Unveiling the Impact of the Digital Economy on Future Employment: A Comparison Study among Selected Southeast Asian Countries

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Abstract
This study explores the dynamics of the digital economy and the current progress of selected countries in Southeast Asia. Additionally, the Structural Change Theory adds valuable insights into the shifting employment patterns resulting from Industry Revolution 5.0. The digital economy is reshaping global markets, affecting multiple sectors, shaping economic growth as well as society. Through an exploration of the digitalization strategies and initiatives of the selected countries, this study seeks to offer insights into their distinctive approaches, challenges, and efforts in leveraging the potential of the digital economy. By analysis of these strategies, the study can contribute a deeper understanding of the importance of digital economy and impact towards society 5.0. Through a comprehensive review of relevant literature, policy documents, and current progress, the study highlights key factors driving digitalization in each country, including government policies, infrastructure development, investment climate, and digital skill levels. Moreover, the implication of the study will add values for employment patterns, innovation ecosystems, and inclusive growth strategies in China, Malaysia, and Indonesia. By synthesizing these findings, the study offers valuable insights for human resources practitioners, policymakers, business leaders, and stakeholders seeking to navigate the complexities of the digital economy and promote sustainable development in an increasingly digitalized world. Furthermore, the finding indicates that Southeast Asia countries are preparing for a shift in employment trends.
Keyword: Digital Economy, Comparison Study, Industry Revolution 5.0, Society 5.0, Employment Trends.

Introduction
The emergence of Industry 5.0 signifies the dynamic manifestation of the digital economy, a visionary concept that has been meticulously outlined in European Union countries since

2015 (Carayannis et al., 2022). ASEAN digital masterplan 2025 has identified seven core aspects that member countries should prioritize to propel their respective economies towards digital transformation (World Economic Forum, 2024; ASEAN, 2021). One of the major aspects discussed was the changes in the job market and human capital, which require a new employment landscape. Moreover, the concept of the digital economy was elucidated by UNCTAD (United Nation Conference on Trade and Development) on 4 September 2019 through "Digital Economy Report 2019". It marked a new milestone in digital development; however, the emergence of gaps has presented challenges to the global digital economy. Inequality within the digital economy has led to disparities in wealth distribution and digital literacy.

Subsequently, the United States and China focused on wealth creation, with 75% of blockchain patterns and 90% market capitalization value in business platforms belonging to these two countries. The Organization for Economic Cooperation and Development (OECD) defines the digital economy as a process contributing to the ongoing evolution of digital technologies. The shift toward digital transformation, impacting employment patterns and fostering new industries was accelerated by the COVID-19 pandemic (Prastyaningtyas et al., 2023). Driven by the desire to foster economic growth, enhance competitiveness, create jobs, stimulate innovation, and improve overall societal well-being, governments globally are actively promoting digitization initiatives. The United States has announced the "Information Digital Economy 2017 and 2021" as an initiative to spearhead digital advancements (Mottaeva et al., 2023). In the Asia Pacific region, several countries are driving their economies towards digitalization with 75% of Asia population using online platforms for various reasons (Ha & Chuah, 2023). For instance, Malaysia's commitment to digital progress is evident through the establishment of the National Fiber and Connectivity Plan (NFCP), the Malaysia Digital Economy Blueprint 2030. Meanwhile, China leads in innovation, as emphasized in the China Digital Economy Development Report (2022) by China Academy Information Communications Technology (CAICT). Additionally, Indonesia is actively pursuing digital transformation with its "Making Indonesia 4.0 Roadmap," emphasizing the digitalization of industries (Farliana, Murniawaty, & Hardianto, 2023).

In a digital economy, data resources and sophisticated networks play pivotal roles in integrating digital technologies, extending business spaces, improving efficiency (Stephenson, 2020) and stakeholders' connections using virtual reality, big data, artificial intelligence (AI) and the internet of things (IOT) (Yunxia et al., 2023). This brings profound implications for workforce dynamics due to the changes in communication, production, marketing, and consumption in Southeast Asia (Ha & Chuah, 2023). In addition, various aspects of employment encompassing learning, working pattern, employee management and society have also been impacted (Yunxia et al., 2023; Szymkowiak et al., 2021). The digital economy also requires high-tech talents for emerging technologies (Li, 2022) and new industries such as e-commerce, telemedicine, and remote collaborations. Comparative analyses among Southeast Asia countries, including Malaysia, Indonesia, Brunei, Cambodia, the Philippines, Laos, Myanmar, Singapore, Thailand, and Vietnam on the digital economy indicate positive changes in the workplace (Ha et al., 2020). Therefore, this study aims to explore the digital economies of selected countries in Southeast Asia from five perspectives through a comparison study and a benchmarking approach. Through a review of transformative literature and a comparative study, the research seeks to provide valuable insights to

policymakers, human resources practitioners, and management, thereby enhancing global awareness of digital economy dynamics and changes. By reviewing transformative literature and conducting a comparative study, the research seeks to contribute valuable insights to policymakers, and management, enhancing global awareness of digital economy changes.

