themes and fifteen sub-themes. Then, we moved on to the next stage, which involved naming the themes and sub-themes (Table 3).

Findings and Discussion

Out of 11 selected papers, seven studies were conducted in Malaysia, while the remaining four were conducted in Singapore, Vietnam, Thailand and Indonesia. Among all 11 articles, four were published in 2019, four in 2020, and three in 2021. The authors developed four themes and 15 sub-themes based on thematic analysis:

(i) technological competency – basic technical, higher technical, and media and digital
(ii) cognitive competency – critical thinking, creativity and innovation, and continuous learning
(iii) social and emotional competency – leadership, teamwork, social skill, entrepreneur skill, communication and initiative
(iv) change management competency – adaptability skills and resilience skills

Technological Competency

As technological automation gradually penetrates the workforce, it is expected that the workforce will rely on technological tools in performing many tasks. Due to that reason, technological competency is one of the critical competencies required during AI age. Overall, this competency emphasises creating or using a particular technology effectively. Based on thematic analyses, technological competency has three sub-themes. The first sub-theme addresses basic technical skills, such as analysing, interpreting, and documenting the output from digital instruments (Ismail & Hassan, 2019). Organisations require future employees who can understand the whole automation process to optimise the day-to-day process (Ismail & Hassan, 2019; Kannan & Garad, 2021). AI technology can only progress towards replacing humans, once humans have analysed the large amount of data that AI needs to be familiarised with (Anton et al., 2020). Hence, organisations require talents with the 'technical know-how' to identify and develop more new AI technology (Kearney-EDBI, 2020). It is important to note that in order for AI-powered technology to produce better results, humans need to acquire basic technical skills such as searching, providing and filling in the information.

The second sub-theme is higher technical skills. These technical skills refer to the specialised knowledge and expertise needed to accomplish complex tasks, actions, and processes that involve computational technology. Among all, manufacturing and education sectors were found to adopt high AI-powered technology in their operation, as production and decision making are heavily data driven (Kowang et al., 2019; Kowang et al., 2020; Kannan & Garad, 2021). Troubleshooting skills, or the systematic approach to correct complex machine, computers, electronics, and software systems, are vital in handling AI technology (Ismail & Hassan, 2020; Ariffin et al., 2020). Another higher technical skill required by manufacturers and managerial-level staff in Malaysia is data security (Kannan & Garad, 2020; Ariffin et al., 2020). Data security skills helps to prevent illegal access to digital data information kept on servers (Ariffin et al., 2020). In Indonesia, advanced technical skills, such as programming skills, are greatly needed in banking and FinTech (financial technology) (Santoso et al., 2020).

The last sub-theme is related to media and digital literacy skills. Digital literacy "is the ability to define, access, manage, integrate, communicate, evaluate, and create information safely and appropriately through digital technologies and networked devices for participation in economic and social life" (Law et al., 2018, p.6). As for media, it plays an important role in communication and knowledge sharing during the AI age. In order to maintain a standard of work, professionals in manufacturing must use media tools (Kannan & Garad, 2021). In Singapore alone, ten campaigns have been held through collaboration with local and international agencies, focusing on introducing and brushing up on digital literacy to

encourage the acceptance and utilisation of technology, leading towards their Smart Nation Vision (Ei & Soon, 2021). These skills are also directed towards guiding netizens in being able to think critically and differentiating any received information. Employees should possess media and digital literacy, which includes knowledge of various forms of media and the skills and abilities for managing multiple conditions of professional communication (Ariffin et al., 2019; Kannan & Garad, 2021).

Cognitive Competency

The next theme is cognitive competency, and it can be divided into four sub-themes: critical thinking, creativity and innovation, continuous learning, and financial competency. Ellingrud, Gupta and Salguero's (2020) study in Europe and the United State found that cognitive skills are still vital in the organisation. Several past studies stated that critical thinking is essential to survive in the AI era (Kannan & Garad, 2021; Le et al., 2020; Ariffin et al., 2020; Rahmat et al., 2019). While AI technology is getting better at drawing conclusions and making recommendations, the unique human skill of critical thinking and judgement are still essential for final decision making (Hupfer, 2019). Critical thinking is fundamental to problem-solving. It involves analysing, interpreting, evaluating, summarising, and synthesising information. According to Arifin et al (2020), management-level employees must be critical thinkers and remain constructive while analysing and scrutinising complex procedures and massive amounts of data. In Vietnam, it was found that many lack critical thinking and that it is a skill which needs to be developed at the workplace (Le et al., 2020). According to Le et al (2020), individuals with critical thinking should be able to: (i) think multi-dimensionally, (ii) analyse and evaluate data, (iii) know how to search and aggregate information systematically; and (iv) work well with others. Critical thinkers can generate new ideas, solve complex problems, and assess the benefits and challenges of potential solutions using logic and reasoning rather than instinct or emotion (Marr, 2020). Likewise, in Malaysia's manufacturing sector, critical thinking skills are also vital for the employee to solve complex problems with large amounts of data (Kannan & Garad, 2021).

