Digital Innovation in Emerging Economies: A Comparative Review of India, Malaysia, China, and Indonesia

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Abstract
This study addresses the pivotal importance of digital technology adoption in key emerging economies (India, Malaysia, China, and Indonesia), focusing on e-commerce, education, and finance. Employing a systematic literature review and VOS viewer based bibliometric analysis, our research aims to shed light on common challenges: infrastructural deficiencies, digital illiteracy, and regulatory intricacies. In emphasizing the significance of the topic, our findings underscore the critical need for strategic investments in digital infrastructure, promotion of digital literacy, and establishment of adaptable regulatory frameworks. Despite specific data limitations, this study provides valuable insights to shape research agendas and inform policymaking for practical digital innovation in emerging economies. Moving forward, our research suggests a roadmap for future investigations. Further studies could explore nuanced aspects within each country, contributing to a more comprehensive understanding of digital innovation challenges and opportunities in emerging economies.
Keywords: Digital Innovation, Emerging Economies, Digital Technology, Opportunities, Challenges

Introduction
The rapid expansion of digital technology is reshaping the global landscape, fueling a revolutionary era with profound economic, social, and cultural changes (Hindman, 2018; Pereira & Romero, 2017). Driven by the convergence of computing power, data analytics, and networking, this digital revolution is transforming various industries and economies. Emerging economies grapple with the imperative of digital innovation, viewing it as both a developmental catalyst and a strategic necessity (Anderson & Agarwal, 2011; Gawer, 2022; Greenstein et al., 2013). Despite diverse socioeconomic conditions, these countries follow distinct paths toward digital innovation, facing challenges such as uneven internet infrastructure, varying legislative frameworks, and complex socio-cultural dynamics (Boland

Jr et al., 2007; Jain, 2020; Xue et al., 2013). Nevertheless, they acknowledge the potential of digital innovation to expedite traditional developmental stages, foster innovation, and enhance global competitiveness. Achieving this requires a comprehensive reassessment of traditional business models, governance systems, and cultural norms in the context of digital innovation in emerging economies (Hilbert, 2022).

Digital innovation stands as a pivotal catalyst for economic growth and global competitiveness in emerging nations, offering avenues for increased productivity, the creation of new industries, and the attraction of foreign investment (Haryanti et al., 2023). Unlike previous research, our focus is on digital innovation in emerging economies for several reasons. Primarily, emerging markets represent the most significant arena in the realm of economic development, with notable contributors to this growth being China, India, and other Asian countries (Bao & Lu, 2020; Erumban et al., 2019; Paul & Mas, 2016). These countries, marked by differences in economic development, cultural norms, government policies, and rates of technological adoption, provide compelling subjects for comparison (Yang et al., 2020).

However, amidst the burgeoning interest in digital innovation in emerging economies, our investigation reveals a critical research gap — a scarcity of large cross-country comparative studies. Prior studies have primarily delved into individual case analyses, providing valuable insights into localized dynamics. Yet, the absence of systematic cross-country analyses impedes the identification of general trends, challenges, and opportunities that transcend specific scenarios (Ciasullo & Lim, 2022). This deficiency highlights the need for a comprehensive understanding of digital innovation across diverse emerging economies.

Formed against this backdrop, our research questions crystallize. We seek to understand how digital innovation trajectories differ among India, Malaysia, China, and Indonesia — countries emblematic of varied historical paths, cultural foundations, and developmental ambitions. We aim to identify commonalities and distinctions that may inform overarching trends and uncover unique challenges and opportunities within these nations. The dearth of such comparative studies prompts these questions to provide a holistic perspective on the multifaceted aspects of digital innovation in emerging economies.

The significance of this study is underscored by the imperative to bridge the existing research gap. By unraveling key possibilities and challenges arising from digital innovation adoption in these four emerging economies, our research aims to offer actionable insights. These insights, in turn, can inform future recommendations and strategies, facilitating a more efficient capitalization on benefits and overcoming the hurdles posed by the unique contexts of India, Malaysia, China, and Indonesia. Thus, our study contributes to the broader understanding of digital innovation in emerging economies and provides practical guidance for policymakers, businesses, and researchers navigating the complexities of this transformative process.

The study conducted a systematic literature review (SLR) to comprehensively examine existing literature on digital innovation and emerging markets, following the approach by (Baker et al., 2020; Baker et al., 2020). Relevant documents were identified through meticulous scrutiny of comparable publications. The SLR method employed keyword

searches, resulting in the inclusion of 50 documents available through May 2023. The analysis unveils both convergent and divergent features of digital transition in four diverse countries, highlighting numerous areas for future scholarly investigation, including challenges and opportunities. Notably, the research emphasizes varied opportunities for digital technology adoption in areas such as e-commerce, manufacturing, finance, and education. However, impediments like infrastructure limitations, digital illiteracy, and legal complexities hinder the seamless integration of these digital advancements.

