

DIGITAL TRADE TRANSFORMATION FOR SMES IN ASIA PACIFIC USING THE TECHNOLOGY-ORGANIZATION-ENVIRONMENT FRAMEWORK: A SYSTEMATIC LITERATURE REVIEW

TRANSFORMAÇÃO DO COMÉRCIO DIGITAL PARA PMEs NA ÁSIA-PACÍFICO UTILIZANDO A ESTRUTURA TECNOLOGIA-ORGANIZAÇÃO-AMBIENTE: UMA REVISÃO SISTEMÁTICA DA LITERATURA

Article received on: 10/2/2025

Article accepted on: 1/2/2026

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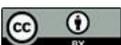
The authors declare that there is no conflict of interest

Abstract

The explosive nature of digital trade development has changed the concept of international trade by offering companies means of optimising productivity, expanding the market base, and competing in the global market. Small and medium-sized enterprises (SMEs) are relied upon in the Asia-Pacific region and have multiple issues, namely insufficient investments, lack of digital preparedness, and regulation complexity. The paper under review seeks to identify the issue of digital commerce transformation of small and medium-sized enterprises (SME) in the Asia-Pacific region based on the Technology-Organisation-Environment (TOE) paradigm. The paper is thorough covering the technical, organisational and environmental forces that are influencing the digital trade transformation of SMEs using the TOE conceptualisation. It provides information that is congruent with the multiple digital settings of Asia-Pacific region in that it encapsulates interaction of internal strengths or capabilities and external situations. In an extensive literature search, data bases were

Resumo

A natureza explosiva do desenvolvimento do comércio digital mudou o conceito de comércio internacional, oferecendo às empresas meios de otimizar a produtividade, expandir a base de mercado e competir no mercado global. As pequenas e médias empresas (PMEs) são importantes na região Ásia-Pacífico e enfrentam vários problemas, nomeadamente investimentos insuficientes, falta de preparação digital e complexidade regulamentar. O artigo em análise procura identificar a questão da transformação do comércio digital das pequenas e médias empresas (PMEs) na região Ásia-Pacífico com base no paradigma Tecnologia-Organização-Ambiente (TOE). O artigo é completo, cobrindo as forças técnicas, organizacionais e ambientais que estão influenciando a transformação do comércio digital das PMEs usando a conceituação TOE. Ele fornece informações que são congruentes com os múltiplos contextos digitais da região Ásia-Pacífico, na medida em que encapsula a interação entre pontos fortes ou capacidades



searched on the Google Scholar, Scopus and the Web of Science. The articles published during the last decade and concerning small and medium enterprise (SMEs), digital commerce, and Asia-Pacific region may be viewed as competent. Synthesis and categorisation of results within TOE framework were done in thematic coding and content analysis. It was determined through the study that SMEs need technology changes, institutional preparedness and facilitating environmental aspects to succeed in digital commerce. Nevertheless, a problem arises when the digital infrastructure and regulatory environment are compared between different countries. SMEs must align their operations with the e-commerce agreements of WTO in order to become more competitive internationally. The paper sheds light on the digital trade by putting it in the perspective of the small and medium-sized enterprises (SMEs) in the Asia-Pacific region. It integrates the TOE model and international trade practises and provides information to support the use of more policy makers and businesses to improve the digital preparedness and competitiveness of SMEs.

Keywords: Digital Trade. SMEs. Technology-Organization-Environment Framework. Knowledge Management. Asia Pacific.

internas e situações externas. Em uma extensa pesquisa bibliográfica, foram consultadas bases de dados no Google Scholar, Scopus e Web of Science. Os artigos publicados durante a última década e relativos a pequenas e médias empresas (PMEs), comércio digital e região Ásia-Pacífico podem ser considerados competentes. A síntese e categorização dos resultados dentro da estrutura TOE foram feitas por meio de codificação temática e análise de conteúdo. O estudo determinou que as PMEs precisam de mudanças tecnológicas, preparação institucional e facilitação de aspectos ambientais para ter sucesso no comércio digital. No entanto, surge um problema quando se comparam a infraestrutura digital e o ambiente regulatório entre diferentes países. As PMEs devem alinhar suas operações com os acordos de comércio eletrônico da OMC para se tornarem mais competitivas internacionalmente. O artigo lança luz sobre o comércio digital, colocando-o na perspectiva das pequenas e médias empresas (PMEs) na região Ásia-Pacífico. Ele integra o modelo TOE e as práticas de comércio internacional e fornece informações para apoiar o uso de mais formuladores de políticas e empresas para melhorar a preparação digital e a competitividade das PMEs.

Palavras-chave: Comércio Digital. PMEs. Estrutura de Tecnologia-Organização-Ambiente. Gestão do Conhecimento. Ásia-Pacífico.

1 INTRODUCTION

With e-commerce, digital payments, and cloud computing going on, the digital trade has already changed the way corporations operate, relate and stay competitive, bringing a global economic revolution. Most of the world trade all takes place online, and the value of this sector has increased multiplied by thousands in the last decade (Le & Ikram, 2022). This growth has mainly been due to the quick adoption of the internet and the development of the digital infrastructure (Shi, 2023). The diversification of the Asia-Pacific markets that these dynamic economies power is one of such transitions. This is one of the aspects that are vital to the development economies within the Asia-Pacific region because the role played by small and medium-sized enterprises (SMEs) in creating

job opportunities, innovativeness and gross domestic product has been significant and the region has some challenges and opportunities that are peculiar in respect to how it can harness fully the potential to empower SMEs to transact in digital trade (ELX, 2011). However, these businesses are faced with a lot of operational and structural challenges. The revolution of digital commerce has provided some pathway through which SMEs can overcome these threats by cutting the transaction cost, increasing market access, and optimising operations (Wu et al., 2023). Nonetheless, the willingness of the SMEs in the region to embrace digital technologies, the availability of government policies that are favourable and how their operations align with the international trade rules define whether or not the SMEs in the region can exploit such opportunities (Kasimin et al., 2013).