Literature Review
Digital economy and current trend analysis
The evolution of the digital economy has been a journey marked by transformative shifts. Initially centered around the internet and information technology, it has expanded into a data-driven decision-making era, leveraging technologies such as e-commerce, cloud computing, and big data (Liu et al., 2022). Today, the digital economy is increasingly characterized by its emphasis on remote work capabilities and innovation in online services, with the incorporation of emerging technologies like AI, augmented reality, and blockchain driving greater automation and efficiency (Khan et al., 2023). It has become impossible to operate not to operate without AI technologies, the economic landscape looks significantly different.

In this dynamic and interconnected environment, adaptability, digital literacy, and a commitment to innovation have become crucial attributes for both individuals and organizations (Limna et al., 2022). Based on growth trends in 2023 and beyond, the focus is expected to shift towards sustainability initiatives, advancements in digital infrastructure, and an increasing reliance on enhanced connectivity and data security technologies. This forward-looking perspective underscores the importance of continuous learning, technological readiness, and strategic planning to thrive in the evolving landscape of the digital economy.

Digital economy and workforce changes
It is profound of using and working in the digital era, high impact of using automation and the adoption of AI technologies in various industries. Tasks that were previously handled by people are now being automated by AI, applications, and digital simulations. For example, the interview process, which traditionally involved multiple rounds and a high number of participants, incurred significant costs and time. With AI simulations, the interview process has been shortened, making it easier to identify suitable candidates for the final stage. The role of human resources has been partly absorbed by digital tools, thus saving costs and time. Replacing unproductive employees will be noticed, potentially leading to positive or negative repercussions.

In another situation, the digital economy has facilitated remote work, hybrid models, and work-from-home setups as integral aspects of contemporary work culture. Society 5.0 places a strong emphasis on fostering flexible work arrangements and remote collaboration to promote a healthy work-life balance (Amalia, 2024). This requires employees to adapt to novel working patterns and enhance their communication competency skills. Ultimately, this transition leads to a learning and development trajectory, which calls for the expertise of digital trainers and skilled coaches proficient in digital competencies. For instance, consider the traditional interview process, which often involves multiple rounds and numerous participants, resulting in significant costs and time expenditures. With the introduction of AI simulations, the interview process has been streamlined, allowing for quicker identification of suitable candidates for final selection. While this automation saves costs and time, it also

signifies a shift in the role of human resources, with digital tools playing a more significant role in candidate evaluation and selection. This transformation may lead to the replacement of unproductive employees, potentially resulting in both positive and negative implications for the workforce. Furthermore, the digital economy has facilitated the widespread adoption of remote work, hybrid models, and work-from-home setups as integral components of modern work culture. Society 5.0 emphasizes the importance of fostering flexible work arrangements and remote collaboration to promote a healthy work-life balance. This shift requires employees to adapt to new working patterns and enhance their communication skills to excel in virtual team environments.

Structural Change Theory and engagement of digital economy
The Structural Change Theory (SCT) offers a comprehensive understanding of how economic structures evolve and adapt to changing societal and technological dynamics over time. This theory posits that economic development is not a linear process but is characterized by distinct phases of transformation driven by shifts in industries, production methods, and employment patterns. Historically, these transformations have been evident in the transitions from agrarian societies to industrialized economies and, more recently, to service-oriented and digital economies (Zhao et al., 2022). In the contemporary context, the digital economy represents a significant catalyst for structural change, reshaping traditional economic sectors and employment landscapes. The integration of digital technologies, such as e-commerce, cloud computing, big data, AI, and blockchain, is driving unprecedented levels of innovation, efficiency, and connectivity (Liu et al., 2022; Khan et al., 2023). This evolution is not only transforming production processes and business models but also redefining the nature of work and skills required in the labor market.