The second sub-theme is creativity and innovation. With all of the new technologies in the age of AI, the future workplace will require new forms of cognition. New technology will necessitate new methods of thinking, making creativity and human innovation a crucial asset (Marr, 2020). Employees must be willing to experiment, discover, and think creatively (Rahmat et al., 2019). Undeniably, AI programs are good at providing several options of solutions, but they are not necessarily good at providing quality of creative choices. In relation to this, lecturers in Malaysia are expected to embrace the implementation of AI in the classroom and need to be creative in choosing the most effective teaching and learning methods (Kowang et al., 2020). Being innovative also exposes lecturers to engaging with a transdisciplinary approach that helps them continuously improve teaching methods to ensure that the teaching and learning process remains relevant (Kowang et al., 2020). Similarly, innovative thinking is also critical for Malaysia's manufacturing sector to ensure that research and development plans can be implemented (Kowang et al., 2019). Moreover, Indonesia's banking and FinTech industries also place importance on innovative and creative thinking because of its rigid business and rules (Santoso et al., 2020).

The last sub-theme is continuous learning. During the AI intervention, the dynamic environment with constant change and innovation necessitates continuous learning competency as a prerequisite for the employee to continue learning (Kannan & Garad., 2021; Ariffin et al., 2020; Kowang et al., 2020; Le et al., 2020; Santoso et al., 2020). In addition, this

skill will make the personnel remain relevant in the organisation because they continuously update and develop the skills required by the current and future labour market (Saniuk et al., 2021). In Vietnam, the labour market demands employees who can constantly update their knowledge and proactively develop learning goals and implement self-study (Le et al., 2020). Likewise, manufacturing employees also require continuous learning to learn and operate the new technology. Manufacturers are expected to control and correct autonomous work unaidedly. Thus, continuous learning allows the employee to implement self-directed learning (Kannan & Garad, 2021).

Social and Emotional Competency

The next theme is social and emotional competency, and it can be divided into six sub-themes: teamwork, social intelligence, entrepreneurial skills, communication, leadership and initiatives. Several past studies stated that teamwork is an important skill during AI age (Kannan & Garad, 2021; Kannikar et al., 2021; Le et al., 2020; Ariffin et al., 2020). Merriam-Webster dictionary online defined teamwork as "work done by several associates with each doing a part but all subordinating personal prominence to the efficiency of the whole". This skill is highly required in manufacturing technology since this sector often sees employees working in teams (Saniuk et al., 2021). Nevertheless, in Malaysia, teamwork skills are required not only for manufacturers but also among managers and digital publicists (Kannan & Garad, 2021). Cooperating effectively in a team could help the employee work with others to complete a project and achieve a goal. Kannikar et al (2021) listed teamwork under facilitation competency where people can give advice and help others in activities.

The second sub-theme is social skill. Social skill refers to the capabilities developed for collaborating with others to attain a common goal (onetonline.org). As organisations embrace automation, many are realising that advanced technology complements – rather than replaces – human skills. According to Rahmat et al (2019), several aspects of social skill competency, such as empathy, negotiation, and service orientation skills, are important for the future job market. All these distinctly human traits are more crucial than ever with the emergence of AI (Deloitte, 2019). Workers with these soft skills can help their firms adapt and compete in ways that robots cannot in a constantly changing landscape. In Singapore, employees in the construction industry must be open-minded to be receptive to other opinions (Low et al., 2021). It also noted that emotional intelligence is another aspect of social and emotional competency important for Malaysian academics and managerial level employees (Ariffin et al., 2020; Rasiah et al., 2019).