The reality that varying countries are at varying degrees of digital readiness and possess varied legal frameworks further complicates the matter (Sahakyan, 2024). Accordingly, we require a deeper understanding of the drivers that are transforming digital commerce in the region. The research problem centres on the necessity to investigate how SMEs in the Asia-Pacific region adapt to the environment of digital commerce in accordance with international trade standards (Murali, Chandani, Paraman, and Anamalah, 2024). Literature on the potential benefits of digital commerce is plentiful, but limited literature has examined the dynamics of digital transitions, particularly in the context of SMEs. Of special concern is the reality this situation contrasts with the long-standing and consistent global trade rules of the WTO. Koh and Kong (2021) say so. The research gap that this study will close is the lack of an in-depth analysis of the digital transformation processes undertaken by SMEs in the Asia Pacific region in the context of the TOE framework. Digitization of SMEs in digital commerce has remained underresearched; prior studies have focused on big firms or particular variables (Fernandez & Aman, 2021). To address this knowledge gap, the research systematically examined the literature, discovered key drivers and determinants of digital transformations in trade to SMEs, and provided policy recommendations. The understanding of the technological, organisational, and environmental factors that may change the digital trading behaviour of SMEs, presented through the description, can be valuable to regional policymakers, company leaders, and other market actors (Muller, Zahn, and Matthes, 2024).

The present research aims to compare the change of small and medium-sized enterprises (SMEs) within the digital trade so that the process of transformation could be contemplated more thoroughly. It will do it by implementing the TOE framework according to which a factor is divided into the technological, organisational, and environmental segments (Chiu, Chen, and Chen, 2022). As a second, it analyses how the digital trade can be employed by small and medium-sized enterprises (SMEs) to comply with the international standards of trade, particularly the e-commerce accords of the World Trade Organisation (Nyazabe, Hwang, and Manyole, 2023). In order to realise these goals, the study will bridge the gap that exists between theory and reality by providing a carefully designed knowledge on the Asia-Pacific region, where online commerce borders between international trade standards. This paper is aimed at investigating how SMEs in the Asia-Pacific region perceive and absorb the digital world of commerce, all in respect of international trade regulations. The research of how SMEs manage to adapt to the changes brought by digital transformation without being left behind by the global trade platforms like those created by the WTO is relatively new and little is written as to the potential opportunities created by digital trade (M. Iqbal and Suzianti, 2020).

To promote digital trade, the WTO has established several key frameworks. These are the General Agreement on commerce in Services (GATS) trade in electronic services, and the Trade Facilitation Agreement (TFA) to streamline customs procedures. E-Commerce Work Programme addresses data flows and cybersecurity, and the Information Technology Agreement (ITA) addresses tariff-free IT goods and Trade Related Intellectual Property Rights (TRIPS) addresses the protection of intellectual property rights. Shi (2023) posits that the global growth of e-commerce is being supported by a momentary cease in the customs tax on electronic transmissions. To ensure that this paper presents the stakeholders in the region namely, policymakers, entrepreneurs, and other parties concerned with the region, with useful information, a number of technical, organisational and environmental factors as anticipated to influence the digital commerce of SMEs shall be explained in this paper.

The overarching purpose of the study is to apply the TOE framework by systematically exploring the current literature on small and medium-sized enterprises

(SMEs) going through digital commerce transformation within the Asia-Pacific region. Specifically, the study aims to:

- “Identify key technological, organizational, and environmental factors influencing SMEs’ adoption of digital trade in the Asia Pacific region.”
- “Examine the challenges and opportunities SMEs face in integrating digital platforms, e-commerce solutions, and cloud computing into their trade operations.”
- “Analyze existing research trends and knowledge gaps related to SMEs’ digital transformation, with a focus on regulatory constraints, technological adoption, and competitive strategies.”
- “Utilize bibliometric analysis and systematic review methods to provide a comprehensive synthesis of prior studies, offering insights for policymakers, business leaders, and researchers.”

On a more pragmatic note, it is a source of comprehensive research on the digital trade policy and regulation where government intervention can help the small and medium-sized companies (SMEs) to adapt to digitalisation and learn the regulations of international trade (Q. Chen & Wang, 2022). It is more accurately comprehensible by being linked with a less exclusive and dynamic digital trading platform. Going back to the bigger picture, the paper helps in the ongoing discussion of the issue of digital commerce by throwing a little light of the existing challenges faced by SMEs and the opportunities that are present on the Asia-Pacific region. It highlights that there is a need to have an open and dynamic digital trading environment, particularly in Asia-Pacific region. The international trade has opened up to the small and medium-sized enterprises (SMEs) in the region to new dimensions of customer accessibility, efficiency, and pace in their operations. It however, subjects SMEs to other aspects including poor digital infrastructure, regulatory uncertainty and ability they need in order to compete in the new, interconnected digital market. In the course of this article, we discuss the intricate opportunities and threats that SMEs face in the Asia-Pacific region.