The document follows a structured organization: Section 2 delves into the literature review, Section 3 outlines the review methodology, Section 4 provides a summary of empirical data, and Section 5 explores potential future research areas. Concluding the study, Section 6 presents the final remarks.

Literature Review
Digital Innovation
Digital innovation refers to the incorporation of digital technology into the innovation process, encompassing both the methodology employed and the resultant innovations, either in part or in entirety. This paradigm shift has significantly altered the landscape of new products and services, giving rise to unconventional avenues for value creation and appropriation. It has facilitated the emergence of innovation collectives, bringing together diverse actors with varying goals and capabilities. This transformative wave has ushered in a new era of innovation processes and has, on a broader scale, revolutionized entire industries, as documented by some scholars (Boudreau & Lakhani, 2013; Co-operation & Development, 2016; Iansiti & Lakhani, 2014; Porter & Heppelmann, 2014).

This evolution from traditional innovation to digital innovation presents a unique opportunity for researchers. Over the past four decades, researchers have been instrumental in observing and interpreting the digitization of organizations and society. Initially concentrating on the impact of digitizing internal organizational processes, their focus has expanded to identifying distinctive aspects of digitization within specific industries, organizational domains, or product families. In addition, some efforts by researchers such as Agrawal et al (2015); Anderson & Agarwal (2011); Greenstein et al (2013); Xue et al (2013) have elucidated the paradoxes and dilemmas posed by digitization for organizations engaged in developing, deploying, and managing digital innovation. The scholars have increasingly delved into the materiality of digitization within innovation processes and outcomes, as evidenced by the works of (Boland Jr et al., 2007; Lee and Berente, 2012; Majchrzak and Malhotra, 2013).

In the current landscape of international digitalization and informatization, marked by cross-border innovation and accelerated development, the digital economy has evolved into a pivotal catalyst for economic growth (Brynjolfsson & Collis, 2019; Curran, 2018; Gomber et al., 2018). This paradigm shift is no longer confined to the Western world but has gained substantial traction in Asian countries, fostering the convergence of digital technology with traditional economic activities (Ali et al., 2018; Taglioni & Winkler, 2016).

A noteworthy aspect observed by researchers is the surge in manufacturing innovation propelled by emerging information technologies (ITs) worldwide. Technologies such as the

sharing economy, blockchain, 3D printing, and artificial intelligence have played a significant role in this transformative process (Sutherland & Jarrahi, 2018). The prevailing consensus among observers is that the digital economy is poised to permeate all facets of society, impacting interpersonal interactions, the economic environment, and political decision-making (Gopal et al., 2003; Hindman, 2018). It is anticipated to drive scientific research, create breakthroughs, foster employment opportunities, spur economic growth, and enhance overall quality of life (Elder-Vass, 2016).

Against this backdrop, Asian digital innovation has long been acknowledged as a key driver of global economic growth. Over the past four decades, the ascent of manufacturing industries in Asian countries, particularly China, South Asian, and Southeast Asian nations, has positioned them as "production factories" for the world, contributing significantly to global value chains (Frederick, 2017). While technological innovation serves as the foundational element of this regional growth, the proactive economic interests and policy promotion efforts of Asian governments have played a complementary role (Curran, 2018).

However, a significant research gap exists due to the absence of extensive cross-country studies analyzing digital innovation trajectories in diverse economies like India, Malaysia, China, and Indonesia. While localized case studies provide valuable insights, the lack of systematic comparative analyses hampers our ability to identify shared or distinct trends, challenges, and opportunities among these nations. The substantial variations in historical paths, cultural foundations, and developmental ambitions underline the necessity for a comprehensive cross-country analysis. Bridging this gap is crucial for a nuanced understanding of factors influencing digital innovation, informing tailored policies and strategies for each country's unique context.

Methodology

The research is conducted using a systematic literature review (SLR), which emerges as a core tool for comprehensive inquiry, synthesis, and evaluation of current information within a certain subject. An SLR's rigor and transparency enable objective appraisal of extant literature, making it an essential technique for informed decision-making and future research direction (Amrutha & Geetha, 2020; Rodríguez et al., 2020; van Dinter et al., 2021). The article retrieval process was painstakingly carried out by querying prestigious databases, most notably Scopus. Scopus was chosen because of its remarkable reputation as a comprehensive archive, renowned for its broad coverage across scholarly areas, including fields such as scientific, technological, medical, and social sciences (Khatib et al., 2022). The primary goal of the study is to identify significant opportunities and challenges arising from the adoption of disruptive digital technologies in emerging markets such as China, India, Indonesia, and Malaysia, as well as to provide future recommendations for effectively capitalizing on opportunities and addressing difficulties. As a result, the study investigates the intersection of "Digital innovation," "Digital Innovation," "Technological Disruption," and "Digitalization" in the context of "Emerging Economies" and "Developing Countries," with a particular focus on "India," "Malaysia," "China," and "Indonesia." This investigation is becoming increasingly important as different countries manage distinct obstacles and possibilities while utilizing digital breakthroughs for societal and economic progress.