Within the framework of SCT, skills development plays pivotal roles in facilitating this structural transition. The theory emphasizes the importance of human capital investment to enhance productivity and adaptability in response to evolving economic demands and changes (Pravdiuk et al., 2020). In the digital economy, where automation and digital literacy are becoming increasingly critical, continuous learning and upskilling are essential for individuals and organizations to remain competitive and thrive. Furthermore, the trends are expected to focus on sustainability, digital infrastructure advancements, and enhanced data security technologies (Limna et al., 2022). SCT provides a lens through which to understand these transformations, highlighting the interplay between economic structures, technological advancements, and human capital development in shaping the trajectory of modern economies.

Methodology
A narrative literature review is a comprehensive and interpretative approach to synthesizing existing literature on a digital economy and workforce changes. Unlike a systematic review that follows a structured and predefined protocol, a narrative literature review is more flexible and allows the researcher flexibility to provide a coherent narrative of the existing knowledge and research on a given subject. This study employed literature review using official news, annual reports, and research articles from EBSCO, Google Scholar, Scopus, Web Science and ScienceDirect. Inclusion criteria were studies that clearly defined the digital economy in the context of global trends, with a focus on the Southeast Asian region especially Malaysia, China and Indonesia. These were used to analyze the digital economy and

employment patterns. Table 1 presents the comparison between Malaysia, China, and India in digital economy progress.

Findings

Digital economy and employment trend in Malaysia

The digital economy and employment in Malaysia have experienced rapid growth, attracting significant investment totaling $15.7 billion in the third quarter of 2022 and expected to increase with promising by 25.5 % in 2025 (Communication Ministry, 2024). This surge in investment reflects the increasing demand for scalable and high-quality data center providers, driven by global digitalization trends. The Malaysian government recognizes the importance of investing in digital infrastructure and technologies to support this growth. Initiatives such as cloud computing, the Internet of Things (IoT), cybersecurity, on-demand markets, and artificial intelligence (AI) have been prioritized to drive digital transformation. To ensure the success of these initiatives, technology specialists are being appointed to enhance productivity and competitiveness in the digital landscape.

As a result of the growth in the digital economy, employment opportunities have flourished within technology firms, e-commerce, fintech, and IT services sectors. The Malaysia Digital Economy Corporation (MDEC) reported a significant increase in digital job vacancies, rising from 19,000 in June 2020 to 56,000 by March 2023. These positions span a range of roles, including software developers, digital marketers, data scientists, content writers, influencers, and more. Recognizing the need for a skilled workforce to support the digital economy, the Ministry of Human Resource Malaysia (2023) has emphasized the importance of retraining and upskilling initiatives. Findings from the IBM Institute for Business Value indicate that 37% of the Malaysian workforce requires reskilling within the next three years. To address this need, various programs and strategies have been implemented, including the MyDigitalMaker Movement, eUsahawan, Premier Digital Tech Institute, Digital Skills Training Directory, Let's Learn Digital, Myfuturejob portal, and online masterclasses offered by local universities. Additionally, the "GigUp Programme'' utilizes online platforms such as Coursera, EdX, and Udemy to provide accessible training opportunities.

Despite these efforts, Malaysia lags in global skills rankings, and ranked at 46th in the Global Skills (Coursera, 2022). Additionally, there were many strong factors to focus on technical skills like cloud computing, cybersecurity, data analytics, digital marketing, and software development, rather than essential digital productivity skills. These productivity skills, including remote working proficiency, critical and analytical thinking, innovation, collaboration, English proficiency, and communication, are crucial for navigating the digital landscape effectively (MIDA, 2021).

The Malaysian government has initiated several digital economy projects aimed at enhancing the country's digital landscape. One such project is the Digital Free Trade Zone (DFTZ), designed to stimulate e-commerce and provide support to digital companies. Additionally, initiatives led by the Malaysia Digital Economy Corporation (MDEC), focusing on digital literacy and upskilling, are instrumental in facilitating worker adaptation to the digital economy. Another significant initiative is the National Fiber and Connectivity Plan (NFCP), outlined in the Malaysia Digital Economy Blueprint 2030. This plan plays a crucial role in expanding high-speed internet connectivity nationwide, laying the foundation for digital

growth and development. However, despite these efforts, challenges persist in the digital economy landscape. The World Bank's report in 2018 highlighted that much of the digital economy's measurable growth has been concentrated in the manufacturing sector of urbanized states. Furthermore, the lack of market competition has resulted in high prices, low coverage, and limited ambitions for fixed broadband in Malaysia. Addressing these challenges will be essential to ensure inclusive and sustainable digital economic development across the nation.