2 RESEARCH METHODOLOGY

A systematic literature search method was used to locate research on small and medium sized enterprises (SMEs) that are undergoing digital commerce transformation within the Asia-Pacific region. The literature search involved numerous academic databases, such as Google Scholar, JSTOR, ScienceDirect, and SpringerLink, to ensure that most academic articles, conference papers, and reports are covered. The search terms included: digital trade transformation, SMEs in Asia Pacific, e-commerce, digital technology adoption, WTO e-commerce agreements, and technology-organisation-environment framework. This rich combination of terms to help locate literature related to producing the topic of digitalisation and the role of SMEs in the international trade systems. These included articles published in peer-reviewed journals or presented at conferences on the topic of digitalization of small and medium-sized enterprises (SMEs) in the Asia-Pacific region between 2010 and 2024.

Those studies that were not relevant to the digital commerce revolution or small and medium-sized businesses were left out. The review incorporated papers published between 2010 and 2024 to capture the dynamic nature of digital commerce. This made sure that the latest and best literature was incorporated. Two data analysis procedures through which the literature has been synthesised include content analysis and theme coding. Content analysis will help us observe patterns, trends, and repetitious ideas within the literature. Thus, methodical extraction of significant findings on organisational, technical, and environmental aspects can provide the results that can lead to digital transformation of SMEs. We performed thematic coding of the data through the thematic coding feature of NVivo to extract themes based on the TOE framework. Consequently, we decided on a more systematic approach to data analysis, which, in turn, enabled us to subdivide the literature into more manageable sections: technical infrastructure, policy and legal frameworks, digital literacy, and market readiness.

This enabled to appreciate how technical innovations, organisational readiness, and environmental influences interacted. By comparing and analysing these coded themes, Sahakyan (2024) identified the main variables that affected the participation of SMEs in digital commerce. The synthesised results were the basis of responding to the study objectives, which described how these variables influence the digital transformation

of SMEs in the region. The chosen material can be divided into three parts based broadly on the TOE framework: technology, organisations, and the environment. Regarding technological considerations of digitisation in SMEs in the context of trade, the advances and developments that emerge in the electronic commerce system, digital payments, cloud computing, and big data are all about technology (Le and Ikram, 2022). The ability of small and medium-sized enterprises (SMEs) to adapt to digital commerce implementation strategies is contingent upon a variety of factors, including but not limited to the culture, leadership, resources, and preparing employees (Aman and Nicholson, 2009).

Examples of environmental variables are current market conditions and government regulation, as well as industry norms as proposed by Wu et al. (2023) as having the potential to affect the smooth operation of the small and medium-sized enterprises (SMEs) carrying out the digital commerce. In the case of these groups, it is possible to analyse what variables play a role in the switching to digital trading in the context of SMEs. Instead, the research aims were complemented with an inclusion of the TOE framework that facilitated the targetedness it did when examining the relationships and impacts of these three groups of variables prompting digital trading of SMEs in the Asia Pacific region (Huang et al., 2024). In response to such factors as incorporating technology, readiness, and the impact of external environments on the regulatory backgrounds, this article examines the process of adapting SMEs to the conditions of the digital commerce. The paper applies the Theory of Constraints (TOC) model in discussing activities that facilitate or inhibit the capacity of small and medium-sized enterprises (SMEs) to compete in the global world.

3 LITERATURE ANALYSIS AND DISCUSSION

3.1 Technological factors

The development of technology has altered the trade since the new technology that has been developed equips with the SMEs with tools that enhance connexion, efficiency, and competitiveness. Online marketplaces have become the initial and the biggest step made by small and medium-sized enterprises (SMEs) who intend to gain

entry into international markets (Faridi and Malik, 2020). According to Ashtankar et al. (2023), now, small and medium-sized businesses (SMEs) are able to transact business across the border using online platforms like Amazon, Alibaba, and Shopify. The reason is that SMEs can open their online shopfront to shoppers in all corners of the planet and the avenue that has been made even less than getting another form of traditional trade. Thanks to the democratisation of access to global marketplaces, small and medium-sized businesses (SMEs) can now compete more equally with larger corporations. Due to the notorious complexity and risk involved with international money transfers, numerous companies have started to adopt online payment solutions, such as mobile wallets and encrypted web payments (Fernandez and Aman, 2021). Their increased capabilities that do not require substantial physical infrastructures allow SMEs to participate in global deals with more facilitations, as more SMEs find the new digital solutions more appealing.

Despite the technological benefits presented by e-commerce and cloud computing to SMEs, there exists an array of challenges that make them not adopt these trends fully. SMEs cannot invest in and use digital platforms effectively because of less financial resources and an absence of digital literacy (Le and Ikram, 2022). Already, adoption is complex due to cybersecurity issues, compatibility with existing systems and regulation adherence (Ashtankar et al., 2023). Following these barriers, it becomes apparent that small and medium-sized enterprises (SMEs) in the Asia-Pacific region are seeking user-friendly digital solutions, training courses, and personalised support. Due to the scalable and affordable solutions of cloud computing, small and medium-sized enterprises (SMEs) will find it easier to digitalise, benefiting their growth and internationalisation (Otoom et al., 2024). Cloud-based customer relationship management (CRM) and enterprise resource planning (ERP) can also be of benefit to small and medium-sized enterprises (SMEs) in a more advanced manner without the expensive costs required to access them on the premises.