The selection of our study sample is done with extreme care to ensure the quality and relevancy of the studies chosen. The first sample size is 11760 after picking the necessary keywords. Because the purpose was not to present findings from specific journals, the study was not constrained by a certain year or publication selection. Instead, the study's goal was to thoroughly evaluate the discipline's overall advancement, which included a comprehensive collection of articles from this developing topic. There were various inclusion and exclusion criteria in this study. Data for this literature review was acquired from Scopus in several rounds. During the identification phase, the number of the left paper was 11760 after the discoveries were limited to articles published in English journals. The criteria for selection are then restricted to the subject matter--business management and accounting. And the type of material is an article, the language is English, and the source is a journal. The match article number is 5726. In the following screening step, the titles and abstracts of the retrieved articles were reviewed to assess their relevance to the research question and to keep the focus on the relevant keywords and filter by countries ("digitalization", "Digital innovations", "Digital economy", "Digital platform", "Digital entrepreneurship", "Digital payment", "Digital capability", "Digital firm", "Digital solutions", "China", "India", "Indonesia", "Malaysia") and the number of a The third step was to collect the full texts of the selected papers for careful review. Each publication was evaluated based on its technique, findings, and relevance to the study topic. Documents that did not meet the inclusion criteria or were deemed irrelevant were discarded. This methodical procedure yielded a final list of articles that would serve as the foundation for the literature review. The inclusion and exclusion criteria used in this investigation are depicted in Figure 1. The ultimate sample size is 50 after screening research.
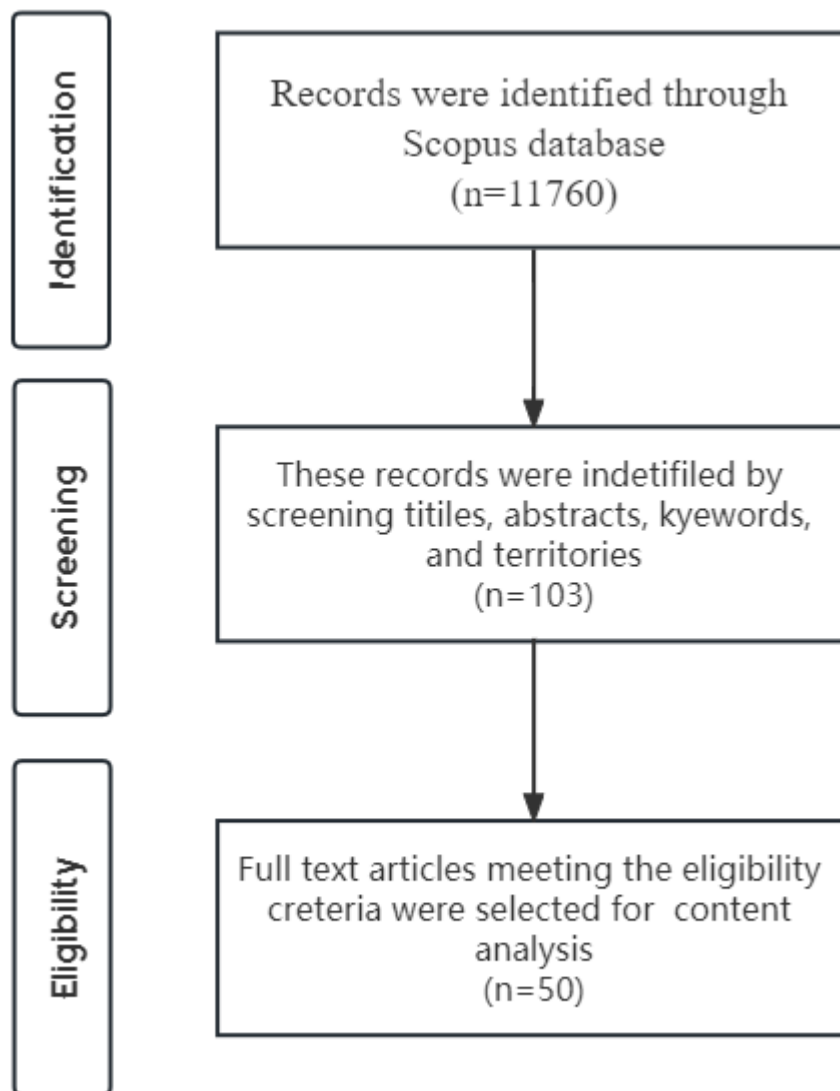
Figure 1 Flow chart of searching the literature