The third sub-theme is entrepreneur-thinking skills. Employees need to have the characteristic of entrepreneurs to recognize marketplace opportunities because they think creatively, take ownership of their work, and are productive (Ariffin et al., 2020; Saniuk et al., 2021). In Indonesia's banking and FinTech industry, entrepreneur-thinking skills could help the employee generate new ideas that become an added value in business activities. Employers in Singapore's construction business agree that future workers must possess entrepreneurial skills, as these employees will be more self-sufficient at work to compete with AI abilities (Low et al., 2021). According to Kruger and Steyn (2020) this skill is vital for the development of new businesses to achieve a competitive advantage and important in effectively using technology. In other words, AI technology could not work efficiently without this thinking skill due to a mismatch with the business strategy. More precisely, employees need to constantly seek opportunities to introduce new technology, new procedures and new products to invade new markets.

The next sub-theme is communication skill. Communication refers to alternative ways to inform and entertain via written, oral, and visual media. Marr (2020) emphasised that employees must learn to effectively interact with others, utilising the appropriate tone of voice and body language to convey their message properly. Ariffin et al (2020) found that among the communication competencies needed by employees is for them to have a strong grasp of the English language (Ariffin et al., 2020). Seeing as most available AI technology uses English, it is vital for employees to be well-versed in English. Nowadays in Vietnam, the employee needs to know a foreign language as an added value at the workplace. As for Indonesia, communication skills are viewed as critical in order for employees to communicate with customers and deliver timely information to meet consumer expectations in service industries such as banking and FinTech (Santoso et al., 2020). Although AI technology can be used for real time communication, it is important to have 'human interaction' or 'human touch', including negotiation abilities, when it involves another human (Saniuk, 2021; Zobrist & Brandes, 2017).

An equally important sub-theme is leadership. Several studies agree that leadership is an essential competency in the various contexts of the workplace (Kannan & Garad, 2021; Le et al., 2020; Ariffin et al., 2020; Santoso et al., 2020; Rahmat et al., 2019). Especially in the manufacturing sector, leadership is vital in because employees need to make decisions quickly and rapid adjustments with regards to the automation system (Kannan & Garad, 2021). Ariffin et al (2020); Le et al (2020) also stated that with AI, an increasing number of virtual work environments would be deployed, requiring everyone to assume leadership roles inside the organisation. Nonetheless, it is vital to understand the domain and business objectives in order to comprehend the data and how AI techniques might assist organisations in achieving their objectives and creating commercial value. Additionally, an increased adoption of AI would foster a greater appreciation for people and social skills, as AI is still in its infancy, particularly in domains such as leadership (Ahmad, 2019; Duranton et al., 2018).

The final sub-theme is initiative. This includes the ability to assess and initiate things independently before others do. Low et al (2021) emphasised that this skill is especially critical in the construction industry which widely employs AI technology. This kind of competency embraces novelty, uncertainty, and unpredictability. In using AI, curiosity helps employees in driving technological transformation at work. Although this skill has only been discussed in one article, it should be given emphasis as the SAS Institute (2021) indicated around 62 percent of managers said curiosity helped employees develop innovative solutions at the workplace. In Malaysia, having the initiative is listed as one of the personal skills that is very important for managerial level employees (Ariffin et al., 2020).

Table 3
The themes and the sub-themes

Studies		Years	Region	Technological			Cognitive			Social & Emotional						Change Management	
				BT	HT	MD	CT	CR	CL	TW	SI	ES	CM	LD	IN	AD	RS
1.	Ismail and Hassan	2019	Malaysia	/	/												
2.	Rahmat et al.	2019	Malaysia				/	/						/		/	
3.	Rasiah et al.	2019	Malaysia								/						
4.	Kowang et al.	2019	Malaysia		/						/					/	
5.	Le et al.	2020	Vietnam		/		/	/	/	/			/	/		/	
6.	Kowang et al.	2020	Malaysia		/			/	/							/	
7.	Ariffin et al.	2020	Malaysia		/	/	/	/	/	/	/		/	/	/	/	/
8.	Santoso et al.	2020	Indonesia		/			/	/			/	/	/		/	
9.	Kannan and Garad	2021	Malaysia	/	/	/	/		/	/				/		/	
10.	Low et al.	2021	Singapore								/	/			/	/	/
11.	Kannikar et al.	2021	Thailand	/						/							