Such scalability enables SMEs to control company activities and react to changing market demands better. Moreover, cloud computing will enable small and medium-sized enterprises (SMEs) to store and analyse large volumes of data, thereby enhancing their decision-making and consumer targeting-both of which are vital in the global market competition (Faridi and Malik, 2020). Small and medium-sized enterprises (SMEs) as

aspiring players in the continually expanding digital economy are likely to experience the benefits of adopting such technology in their businesses so that they can become better entrants into global markets in the future. Technological advancement is aligned with the internationalisation and competitiveness of SMEs. Nguyen, Le, Nguyen, and Nguyen (2024) posit that through e-commerce and cloud computing technology, small and medium-sized enterprises (SMEs) can streamline operations, enhance communication, and have improved access to international markets. Digital technologies, by eliminating the physical restrictions, enable SMEs to expand up to levels attainable mainly by multinational corporations. Small and medium-sized enterprises (SMEs) expanding internationally through digital channels cannot ignore international trade norms and standards, including those of the World Trade Organisation (WTO). Data protection, intellectual property rights, and digital trade laws govern internet commerce and cross-border transactions (2023).

Small and medium-sized business (SMEs) must make sure that their functions do not negate bans that are likely to make it more challenging to fit in abroad markets, specifically, following the inception of online trading. Consequently, despite the fact that technological innovation has many benefits to SMEs it also makes it difficult in their quest to monitor international regulations and standards. Before lapsing comes to mind the many advantages of internationalisation, SMEs must ensure that the policy of digital commerce conforms to the WTO standards. Sirenko, Balian, Martyniak, Malakhova, and Bakushevych (2024) go further to suggest that the World Trade Organisation has gone a long way in establishing an international standard of Electronic Commerce in the areas of non-discrimination, transparency, fair trade, and stable legislation.

The free movement of data, services, and products across national borders without these rules SMEs will not be able to expand internationally. Nonetheless, the digital sphere is developing at a fast pace, and small and middle-sized businesses (SMEs) phenomenon cannot learn and follow many rules they are to be aware of (Inama, Crivelli, and Ha, 2022). With the growing reliance of SMEs on digital technologies, then it implies that they should modify their business models to suit digital environment. The world, the local regulations, and legal frameworks of this presentation must be harmonised to avoid legal hassles and trade related hurdles. Small and medium size enterprises (SMEs) have

also been given an opportunity to compete internationally in business through resourceful technology despite the bigger multinational organisations (Kvitka et al., 2021).

According to Huber, Pooripakdee, and Schreier (2023), the provision of small and medium-sized enterprises (SMEs) with an opportunity to communicate with their clients worldwide can be made possible through e-commerce platforms, digital payment systems, and cloud computing solutions. This helps them to circumvent the traditional barriers of conducting business within the international arena such as the high cost of transporting goods and the large-scale physical infrastructures. It is predictable that with their expansion into foreign markets, the SMEs are also different in being cognizant of regulatory frameworks that have been put in place by the World Trade Organisation and other international organisations. Small and medium-sized ventures (SMEs) can also increase competitiveness by modifying their online trade activities to the standards of global trade in the efforts to create a more open and equal international trading system. Overall, the technical variables can propel SMEs to success in the online age when designed in the right way they can assist ambulatory enterprises in surmounting the obstacles of the internationalisation process and increasing their competitiveness in the digital marketplaces.

3.2 Organizational factors

Organisational issues become predominant among SMEs when it comes to making the transition to digital commerce. One of the most significant organisational variables is the corporate culture because it defines the extent to which a company is open to new ideas and changes. Wu et al. (2023) writes about the way in which the culture of openness, flexibility, and learning orientation in this company contributes to its ability to adapt the latest digital technology. In the case of small and medium-sized businesses (SMEs), where resources are scarce, the leadership plays a key role in facilitating this cultural change and ensuring that digital trade practises do not undermine other corporate goals. Research by finding that the success of implementation relies on the dedication of leadership to transform the digital economy, especially harmonising the organisational culture (Atli, 2020). These executives can find ways to negotiate the perils of digital trade, including integration of e-commerce and adoption of cloud computing, because they are

focused on innovation and offer their organisations clear strategic direction (Han and Trimi, 2022). When top-level leaders are so engaged, their organisations can be more responsive to aligning their culture, values, and resources with the digital transformation agenda. Flexibility, leadership commitment, and digital competence are key organisational variables in the digital transformation of SMEs.

Successful programmes have included the Shopee SME assistance initiative in Southeast Asia, providing digital resources and training, and the Taobao Villages in China where existing enterprises support new small and medium-sized businesses (SMEs) aiming to raise their visibility by featuring on Taobao. However, legislative boundaries vary among countries, thereby affecting the uptake of digital technologies (Han and Trimi, 2022). As an example, the absence of a strong digital infrastructure in emerging countries weakens their development, and strict data protection regulations in Singapore raise the cost of compliance. To address them, policymakers, financial incentives, and SME-focused digitalisation strategies must work in collaboration. Equally significant as leadership and culture in transforming digital commerce are organisational resources. The small and medium-sized enterprises (SMEs) would be enabled to respond to the evolving digital environment to different extents based on the financial and technical resources they have at their disposal. According to a study by Ahmad, Zaid, and Sleimi (2023), the ability of a company to capture digital trade opportunities depends on its access to financial resources and digital infrastructure. Digital technologies such as cloud computing, e-commerce systems, expand operational efficiencies and market presence (Murali et al., 2024) but require their investment. However, SMEs are restricted in access to adequate funding and skilled workers.