Digital economy and employment trend in China
In a relatively short span of time, China has become a new technology savvy country with $1.7 trillion e-commerce sales volume in 2020 to $4.4 trillion (2023), increased by 39.8%. Beyond that, China made its first move in cutting-edge innovation, robust technology infrastructure, and wide digital integration, which has the world's largest e-commerce market, driven by Taobao, Tmall, and JD.com, led by Alibaba, Tencent, and Huawei. Alipay and WeChat Pay have revolutionized mobile payments, creating a cashless society (Ha, 2023). In the future, China is planning a 6-dimensional McKinsey China Digital Practice megatrend move.

Sector technology is booming in China due to the aggression of their startup involvement and development. The changes in startup culture mainly change employment patterns such as AI, big data analytics, and 5G investments show its tech innovation. China's digital infrastructure, entertainment streaming, fintech, smart city, and IoT projects lead global digital transformation, changing technology and business (Lehman & Rothstein, 2021). Despite the continuous and fast growth, there are several challenges in China's digital economy. China's digital economy penetration remains small, relative to other developed economies (Sun, 2022). Apart from that, imperfect and lagging regulations and enforcement causes imbalances in the business environment, triggering severe vulnerabilities, from financial and debt risk to pollution and inequality (World Economic Forum, 2017). While doing well in the business-to customer-segment, China has not been too successful in its business-to-business services (Jiang & Murmann, 2022).

Digitalization has made Chinese workers more tech-savvy, skilled, and manufacturing-focused. High-tech and specialized occupations are still falling. Further mechanism testing suggests industry structure upgrading and human capital stock boost digital economy employment. Firms must be encouraged, promoted, and guided to accelerate digital transformation, increase worker knowledge and skills, and boost human capital dividend in the digital economy (Wu & Yang, 2022). Government initiatives are inspiring activities in the Chinese government on digital economy development. The 13th Five-Year Plan for the National Economy and Social Development (2016–2020) will launch the Scientific and Technological Innovation 2030 Project in aero engines, gas turbines, a deep-sea station, quantum communication, quantum computing, brain sciences, and brain research (FAOLEX Database, 2020). China's digital talents only have digital skills, while their counterparts in the West also have industry and business skills and experience. It needs to emphasize the integration of digital technologies with other scientific and engineering fields to expedite its digital transformation.

Digital economy and employment trend in Indonesia

Indonesia is currently in a huge digital economy transformation with focus on employment and future employment market (education sector). According to the President of Microsoft Learning Hub Indonesia, the country is undergoing a significant transformation in its digital economy, with a particular focus on employment and the future job market. He has claimed, in addition, that the value of the country's digital economy is projected to increase to US$130 billion by 2025. To prepare for this digital transformation, Indonesia aims to equip nine million individuals with digital skills across 15 sectors by 2030, emphasizing the upskilling of the current workforce. Efforts to enhance digital skills are underway through initiatives such as the collaboration between the Ministry of Economic Affairs and Microsoft to train an additional one million employees in digital technologies. Indonesia is positioning itself to become the 2nd leading digital economy in Southeast Asia, propelled by government regulations and policies that support digital innovation and entrepreneurship (Bowlus et al., 2021).

Internet usage in Indonesia has seen significant growth, reaching 220 million users in 2022, reflecting the country's increasing adoption of digital connectivity. By 2030, three-quarters of Indonesia's population will be led by the youth generation, underscoring the importance of molding this demographic into a digitally adept workforce. The digital transformation of Indonesia's economy and workforce aligns with broader global trends toward digitalization and technological advancement. Various studies have highlighted the critical role of digital skills development in preparing individuals and economies for the digital age. For example, research by the World Economic Forum (WEF) emphasizes the importance of upskilling and reskilling programs to address the evolving demands of the labor market in an era of rapid technological change (World Economic Forum, 2017; Lee, 2024).

Moreover, studies focusing on digital economies in emerging markets, such as Indonesia, underscore the significance of government-led initiatives and public-private partnerships in driving digital transformation and fostering inclusive growth (OECD, 2021). As Indonesia gears up to become a digital powerhouse in Southeast Asia, understanding the socio-economic implications of this transformation and its impact on employment dynamics is critical for policymakers and stakeholders (Asian Development Bank, 2019).

In summary, Indonesia's digital economy evolution presents both opportunities and challenges for shaping future employment trends and fostering inclusive economic growth. Through their strategic investments in digital skills development and policy framework, it shows the commitment of the Indonesian government to the emerging digital landscape to drive sustainable innovation and entrepreneurship.