Technological competency

BT = Basic technical

HT = Higher technical

MD = Media and digital

Cognitive

CT = Critical thinking

CS = Creativity and innovation

CL = Continuous learning

Social & Emotional

TW = Teamwork

SI = Social skill

ES = Entrepreneur skill

CM = Communication

LD = Leadership

IN = Initiative

Change Management

AD = Adaptability skill

RS = Resilience skill

Change Management Competency

There are two sub-themes listed under change management competency – adaptability and resilience. Several studies agree that adaptability is vital so that employees is able to adjust to the ever-changing working environment in the AI digital era (Kannan & Garad, 2021; Le et al., 2020; Kowang et al., 2020; Kowang et al., 2019; Low et al., 2021; Ariffin et al., 2020; Santoso et al., 2020; Rahmat et al., 2019). According to Le et al. (2020), flexibility is a skill that may be classified within the adaptability competency. Adaptable employees can work in transdisciplinary and multicultural environments (Santoso et al., 2020; Le et al., 2020; Kowang et al., 2021). For example, managerial-level employees are expected to possess adaptability competencies, which enable them to adapt to various situations involving work time, work materials, and even (virtual or physical) working conditions (Ariffin et al., 2020). Adaptability is also critical for future construction employees because it enables employees' thoughts and behaviours to evolve in tandem with the ever-changing work environment and workplace culture (Low et al., 2021). It is crucial for employees to adapt to the quick advancement in technology. Additionally, the labour market in Vietnam requires employees with a high level of adaptability, which includes flexibility, positive thinking, and the capacity to use the previously acquired knowledge in new circumstances (Le et al., 2020). The same is happening

in the Malaysian academic setting which requires lecturers to adapt to digital teaching and learning methods (Kowang et al., 2020).

The second sub-theme is related to resilience. Resilience is defined as "the ability of an entity — asset, organization, community, and region to anticipate, resist, absorb, respond to, adapt to, and recover from a disturbance" (cited in Tripathi et al., 2021, p. 136). The construction industry in Singapore requires employees with resilience as working in the construction industry is stressful (Low et al., 2021). Resilience allows the employee to have the ability to bounce back from any difficulty at the workplace. As for the management-level employees, resilience enables employees to cope better in conflicting situations when facing difficulties with digital technology (Ariffin et al., 2020). Technological advancements are reshaping the very underpinnings of how we work and live, and the implementation of AI is full of ambiguity, uncertainty and causing a significant change in the working environment. Hence, people with resilience will view unforeseen issues in using AI to be manageable.

Conclusion

It can be concluded from the recent literature that all of the aforementioned competencies are critical for the workforce in SEA region, implying that a basic understanding of the 'competencies' is needed in response to technology advancements. The four themes that represent the competencies needed in the AI age in the SEA region were identified based on the systematic review conducted; technological, cognitive, social and emotional, and change management competencies as shown in Figure 2. It is projected that AI will continue to alter workforce competencies; as a result, the workforce needs to be re-skilled or up-skilled. Among all four sub-theme discussed in the selected articles, this study found that more than seven selected articles highlighted change management (i.e. adaptability skill) and technological competency (i.e. higher technical) as a must employees competencies in AI era. For a variety of reasons these two are essential during AI compared to the rest.

First, the implementation of AI technology can frequently result in considerable changes to organisational procedures and systems, and individuals must be able to adapt to these changes in order to do their jobs successfully. Employees with good adaptation abilities can more readily adapt to these changes and remain productive in their professions. Second, as AI technologies progress and become more complex, employees will most likely need to constantly learn and gain new abilities in order to properly use and interact with the technology. Higher technical technology abilities can assist employees in learning and adapting to new technologies as they develop. Finally, as AI technologies become more common, an employee's ability to effectively interact with these technologies may become an increasingly essential aspect in an employee's worth to a business. Strong adaptability and greater technical technological abilities can assist individuals in remaining competitive in the labour market and seizing new chances as they occur. Overall, adaptability and advanced technical technology abilities are vital during AI adoption since they may assist employees in efficiently adapting to and working with new technologies, as well as remaining competitive in the labour market.

Most of the articles available discussed more competencies needed at infancy stage, where probably only one department practices AI, while the rest of the organisation is still not ready, causing the data collected to be too broad. Nevertheless, the findings are in line with two categories out of three in total of the competencies proposed by Crawford's Integrated Model

framework (Crawford, 2005), which are input competencies (theme – technological and cognitive competency) and personal competencies (theme – social and emotional, and change management competency). As for output competencies, or the ability to perform any given tasks, were not discussed in any of the selected articles. It is worth mentioning based on the review that soft skills are much needed because AI is not yet be able to replace it. Many researchers emphasised that humans are less likely to be substituted by AI any time sooner because personal competencies consist mostly of soft skills unique to humans and cannot be replaced by machines (Ariffin et al., 2020; Rahmat et al., 2019; Kannan & Garad, 2021).