By not utilising ICT in this manner, firms may fail to take advantage of opportunities to adopt digital trade strategies. To overcome these challenges, SMEs must prudently invest in the things that will make them to grow and compete globally. Staff preparedness is another determinant that can make SMEs successful when it comes to digital commerce. Employees have to acquire new competencies in order to function within evolving frameworks, track online marketing campaigns, and address consumers across the globe (Faridi and Malik, 2020). Due to this, inadequate training facilities and the absence of skilled labour remains a challenge to majority SMEs in emerging countries. Therefore, it is essential to invest in workforce development and training when businesses

wish their employees to be prepared to digitalize their processes (Han and Trimi, 2022). There is a significant likelihood of successful adoption when organisational work that promotes the preparedness of the workforce is based on staff development through skill-building workshops and ongoing learning programmes. Human capital investments, therefore, are not only aimed at augmenting technical skills but also should contribute to an organisational culture of innovation and digital literacy.

The regulatory framework that encloses international commerce influences market entrance, compliance, and operational plans, thereby influencing the structure and strategy of the organisation. The latter also involves online commerce, whereby the World Trade Organisation along with other global regulatory bodies wield disproportionate influence in terms of how SMEs structure their online trade activities (Le & Ikram, 2022). Organisations should also comply with all trade restrictions and legislation that are relevant to conducting business, and these cover issues such as data privacy, intellectual property and restrictions on e-commerce. These restrictions will significantly influence how small and medium-sized enterprises (SMEs) organise their digital trading operation. An illustration would be a computationally expensive data management system that meets global data transfer needs, which would be expensive to develop and deploy into a small or medium-sized enterprise (SME) (Sahakyan, 2024). To prevent the legal traps of such restraints and exploit the global trading benefits, organisational practises should be coherent with regulatory provisions. When small and medium-sized enterprises (SMEs) work actively to realign their structure to address these demands, they are better placed in global expansion and digital economy functionality.

The organisational structure of operational procedures for SMEs is also affected by digital trade initiatives and international trade rules. When a small or medium-sized enterprise (SME) expands into a new market, it must adjust its operations to comply with local legislation, which may vary greatly from one nation to another (Burri, 2023). They are higher in places where the law is intricate and it has to be carefully prepared that the small and medium-sized enterprises (SMEs) should strategise carefully on their organisational structure to observe the local and international regulations. Global trade requires organisations to contain designs merging digital approaches and working regulatory bodies and legal teams to minimise the risks of global trade (Azzaoui and Kim, 2024). Due to the swift development of the digital norms and regulation that impacts

business, this requires the organisational flexibility of the SME. In this way, small and medium-sized businesses (SMEs) can perhaps withstand the external forces and become long-term viable in the digital business only by aligning its internal operations with the global laws and regulations. The dynamic nature of international business requires a spirit of being adaptable and conforming, in case small and medium-sized enterprises (SMEs) will succeed.

3.3 Environmental factors

Examples of such external variables include market conditions, government regulations, and industry benchmarks that might have an influence on the likelihood or otherwise of SMEs to be digitally transformed. SMEs are faced with several issues as they undertake the digital commerce journey, such as the ability to keep in pace with the technological advancement, the evolving market, and the bureaucratic system (Mallela, Sahu, and Dash, 2024). The market variables that affect the digitisation of SMEs are intense competition, demand of a certain commodity by customers, and the presence of digital infrastructures. The pressure that many SMEs experience in transitioning to digital technology is one such situation; the fact that their bigger competitors are doing the same thing (Varga and Csiszarik-Kocsir, 2024). Small and medium-sized businesses (SMEs) in the retail and industrial sector make use of e-commerce systems, digital marketing, and supply chains management systems to simplify operations and reach customers globally. The Asia-Pacific area has extremely varied market conditions, some countries have more favourable regulatory policies to the growth of digital commerce than others. In other words, countries that have experienced increased internet penetration and digital literacy have stronger digital ecosystems than other countries, including Singapore and South Korea. Salazar et al. (2024) argue that these challenges could make small and medium-sized enterprises (SMES) lesser adequate to engage in the global action.

Laws enforced by governments play a significant part in determining how companies trade and operate within the global arena. Consequently, rules and regulations shape the digitalization of SMEs (Elsawy, 2023). The policies governing digital commerce, such as data privacy, cybersecurity, and cross-border data flows, determine the legal framework within which a small or medium-sized enterprise (SME) should

operate as it expands abroad (Arzo and Hong, 2024b, 2024a). Governments in the Asia-Pacific region have a broad spectrum of support concerning laws. Regarding the digital infrastructure and access to external markets, such as (but not limited to) they have more such projects that have now occurred (Kamada & Yoshida, 2020). Use the example of China; the nation has established regulations that facilitate online trade. Dubbed Made in China 2025, the plan focuses on digitalisation and high-tech production through high-tech resource application (Zhong and Luo, 2024). Nevertheless, the Indian government imposes strict localisation and data protection policies that prevent small enterprises in India with globalisation opportunities (Vuppugalia, Guntipally, Borra, Iqbal, and Vistapalli, 2023). In order to shape SMEs' digital environments in a way that encourages or discourages their use of digital technologies and international commerce, government backing is crucial.

Because they may provide recommendations for the correct use of these technologies and provide uniformity and compatibility across many platforms, industry standards will be increasingly important throughout the digital transformation of SMEs (Egorova, 2022). Xiaolong et al. (2021) and Yingfei et al. (2021) state that small and medium-sized enterprises (SMEs) engaged in e-commerce, manufacturing, and logistics operations are expected to follow industrial standards. This is because their product or service needs to align with global markets. Small and medium-sized enterprises (SMEs) engaged in digital commerce must, for example, use standardised payment systems like mobile wallets and secure online transaction techniques (S. Wang & Zhang, 2025). While certain Asia-Pacific nations may be more along in the framework's development than others, this might lead to varying rates of adoption. For instance, according to Okine et al. (2023), the Chinese government actively promoted the use of standardised e-commerce platforms and digital payment systems like Alipay and WeChat Pay by SMEs. There is a great deal of rivalry on a worldwide scale, and implementing industry standards in nations with less established infrastructures in the area would be difficult.