Moreover, the allocation across countries stems from a meticulous selection of a final cohort of 50 articles, with a breakdown of 16 from China, 16 from India, 10 from Indonesia, and 8 from Malaysia. Subsequently, the utilization of VOSviewer, an advanced bibliometric instrument, is intended to vividly depict the intellectual terrain enveloping the thematic focal points of the study. The visual representation is delineated in Figure 2. VOSviewer facilitates the generation of intricate visual cartographies, unveiling the intricate interconnections weaving through research articles, authors, and keywords. This graphical rendition offers a portal into the scholarly expanse, enabling a lucid differentiation of seminal publications, pivotal contributors, and nascent trends (Ding & Yang, 2020; Wang et al., 2023). Through the deployment of VOSviewer, the investigation transcends textual confines, plunging readers into a comprehensive assimilation of the expansive scholarly terrain.
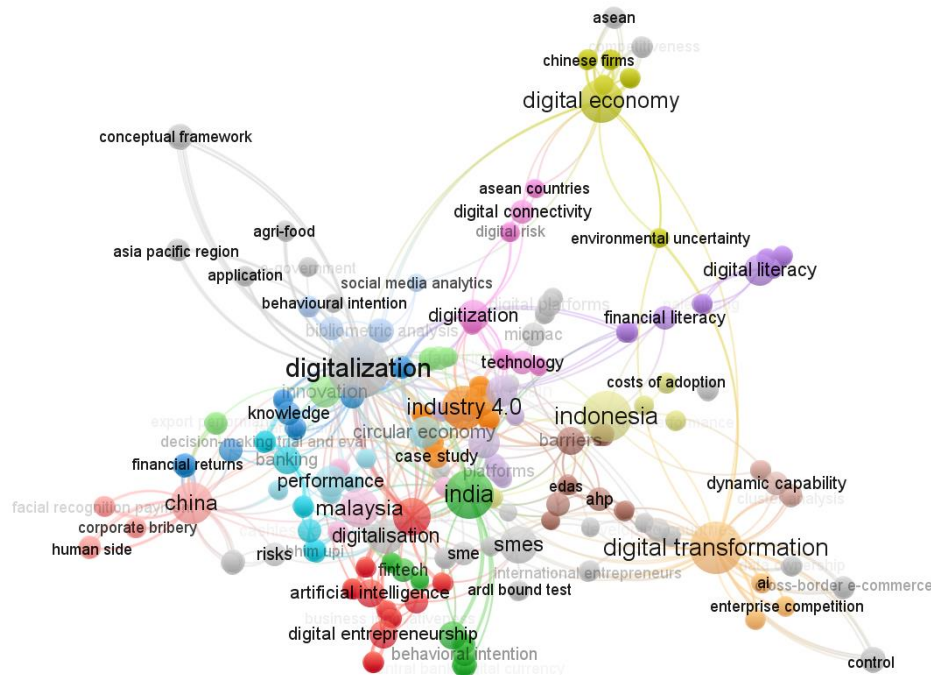
Figure 2 The Knowledge Map by VOSviewer

Findings
Summarize The Finding from Each Country
China

The importance of digitalization in China is highlighted in three key research areas: digital economy and business strategies, technology adoption and impact, and digital innovation and performance. The digital economy plays a crucial role in enhancing China's service industry within global value chains, emphasizing the need for companies to align their plans with key value propositions and data ownership (Jin et al., 2020). Studies explore the relationship between core industry concentration in the digital economy and Gross Total Factor Productivity (GTFP), as well as the dual nature of information and communication technology (ICT) adoption on wholesale markets (Kan et al., 2022; Li et al., 2022; Song et al., 2022)..

The adoption and influence of technology reveal diverse consequences, exploring risk exposure for multinational organizations and the transformation of wholesale marketplaces through factors like transaction costs, marketing influence, and innovative business models (Luo, 2022; Palash et al., 2022; Xia et al., 2022; Chen, et al., 2023; Zeng et al., 2020). Criteria such as relative advantage and privacy hazards are influential in the adoption of new technologies. Urban digital economy quality research advances with blockchain technology adoption, government support, and dynamics in the knowledge industry. Attention is directed towards examining risk exposure for multinational firms and the interplay between innovation, standardization, and company competitiveness (Yang et al., 2023).

Digital innovation and performance bring new perspectives, with studies on Digital Entrepreneurship Performance Capacity (DEPC) fluctuations, enhancement avenues, and the

favorable impact of cross-border e-commerce organizations and digital platforms on enterprise performance (Chen, et al., 2023; Yao & Li, 2023). The adoption of inter-organizational information systems in marine supply chains is influenced by industry features, confidentiality concerns, and power dynamics (Zeng et al., 2021). Spatial diversity in GTFP is evident, with the concentration of the digital economy's main industries affecting the eastern and mid-western areas differently (Li et al., 2023). The new retail model implementation is found to improve operational efficiency and overall productivity (Y. Yang, N. Chen, et al., 2023). These research domains collectively provide a comprehensive overview of the intricate interplay between digitization and China's economic landscape (Chen & Tian, 2022; Yang et al., 2023).