Table 1

Comparison of Digital Economy Growth between China, Malaysia, and Indonesia

Items	China	Malaysia	Indonesia
Digital economy scale	$1.7 trillion (2020) to $4.4 trillion (2023), increased by 39.8%	$15.7 billion (2022) Increases by 30% (2025)	$130 billion (2025)
E-Commerce dominance	Taobao, Tmall, JD.com, Alibaba, Tencent, Huawei	Digital Free Trade Zone (DFTZ), Lazada, Shopee	Employment & future employment market in education sector
Technology innovation	Scientific and Technological Innovation 2030 Project, internet facilities and data centers.	MyDigitalMaker Movement, eUsahawan, Premier Digital Tech Institute, Digital Skills Training Directory, Let's Learn Digital, Myfuturejob portal, online masterclasses	Becoming a digital powerhouse in Southeast Asia
Skills and training needs	Requires training in other fields like soft skills	Requires training in essential digital productivity skills, and upskilling.	Requires training in digital upskilling
Government supports	China's Alibaba Group	MDEC and Digital Free Zone Area, Ministry of Communication	Ministry of Economic Affairs & Microsoft
Challenges	High investment on digital infrastructure, entertainment streaming, fintech, smart city, and IoT projects lead global digital transformation, changing technology and business	It is difficult to get gig employees to register, despite government support through programs like the Global Online Workforce (Glow) and the i-Saraan Program. Out of 400,000 gig workers, only 28,425 have registered with Social Security.	The establishment of an Online Gig Economy (OGE) has reduced the unemployment rate and increased flexible working arrangements. The number of gig employees has grown from 171,033 in 2019 to 4 million in 2023.

Discussion and Implication

The comparison among three selected countries offers valuable insights into the differing approaches and success rates in embracing digital economy practices. Table 1 illustrates the commitment and efforts undertaken by countries to realize the digital economy. China digital economy is significantly larger than other countries with a scale of $1.7 trillion (2020) and has increased to $4.4 trillion 2023. The significant size is attributed to the existence of major e-commerce and technology giants like Alibaba, Tencent and Huawei. In contrast, Malaysia's investment on digital technology less compared to Indonesia at $ 130 billion by 2025. It signals other Southeast Asia countries need to plan for their digital economy efforts. One of the success rate China able to lead in the digital economy because of the E-Commerce landscape is which is dominated by platforms like Taobao, Tmall, JD.com, and Alibaba, which are well-integrated into our daily lives. In Malaysia, DFTZ and MDEC are actively promotes platforms like Lazada and Shopee, which play a crucial role in the region's e-commerce activities. Meanwhile, in Indonesia Tokopedia and Bukalapak alongside Shopee, moving their e-commerce in Southeast Asia.

China has shown a positive commitment to innovation like establish the Scientific and Technological Innovation 2030 project. Malaysia fosters technological skills through initiatives like the MyDigitalMaker Movement, eUsahawan, and various digital skills training programs. Prioritizing the enactment and enforcement of cyber laws, such as a Cyber Protection Act, is crucial for establishing regulatory frameworks that not only safeguard digital infrastructure but also foster trust and security among stakeholders. Moreover, such legislative measures contribute significantly to Environmental, Social, and Governance (ESG) initiatives, aligning with global sustainability goals. Indonesia, aiming to become a digital powerhouse in Southeast Asia, emphasizes broad technological advancements and innovative strategies to enhance its digital infrastructure. Indonesia, positioned as an emerging digital powerhouse, presented a unique set of challenges and opportunities for policymakers and stakeholders. While the country demonstrates immense potential for digital growth, it also grapples with issues such as infrastructure development, digital literacy, and regulatory models. Addressing these issues requires concerted efforts from both parties, government and private to improve it (Mottaeva et al., 2023). By leveraging their own demographic dividend, improving digital skills development and regulatory clarity, it will provide the respective government to drive the goals effectively. The digital economy analysis has contributed to the SCT body of knowledge by integrating digital technologies into the economic process leading to automation, efficiency gains and changes in employment patterns.

Conclusion

This study has narratively discussed the meaning, importance, and impact of the digital economy in Southeast Asia. There is no denying that the emergence of the digital economy has reshaped the employment workforce pattern in Southeast Asia. A general trend is the increasing demand for digital skills across industries, driving the creation of new jobs, while transforming traditional occupations and the evolution of flexible working arrangements in the gig economy. Prior to the discussion, all the countries well navigate this landscape of change, a proactive approach centered on continuous skills development is necessary to ensure that individuals remain resilient and empowered to thrive in a dynamic and evolving digital economy. The comparative analysis shows that China is enjoying a rapid growth of the digital economy and future workforce development in comparison to Malaysia. This is mainly

due to China's emerging digital technology; high-quality public infrastructure; extensive use of digital payments; high speed internet connectivity, and supportive government policies.

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