The Asia-Pacific regional international trade rules further offer context to the forces that are out of our control, which generate digital change. The Asia-Pacific region includes several nations and each possesses a distinctive way of engaging in the global trading system. International trade agreements, such as the RCEP and the CPTPP, play a significant role in the digital commerce sector among SMEs. These treaties specify

regulations on international data transfer, protection of IP, and online trade, all of which impact small and medium-sized enterprises (SMEs) that conduct business in the international market (Wang and Zhang, 2025). International transfers SMEs rely on the provisions of the CPTPP when it comes to international data transfers due to the fact that cloud computing and online trading takes place on a global scale (Shi, 2023). The execution of such agreements, however, is uneven across the member countries of the region. Perfect harmony between, say, the internal data protection and privacy policies of China and the regulatory requirements of its international trade treaties cannot exist (Han and Trimi, 2022). This implies that digital SMEs operating in Asia-Pacific have a more complex regulation due to the existence of both national regulations and international treaties, which can facilitate or constrain their business.

This situation, however, significantly changes when one examines the influence of market conditions, government policy, and industry regulation in the digital transformation of SMEs in other countries throughout the Asia Pacific region. Indeed, digital trading in China is quite friendly to small and medium-sized enterprises (SMEs) because the nation boasts a robust digital infrastructure and governmental policies that promote the use of technologies. Nevertheless, the legislative context surrounding data privacy and IP challenges remains one of the biggest impediments (Egorova, 2022). Nonetheless, in the Philippines and Indonesia, SMEs face peculiar setbacks, including low digital literacy and internet penetration, which may hinder their online transformation. Furthermore, there is a divergence in the SMEs approaches to digital operations in both countries because of the legislative differences on issues including localisation of data in India and advanced manufacturing technologies in China. The differences in digital readiness and regulatory alignment mean that small and medium-sized enterprises (SMEs) must adopt distinct approaches to thrive in the digital global market, despite international trade agreements offering a framework to facilitate overseas business trade (Huang et al., 2024). To enable small and medium-sized enterprises (SMEs) in the Asia-Pacific to harness the benefits of technology and be able to meet the requirements of international trade, it remains essential to know which forces are influencing their own digital transformation.

4 INTERACTION BETWEEN DIGITAL TRADE TRANSFORMATION AND WTO RULES

E-commerce agreements by the World Trade Organisation offer a platform on facilitation of cross border digital trade and are thus closely connected to the digital trade transformation of the SMEs in the Asia Pacific region. The prosperity of small and medium-sized businesses (SMEs) operating in digital commerce relies on various factors, such as data flows, privacy laws, and standards of intercontinental trade (Henri Aurelien et al., 2023). The free flow of information between countries is one of the fundamental pillars of the e-commerce agreements of the World Trade Organisation. Cloud computing, big data, and SME e-commerce data flows across international borders with few obstacles. Hence, SMEs attach great importance to WTO-legislation that streamlines data flows, as they ensure a more effective functioning on a global level and an opportunity to enter other markets (Z. Iqbal & Sadaf, 2024). Another issue with SMEs is data privacy standards, as it varies by location and country. The approach taken by the World commerce Organisation (WTO) achieves data privacy regulations that do not hinder commerce. Companies, particularly in countries with strict data localisation laws, might struggle to find a balance between privacy security and unrestricted flow (Pasali & Chaudhary, 2020).

Working within international standards, as well as fulfilling most state privacy mandates, imposes operational cost and burden on a SME. As SMEs in the Asia-Pacific region are aiming to expand their market share, the limitations on digital trade practises by the World Trade Organisation will have far-reaching implications on their operations. WTO agreements aim to ease digital commerce and even the playing field among SMEs by reducing barriers to cross-border transactions. One of the areas where the WTO TFA has been busy involves simplifying the customs processes. This move will have a massive positive impact on SMEs as they frequently are incapable of coping with complex and costly rules that govern global trade. Moreover, the global intellectual property rights provisions outlined in the WTO accords will ensure that digital innovation in SMEs is protected on a global scale (Brink, Sorensen, and Neville, 2023). Such agreements end up limiting SMEs due to the immense disparities between local and foreign legal and regulatory environments. As a result, to reach the global standards provided by the WTO,

SMEs will have to invest significant financial resources in data management practises and legal compliance.

Should small and medium-sized enterprises (SMEs) in the Asia-Pacific region wish to remain on the leading edge of the curve and not be left behind when it comes to the regulation of global digital trade practises, they will have to be prepared to engage in international negotiations and upgrade their digital business models. Various policy changes were implemented to align China with WTO standards in digital commerce since the country is a major power in the Asia-Pacific region. Lin (2021) says that the strategy Made in China 2025 promotes technical advancement and digital transformation, and the objectives of the strategy are to increase the digital infrastructure of the country, promote e-commerce, and develop small and medium-sized businesses. Policies and the involvement of China in WTO e-commerce accords have influenced privacy and cybersecurity aspects of its liberalisation of digital trade. However, elsewhere this does not entirely conform to international standards; e.g. regarding data localisation, China is very strict in terms of rules and principles that require that data be stored within the country. The World Trade Organisation (WTO) supports open data flows, but SMEs experience barriers to digital trading because national policies collide with international trade rules due to how China views data sovereignty and control (Solaimani, van Eck, Kievit, and Koelemeijer, 2022).