India

The current articles summaries research on India's digital innovation, which is divided into three primary categories: shaping the digital landscape, developing digital opportunities, and digital innovation impediments and solutions. To begin with, sharping digital landscapes is made up of conclusions that look into the transformational potential of policy actions and consumer preferences in the digital arena. The transformation of digital environments through regulatory interventions, consumer shifts, and creative solutions is the focus of this category (Chawla & Joshi, 2021; Gupta et al., 2023). Some study focuses on the possibility for effective policy adjustments to reshape consumer behavior and emphasizes the importance of accessibility and literacy in digital services (Singh et al., 2023). Simultaneously, some research indicates that Indian government policy initiatives have reduced home market and industry-level barriers to export for SMEs using e-commerce platforms for internationalization (Kandasamy et al., 2023). Furthermore, financial fields such as watch banking, digitalization in rural banks, and reduced money supply are hot study topics (Reddy P, 2019; Sandhiya & Nandagopal, 2023). Moreover, some study focuses on the development of a proper digital system and the interaction of clients, street hawkers, and vendors. Simultaneously, other researchers are investigating digital innovation challenges such as a lack of security, a lack of enthusiasm, digital illiteracy, and difficulty adapting (Honagannavar & Bhat, 2019). Furthermore, the development of innovative digital platforms is explored, showcasing their potential to facilitate interactions between consumers and vendors (Sameer, 2022).

The second focus is on developing digital opportunities, with papers examining emerging digital potential in industries such as technology, healthcare, entertainment, and e-commerce. The findings highlight the importance of algorithms and technology-mediated interactions in adding value to these opportunities (Modgil et al., 2022). The study also presents a framework that explains the stages of innovation, emphasizing the emergence of digital platforms as organizational domains (Mukerji & Roy, 2019). The final section focuses on digital innovation barriers and solutions, and it includes papers that address digital innovation barriers and solutions. These impediments to the implementation of Industry 4.0 technologies are classified as organizational, strategic, and societal (Amirtha et al., 2020; Bhatia & Kumar, 2022; Lahane et al., 2023). According to some study, efficient alternatives, such as top management commitment and government backing, are offered to overcome these barriers and permit successful implementation (Upadhyay et al., 2023). To summaries, India's emphasis on digital entrepreneurship and developing sectors such as EdTech and

FinTech demonstrates the country's potential for innovation and growth. The large pool of tech-savvy talent and the rising digital customer base are beneficial.

Indonesia

The researched findings in Indonesia are categorized into two key areas: (a) factors influencing technology adoption and its impact on performance, and (b) digital transformation, collaboration, and innovation resilience. In the first category, studies underscore the importance of understanding elements like individual digital orientation, entrepreneurial abilities, technological readiness, and organizational resources for effective digital transformation adoption (Chawla & Joshi, 2021; Gupta et al., 2023; Singh et al., 2023). Notably, the impact of factors such as entrepreneurial skills, e-commerce adoption, technology preparedness, and top management support on SME performance is highlighted (Sri, 2023). Challenges in integrating Human Resource Information Systems (HRIS) and influencing innovation outcomes also showcase the need for a holistic approach to digital adoption (Satispi et al., 2023).

The second category explores digital transformation, collaboration, and innovation resilience, emphasizing the broader socioeconomic transformation beyond technological adoption. Research highlights the interconnectedness of technological culture, SMEs' digital transformation, customer experiences, and collaborative capabilities (Afrianty et al., 2022; Mihardjo et al., 2019). For instance, the influence of information technology culture on city administration and SMEs' digital transformation aids in implementing the green economy (Islam & Trinugroho, 2023). This comprehensive approach to digital transformation contributes to brand and supply chain image and long-term supply chain performance (Mihardjo et al., 2019). Indonesia's proactive efforts in embracing electronic commerce, enhancing SME performance, and incorporating drone technology indicate the nation's potential for utilizing technology for societal objectives (Tjandra et al., 2022).

Malaysia

The digital innovation research in Malaysia is delineated into two pivotal areas: the positive impacts and potential of digitalization and the challenges and concerns it presents. In the realm of positive effects, digital technology adoption in the E&E manufacturing industry is facilitated by effective leadership, enhancing efficiency and competitiveness (Arumugam et al., 2022). Government support programs and supplier ties contribute to technological adoption, fostering innovation and growth (Ali et al., 2021). The integration of global digital technology advances artificial intelligence (AI) in urban services, shaping the concept of smart cities (Samsurijan et al., 2022). Digital adaptation led by business strategy and digital leadership enhances SME value creation and talent utilization (Rusly et al., 2021). Despite challenges, digitization serves as a resilience strategy, mitigating the adverse effects of the Covid-19 outbreak on manufacturing sales.