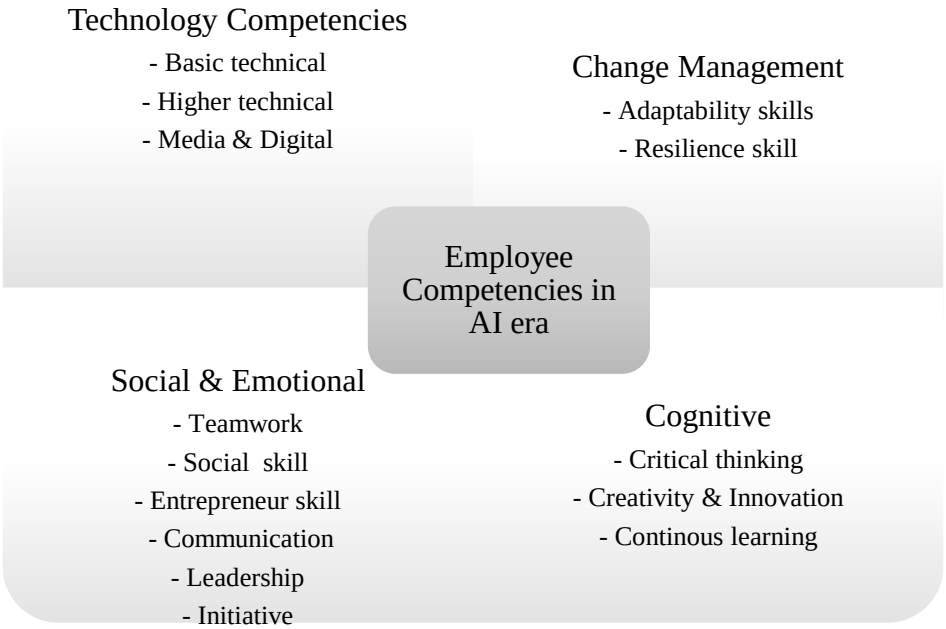

Figure 2: Theme of Competencies

Recommendations

The findings and systematic review process of the present study have led to a number of recommendations that may be helpful for future studies. First, future scholars should focus on the level of AI technology adoption and how it shapes the skills needed for AI employment and training development as part of the organisation's strategy. It is noteworthy that the level of adoption (low or high performing AI) significantly impacts their talent upskilling. Having said this, based on this level, employers will have planned the recruitment and training of talents according to the skills required. Deloitte Development (2020) conducted survey research on 2,029 global executives and public sector leaders from all around the world, revealing that 46 percent of them lack knowledge and skills needed for the age of AI. The required knowledge and skills can only be acquired and improved through talent development and training to prepare employees in responding to the fast paced changes and new requirements due to the implementation of AI.

Furthermore, the review process revealed that many of the previous studies focus on the manufacturing industry. This is in line with industry 4.0 that focuses on manufacturing sectors by promoting smart manufacturing, supply chain management, and operation with smart digital technology (MITI, 2019). It is vital to note that the telecommunication, automotive, financial services, media and entertainment and transportation industries are also all major players of AI technology that also contribute to a country's growth (Ferreira et al., 2020;

McKinsey Global Institute, 2018). In the SEA region alone, the service-oriented industry is leading the way with 15% of service-oriented businesses in the advanced stages of AI implementation (Kearney-EDBI, 2020). This indicates the importance of more research to be done on other industries, such as those previously mentioned.

Moreover, as previously mentioned, this review focuses only on studies done on the SEA region. Thus, more similar studies need to be conducted on other regions including Western Asian (i.e. Egypt, Oman, Qatar, UAE) and East Asian (i.e. Japan, Taiwan, China, Korea). In this case, it is imperative to obtain empirical data on how AI technology impacts the trend and pattern of skills required for employment. When we conducted this systematic review, we found that although some reports (i.e MITI, 2019; Deloitte, 2019) showed that the SEA region is progressing well in AI technology, there were also articles that contradicted this, saying that we are still at the infancy stage (Chitturu et al., 2017; Howard, 2019). The level of AI implementation will change the way people work, and a spectrum of skills will be needed to ensure success. For instance, in Australia, addressing skill gaps is revealed to be one of the obstacles in progressing well in AI (Loucks et al., 2019). In other words, these studies are vital to see the broader scope and perspective from other countries.

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