With these technologies, enterprises will be able to comply with WTO requirements associated with digital commerce easily and help with keeping proper records, speeding up customs processes, and minimising the errors in trade documents. Other SMEs also engage in compliance training programmes to continue educating their employees about the WTO requirements of data protection, intellectual property rights, and e-commerce standards (Wang, Hou, and Wang, 2023). The training sessions benefit small and medium-sized enterprises (SMEs) as this helps them to become more familiar with the regulatory frameworks, avert traps in the legal environment, and adopt digital trade best practise. These workshops are often conducted as part of trade groups or government agencies. As mentioned in the attention of the World Trade Organisation (WTO) to strengthening digital trust and data governance, SMEs pursue cybersecurity measures with encrypted transactions, secure cloud repositories, data localisation. Regulatory compliance functions are incorporated into digital trade platforms and third-

party logistics (Alibaba, Amazon Global Selling, and regional e-commerce centres); yet another noteworthy approach is to enter into partnership with them (Li et al., 2022). These platforms provide automated customs clearance, tax calculation, tariff processing, and international payment processing features that can assist small and medium-sized enterprises (SMEs) in making their way through complicated trade regulations.

According to the attention of the World Trade Organisation (WTO) to enhancing digital trust and data governance, SMEs also adopt cybersecurity strategies through encrypted transactions, secure cloud storage, data localisation. Digital trade platforms and third-party logistics (such as Alibaba, Amazon Global Selling, and regional e-commerce hubs) contain regulatory compliance features; another notable strategy is to establish partnerships with them (Li et al., 2022). The automated customs clearance, calculation of taxes, tariff processing, and international payment processing options offered by these platforms can help small and medium-sized enterprises (SMEs) navigating complex trade regulations. These solutions can allow SMEs to be more competitive globally, minimise their regulatory risks, and expand their digital trade activities without violation of WTO regulations. In the context of enhancing their digital trade framework, particularly in SMEs they operate, the following countries in Asia-Pacific have made unique legislative strides that are distinguishing. In Singapore, and other cases, governments have enacted appropriate and rigorous data protection laws, where data flows are free and the regulatory landscape conducive to online trade (J.-K. Lin and Jia, 2024). The Singapore Digital Economy Framework for Action, as stated in the Singapore Economic Development Board report 2020, is aimed at increasing the digitalisation of small and medium-sized enterprises (SMEs) through a series of digital literacy courses, subsidies, and access to international digital platforms.

India adopted a less radical stance; the government enacted tougher regulations on data localisation, requiring some types of data to be stored within the country. This regulatory framework impacts small and medium-sized enterprises (SMEs) in India or conducting business with them due to the need to localise their operations and invest in country-specific data infrastructure (Wang and Zhang, 2025). Although the approach to regulations may differ, most countries in the region, including Indonesia or Malaysia, are now moving towards the adoption of policies that will pursue a compromise between digital trade liberalisation and protecting national interest. These changes in China and

other Asia-Pacific laws will have widespread effects on small and medium-sized businesses (SMEs) with plans of online growth. Although data localisation and privacy demands may pose another challenge, there are policies that can facilitate resource access and reduce these constraints, enhancing the expansion of digital commerce. Small and medium-sized enterprises (SMEs) must adjust their strategies to the changing policy environment. In particular, SMEs are advised to pay attention not only to global trade restrictions imposed by the World Trade Organisation (WTO), but also to internal policy, which can be more complex or tougher in terms of regulatory requirements. Related to both national regulations and international e-commerce treaties, SMEs may improve their concentration in the global online economy. Finally, governments, non-governmental organisations, and the business world must work together to design an environment through legislation that favours digital trade among SMEs. This environment must guard privacy but permit innovation to simplify transactions across borders.

5 POLICY RECOMMENDATIONS

Specific policy responses to SMEs should aim to improve technical capacity, organisational aims, and external help climate to assist digital adjustment in commerce. Such investments should bear in mind constructing and deploying the relevant digital infrastructure, such as high-speed internet connexions, cloud computing systems, and e-commerce solutions, to ensure small and middle-sized enterprises (SMEs) can access digital trade with minimal difficulties. One way to address this would be to invest digital tools and services to small and medium-sized businesses (SMEs), particularly micro and tiny enterprises. This would open doors and bring more people into the digital world. Governments are further encouraged to initiate intensive digital literacy programmes to enable the small and medium enterprise (SME) workers to acquire the technical knowledge that they need to learn in order to exploit the new technology once it arrives and to innovate in the virtual marketplace. These programmes have the potential to get even more accessible and relevant in concert with governmental organisations, commercial IT businesses and educational establishments to help small and medium-block enterprises (SMEs) compete at a better level both domestically and internationally.

The government must respond to the financial and legal barriers to trade across borders by small and medium-sized enterprises (SMEs).