Conversely, the challenges and concerns associated with digitization in Malaysia span various issues requiring careful consideration. Bridging the digital gap remains a major concern, as many populations lack access to digital technologies and the internet, limiting inclusion (Sukumaran et al., 2022). Cybersecurity risks have heightened with the speed of digitalization, necessitating robust safeguards to protect individuals, companies, and vital infrastructure (Alam et al., 2021). Growing data gathering raises privacy concerns,

emphasizing the need for stringent data protection legislation (Sukumaran et al., 2022). Automation and artificial intelligence pose workforce challenges, sparking concerns about job displacement and unemployment, underscoring the importance of reskilling and upskilling initiatives (Yeo et al., 2022). Additionally, adopting blockchain technology in the halal food supply chain faces hurdles, from technological complexities to supply chain integration and compliance with food laws (Ali et al., 2021). These complexities underscore the need to address issues for a balanced and equitable digital transition in Malaysia. In summary, Malaysia's strategic focus on sectors like E&E manufacturing and e-wallet adoption offers opportunities for sector-specific digital innovation, while initiatives to mitigate the impact of COVID-19 through digitization are noteworthy.

Comprehensive Comparison of Four Countries
Similarities and Difference

The scholarly studies on digitization processes in China, India, Indonesia, and Malaysia reveal similarities in their adoption of digital innovation, underpinned by a global recognition of its potential to stimulate economic growth and enhance societal well-being. Governments across these nations play a crucial role in defining and promoting these transformative processes through digital policies (Samsurijan et al., 2022; Sandhiya & Nandagopal, 2023; Subrahmanya & Puttanna, 2018; Xia et al., 2022). Common objectives include economic expansion, competitiveness, and increased accessibility, contingent upon digital literacy and technological infrastructure (Arumugam et al., 2022; Honagannavar & Bhat, 2019; Jin et al., 2020; Sariwulan et al., 2020).

Despite these commonalities, there are notable disparities in their approaches and priorities. China leverages its manufacturing and technological prowess, leading in artificial intelligence and widespread 5G implementation (Xia et al., 2022; Zeng et al., 2020). India undergoes a transformation driven by legislative measures like demonetization, fostering digital platforms' acceptance, especially in EdTech and FinTech (Luo, 2022; Modgil et al., 2022). Indonesia emphasizes promoting SMEs through digitalization for sustainable economic growth, with efforts in digitizing traditional markets and enhancing e-commerce capabilities (Sri, 2023). Malaysia showcases proficient leadership and governmental backing, employing digital innovation in sectors like urban services and halal food supply chain transparency (Samsurijan et al., 2022; Ali et al., 2021).

Additionally, the countries' industrial specializations differ; China focuses on manufacturing, services, and technology, while India aims to lead in EdTech, FinTech, healthcare, and e-commerce. Indonesia prioritizes digital technology's impact on society and E-commerce adoption, and Malaysia concentrates on the E&E manufacturing business, fashion retail, and e-wallet deployment (Ali et al., 2021; Arumugam et al., 2022; Chawla & Joshi, 2021; Islam & Trinugroho, 2023; Kan et al., 2022; Li et al., 2022; Luo, 2022). Table 1 show the difference in the different country.

Table 1

The Difference in The Research On Various Industries of Digitalization in Different Countries

		China	India	Indonesia	Malaysia
Industry	Service Industry	E-commerce and Internationalization	Work from Home and Remote Work Practices	Manufacturing Sector
	Manufacturing and Supply Chain	Technology (EdTech, FinTech, cybersecurity)	SMEs and E-commerce Adoption	Urban Services and AI Implementation
	Entrepreneurial Ecosystems	Healthcare (diagnostics, virtual care, fitness)	Cloud Computing Adoption	Fashion Apparel Retail
		Entertainment (gaming, social media)	Green Economy Implementation	Halal Food Supply Chain
		Rural Banking and Financial Services	Sustainable Supply Chains	SMEs' Digital Adaptation
		Digital Payment and Transaction Services	Governance and Public Sector Innovation	Cryptocurrency adaptation and E-Wallet Implementation
		Industry 4.0-enabled Supply Chains	Drone Technology in Construction	

Challenges and Opportunities

China

China, a prominent global economic player, faces challenges in its digital innovation journey, with the foremost issues being comprehensive risk management and addressing privacy concerns. The use of advanced technologies like information and communication technology (ICT) and blockchain introduces new dimensions of privacy and security threats, emphasizing the need for robust data protection measures and competent risk management (Li et al., 2022; Song et al., 2022). Another critical challenge involves the intricate web of obstacles to effective technological integration, including geographical complexities, industry-specific structures, and strategic considerations, necessitating specialized measures tailored to individual situations (Kan et al., 2022; Jin et al., 2020). Balancing innovation and standardization while maintaining competitiveness in the digital economy landscape further complicates the journey for businesses.

However, amidst these challenges, China's digital innovation journey offers significant opportunities. The digital economy has the potential to elevate China's service sector in global value chains, fostering economic growth and enhancing global competitiveness (Yang et al., 2023b; Kan et al., 2022). Leveraging disruptive technologies like blockchain, coupled with strong government support, can propel China's urban digital economy to unprecedented heights, fostering an environment conducive to long-term growth and innovation (Xia et al., 2022). Additionally, the adoption of new retail paradigms presents opportunities to enhance operational efficiency, leading to increased productivity and expanded growth prospects

(Yang et al., 2023c). Despite challenges, China's dynamic digital landscape holds immense promise for transformative advancements.

India

India, the world's second-largest economy in the emerging market, confronts significant challenges in its digital transformation journey, with digital literacy standing out as a primary concern. The uneven growth of regional economies has led to a digital divide, making bridging the gap between the digitally affluent and those without access a challenging task, impacting inclusivity and equity (Honagannavar and Bhat, 2019). Security considerations, including cybersecurity risks and data breaches, pose another critical challenge, necessitating efforts to establish a secure digital environment for user trust and data integrity (Modgil et al., 2022; Chawla and Joshi, 2021). Additionally, ensuring labor flexibility becomes crucial as digital technologies demand seamless integration, especially in traditional sectors, requiring a skilled workforce to navigate technological advancements (Sameer, 2022).

However, amidst these challenges, India's digitization journey presents various opportunities. The creation of digital platforms enhancing interactions between consumers and sellers improves client experiences, unveiling opportunities for long-term growth (Subrahmanya and Puttanna, 2018). India's strategic focus on digital entrepreneurship, EdTech, and FinTech underscores the potential for innovation and growth in technology-driven sectors, utilizing digital services to catalyze progress (Modgil et al., 2022). Proactive government policy adaptation can impact consumer behavior, driving the uptake of digital services and fostering economic progress while orchestrating a profound societal revolution. Despite hurdles, India's digital landscape is poised for transformative advancements and sustained growth.

Indonesia

Indonesia, a prominent emerging market, has undergone a significant economic shift from agrarian-based to manufacturing, services, and digital advancement. However, this transformative journey is marked by multifaceted challenges. The primary challenge involves overcoming barriers to technology adoption, encompassing issues like digital literacy and organizational preparedness, requiring effective identification and mitigation of influencing factors for successful digital innovation initiatives (Sariwulan et al., 2020; Islam and Trinugroho, 2023). Concurrently, cultivating collaboration, innovative resilience, and societal paradigm shifts within digital innovation pose a formidable test for both corporate entities and the broader economy. A secondary challenge revolves around understanding the nuanced interplay between technology adoption and performance outcomes, necessitating a comprehensive approach to address potential barriers holistically (Sri, 2023; Aligarh et al., 2023; Satispi et al., 2023).

Amidst this complexity, opportunities for advancement persist. Notably, harnessing digital innovation to enhance the performance of Small and Medium Enterprises (SMEs) while aligning with sustainable practices for the green economy presents a noteworthy opportunity (Sri, 2023). Additionally, adept utilization of digital innovation to fulfill societal aspirations and bolster resilience, particularly in domains associated with ecological sustainability, unveils promising avenues for growth. Viewing digital innovation as a broader socioeconomic metamorphosis further highlights prospects for augmented collaboration, innovation, and

sustainability (Islam and Trinugroho, 2023). In essence, Indonesia navigates the uncharted waters of comprehensive digital innovation, standing at the confluence of challenges and opportunities.

Malaysia

Malaysia, like other emerging countries, encounters challenges on its digital innovation journey that require strategic solutions. Overcoming the digital gap and ensuring equitable digital access across diverse populations is crucial to democratizing the benefits of digitalization (Sukumaran et al., 2022). Developing comprehensive cybersecurity policies to safeguard individuals, organizations, and vital infrastructure from cyber assaults poses a challenging task (Yeo et al., 2022). Managing workforce transitions caused by automation and artificial intelligence necessitates well-crafted reskilling and upskilling plans to mitigate job displacement. Overcoming integration challenges of technologies like blockchain into sectors such as the halal food supply chain requires adept negotiation of technological complexities while adhering to regulatory standards (Ali et al., 2021).

Simultaneously, Malaysia is presented with significant opportunities. Leveraging digital leadership and government support can encourage innovation, foster growth, and enhance competitiveness, observed in sectors such as electrical and electronic (E&E) production and widespread e-wallet usage (Alam et al., 2021). Advances in artificial intelligence for urban services open avenues for smart city development, offering opportunities for improved urban living standards and sustainable practices (Samsurijan et al., 2022). Additionally, digitalization has the potential to drive economic development, foster efficiency gains, and enhance resilience, particularly in the face of challenges like the current COVID-19 pandemic (Yip et al., 2023).