Once the regulations that control customs processes, taxation policies, and regulation of data flow are standardised and simplified, the complexity and the cost of cross-border transactions would be dramatically reduced. Tax credits, grants, or low-interest loans are financial incentives that enable SMEs to invest in technology and compliance procedures that are internationally trade compliant. The creation of national-level digital trade help desks and advisory centres could also potentially benefit small and medium-sized enterprises (SMEs) by helping them navigate the international trade requirements, including the e-commerce agreements of the World Trade Organisation. The centres will also offer forums where industry gurus can share knowledge on digital trends, market opportunities, and best practises to enable SMEs to broaden their operations to a global frontier. What should small and medium-sized enterprises (SMEs) in the Asia-Pacific region do to capitalise on digital commerce and remain within the high standards set by international regimes? This is a question that must be answered through law and regulation within the WTO framework. To support the growth of small and medium-sized enterprises (SMEs) internationally, it is imperative to promote WTO rules that guarantee unrestricted and safe cross-border flow of information. Nevertheless, these regulations should balance on the more fragile matters of data privacy and cybersecurity, unique to this sector. Governments should work with the WTO towards establishing shared standards; the privacy laws of member states and cybersecurity practises would be harmonised, and the workload on small and medium-sized business (SMEs) with operations across more than one jurisdiction would be relieved.

These rules must also promote greater transparency and inclusiveness at the WTO negotiating table so that their unique problems may be taken care of fairly as they pursue their respective problems at the WTO level. Governments can facilitate the readiness of small and medium-sized enterprises (SMEs) to the digital age by integrating digital trade policies into bigger economic and industrial strategies. Indicatively, national digital trade initiatives in the Asian Pacific region must incorporate regional digital trade zone agreements to encourage cooperation among neighbouring countries. Smaller and medium-sized enterprises (SMEs) could potentially benefit through regional digital trade zones that can share digital infrastructure, cut logistical costs, and harmonise regional

trade regulations. Governments can assist SMEs in international e-commerce by subsidising or providing special access to large platforms. Regulatory incentives should be ramped up to secure access to intellectual property to make SMEs more competitive in a global environment. This would lead to enhanced protection of digital inventions. Therefore, capacity development in the context of the World Trade Organisation, should be directed towards educating and empowering small and medium-sized enterprises (SMEs) to operate in the rapidly evolving digital realm of trade. This involves educating on issues of data governance, trade facilitation transactions, and WTO e-commerce regulations. Additionally, WTO member states should address the dilemma of SMEs in international markets by devising support systems that would be conducive to them, such as capacity-building grants and simplified dispute settlement procedures. Asia Pacific countries can take this opportunity to create a strong enabling environment to the digital economy by harmonising national policies with the principles of the WTO, and by deepening international collaboration. By adopting a shared vision of sustainable development, the relevance of the region in the global digital business ecosystem can be improved, and small and medium-sized businesses (SMEs) will remain the core of the global economy.

6 CONCLUSION

The literature review indicates that this digital trade revolution is an essential element in further internationalisation of small and medium-sized enterprises (SMEs) in Asia-Pacific and associated enhancement of corporate competitive advantage. Digitisation of the entire operation, primarily via e-commerce platforms and cloud computing and digital payment services among others, made the procedures easier to access better markets. Moreover, the results indicate that SMEs potentially gain a better understanding of the dynamics of international trade when digital trade practises are employed alongside international trade standards, especially WTO standards. Technical considerations include organisational factors, like leadership and workforce readiness, and environmental factors, like regulatory environment and market conditions. Digital commerce requires a holistic approach, which considers technology innovation, organisational agility and an environment favourable to realise the potential of digital

commerce. This method should consider all of these factors. Environmental, organisational, and technological factors influence the evolution of digital commerce. Small and medium-sized enterprises (SMEs) can adopt technology as a tool to enhance the processes, lower costs, and compete effectively in the global market, but only when their organisations are ready to embrace these changes, such as having a skilled workforce, effective leadership, and resource utilisation.

It is thought that the policies of governments, the standards established by industries and the regulations imposed by international trade are all factors in determining whether or otherwise SMEs will succeed in digital commerce. The governments of the Asia Pacific region might be encouraged to take more action on matters related to policy practise and legislation to help develop digital infrastructure and promote innovation amongst small and medium-sized enterprises (SMEs). These outcomes would require a fair and inclusive digital trade landscape, and that would necessitate the efforts of all stakeholders involved, including governments, international organisations and SMEs. Thus, future research on the intricate interplay between digital trade and international trade law should be the e-commerce deals with the WTO. An analysis of the ability of SMEs to adapt to the rules and of how they could take advantage of such restrictions may reveal additional relationships between policy and practise. The enhancement of economic growth and the regional development of the Asia Pacific region could be complemented by further studies on the long-term effects of the transformation of digital commerce.

A comparative analysis of how effective the digital trade policies in different countries or in different regions of the Asia Pacific region are may further clarify the best practises and areas that require improvement. Further research in this field is needed, especially to examine how differences in legislative and regulatory overviews across geographies influence the sustainability of digital trading to SMEs. China has made strides in digital commerce infrastructure and policymaking compared to other countries. These differences should be further researched in relation to their effects on the digital trade performance of SMEs and the method to harmonise regional rules to form a consistent trading landscape. Next time, researchers can look at the digital trade environment in terms of new technologies such as blockchain, artificial intelligence, and the Internet of Things to discover what opportunities and threats the technologies bring,

especially to small and medium-sized enterprises (SMEs) attempting to remain globally competitive.

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Authors' Contribution

All authors contributed equally to the development of this article.

Data availability

All datasets relevant to this study's findings are fully available within the article.

How to cite this article (APA)

Yang, Q., Aman, A. B., Zaki, H. O., & Baharin, R. (2026). DIGITAL TRADE TRANSFORMATION FOR SMES IN ASIA PACIFIC USING THE TECHNOLOGY-ORGANIZATION-ENVIRONMENT FRAMEWORK: A SYSTEMATIC LITERATURE REVIEW. *Veredas Do Direito*, 23(4), e234766. <https://doi.org/10.18623/rvd.v23.n4.4766>