In conclusion, the transition from conventional to digitalization in these four emerging markets presents both significant challenges and opportunities, influenced by variations in economic growth, social dynamics, physical infrastructure, culture, and more. Table 2 provides an overview of the potential and challenges associated with the four countries under consideration.

Table 2

The Potential Opportunities and Challenges Among Four Countries

Item	China	India	Indonesia	Malaysia
Opportunities	Lower trade costs and better service industry frameworks improved global value chain integration.	Digital platform enhances customer experiences and reveals long-term business potential.	Using digital innovation to boost SME performance	Digital leadership and government support may improve innovation, growth, and competitiveness.
	This combination could foster innovation and knowledge-intensive sectors, fostering long-term growth.	EdTech and FinTech demonstrate technology-driven sector growth and innovation.	The socioeconomic shift to digital innovation allows collaboration, creativity, and sustainability.	AI will increase urban living standards and sustainability.
	New retail formats will boost operational efficiency, productivity, and growth potential.	Proactive government policy changes can enhance digital service adoption and consumer behavior		Digitalization can boost the economy.
Challenges	Comprehensive risk management and the resolution of privacy concerns.	Digital literacy	Surmounting barriers to technology adoption	Overcome the digital gap and ensure equitable digital access
	The dense web of impediments to effective technological integration. .	Lack of security, digital knowledge, and adaptability.	Digital transition requires collaboration, innovative resilience, and societal paradigm shifts from corporations	Developing comprehensive cybersecurity policies.

		and the economy.	
	labor flexibility	Understanding the complex relationship between technology uptake and performance.	Overcoming the problems connected with the integration of technologies.

Discussion

This study provides a comprehensive analysis of the digital innovation landscapes in China, India, Indonesia, and Malaysia, revealing both similarities and differences in their approaches. The identified challenges underscore the complex and heterogeneous nature of digital innovation in each nation. China faces issues with technology adoption, globalization, and risk management, emphasizing the need for sophisticated strategies to address data privacy concerns and integrate advanced technologies in international corporations. India grapples with challenges in digital literacy and reducing the digital gap, requiring inclusive policies to promote equitable access to digital opportunities. Indonesia's focus on the factors of technology adoption and their impact on performance highlights the significance of understanding correlations between digital readiness, entrepreneurship, and economic outcomes. Malaysia's efforts in digitalization and cybersecurity risk management, considering workforce transitions, emphasize the importance of comprehensive measures to mitigate potential disruptions.

Despite these challenges, the opportunities for economic expansion, innovation, and societal progress are considerable. China's strategic focus on the digital economy positions it as a significant participant in the global market. India's emphasis on digital entrepreneurship showcases its ability to foster innovation and growth. Indonesia's commitment to long-term development highlights the transformative potential of digitalization. Malaysia's sector-specific strategy offers a comprehensive plan for effective digital innovation. However, the study calls attention to the limited focus on the digitalization of the labor market, suggesting that future research could explore areas such as enhanced productivity, novel market openings, increased employment opportunities, improved work-life equilibrium, and augmented remuneration.

In light of these findings, potential future research directions include a deeper examination of the complex interplay between technological adoption, innovation, and performance outcomes. Exploring the role of government policies in driving digitalization and

addressing digital illiteracy and cybersecurity concerns can provide insights for better strategy formulation. Comparative research across a broader range of emerging economies could enhance understanding of various factors influencing effective digital innovation. Additionally, studying the societal ramifications of digitization, including its effects on employment patterns, education systems, and social inclusion, is crucial. Research on collaboration and innovation resilience dynamics in emerging economies can illuminate how digital innovation contributes to long-term development and shared prosperity.

Conclusion

The scholarly examination of digitization processes in China, India, Indonesia, and Malaysia reveals a common recognition of digital benefits for economic growth and societal well-being. However, they diverge in approach and priority, with each country capitalizing on its unique strengths and capabilities. These unique paths, rooted in distinct socio-economic contexts, illuminate the complex dynamics of digital innovation within diverse geopolitical settings.

In the context of digital innovation, these nations face common challenges such as bridging the digital divide, ensuring cybersecurity, and managing workforce transitions. These challenges necessitate comprehensive strategies and policies to foster inclusive growth and innovation. Conversely, they share analogous opportunities to enhance economic growth and competitiveness through technology-driven innovation, digital entrepreneurship, and sustainable practices.

In conclusion, policymakers and researchers stand at a pivotal juncture, equipped to navigate the intricate landscape of digital innovation. This research points to promising directions for subsequent investigations, including a deeper exploration of the interplay between technological adoption, innovation, and performance outcomes, comparative studies across a broader spectrum of emerging economies, and research on the societal ramifications of digitalization. Despite its contributions, the study has limitations, including a small sample size, potential research bias, and limited geographical coverage. Future inquiries could address these limitations for more comprehensive and relevant insights into digital innovation.

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