
SME's E-Commerce Adoption in Sabah and Sarawak: The Moderating Role of Government Support

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Abstract – This study investigates the factors influencing e-commerce adoption among SMEs in Sabah and Sarawak, addressing gaps in the existing consensus and theoretical framework. Utilizing the Technology-Organisation-Environment theory, the research focuses on perceived usefulness, perceived ease of use, organizational readiness, and top management support, with government support as a moderating variable. Employing a quantitative approach and survey methodology, data analysis was conducted using SPSS and SmartPLS 4. The results reveal that perceived usefulness and ease of use positively impact e-commerce adoption, and government support moderates the relationship between ease of use and adoption. The findings highlight the crucial role of the technological context, particularly user experience. The study underscores that user-friendly and useful e-commerce platforms increase the likelihood of adoption, while government support is vital through regulations and infrastructure improvements. Future research is recommended to explore e-commerce adoption across diverse industries and examine post-adoption stages to identify evolving patterns over time.

Keywords: 'E-Commerce Adoption', 'SME', 'Technology-Organisation-Environment (TOE)', 'East Malaysia', 'Perceived Usefulness', 'Perceived Ease of Use', 'Top Management Support', 'Organization Readiness', 'Government Support'.

1. Introduction

Information technology (IT) and globalization have significantly transformed business operations. IT systems are now installed and integrated into nearly all businesses, especially those that have heavily invested in their IT infrastructure to ensure future growth (Jain et al., 2021). The COVID-19 pandemic has further accelerated the expansion of e-commerce in both B2C and B2B sectors. Moreover, 52 per cent of consumers worldwide have begun avoiding retail businesses and crowded areas, with 32 per cent delaying visits to traditional brick-and-mortar stores until after receiving vaccinations due to the pandemic (Behl et al., 2020).

Electronic commerce, or e-commerce, refers to the buying and selling of goods and services over the Internet (Khan, 2016). Previous studies (e.g., Kareen et al., 2018; Mapeshoane &

Pather, 2016; Yaghi, 2017) have demonstrated that e-commerce provides significant benefits to companies and countries, including improved supply chains, economic growth, and development. In essence, e-commerce eliminates the need for substantial financial investments in physical infrastructure to achieve a global presence, revolutionizing how business is conducted worldwide (Alyoubi, 2015).

SMEs play a crucial role in national economies, particularly in developing countries (Kurnia et al., 2015; Kraja & Osmani, 2013). The critical importance of the SME sector is widely acknowledged, driven by its substantial contributions to essential socioeconomic objectives. These include boosting employment and output, fostering export growth, and nurturing entrepreneurship (Kesk et al., 2017). Furthermore, SMEs create job opportunities, promote the stability and growth of local economies, contribute significantly to innovation and financial advancement, and produce high-quality, value-added goods. SMEs are also instrumental in the revitalization and advancement of national economies (AKA & Hongbo, 2022). In summary, SMEs are the primary drivers of economic development and the foundation of socioeconomic progress due to their significant contributions to achieving key economic goals (Bayraktar & Algan, 2019).

Despite the benefits of e-commerce, Malaysian businesses, like those in other countries, face challenges and drawbacks. According to Shahzad et al. (2020), Malaysia's SMEs still lack the digital skills necessary to fully benefit from advanced e-commerce resources and enhance their performance. According to the Malaysian Communications and Multimedia Commission (MCMC)'s (2018) e-commerce consumer study reports an average e-commerce adoption rate of 51.2 per cent in Malaysia. However, the survey indicates that e-commerce adoption rates vary across states, with Selangor at 40 per cent, W.P. Kuala Lumpur at 38 per cent, Sarawak at 24 per cent, and Sabah at 23 per cent. Thus, Sabah and Sarawak have two of Malaysia's lowest e-commerce adoption rates.

This study aims to address this gap by empirically developing a model to explain the factors influencing e-commerce adoption in Malaysia. The findings of this study are intended to enhance understanding of the factors driving e-commerce adoption in developing countries, particularly Malaysia (Ahmad et al., 2015).

2. Literature Review

2.1. Theory foundation

Many theories can be applied to e-commerce adoption, such as the Theory of Reasoned Action (TRA) (Fawzy & Salam, 2015), the Theory of Planned Behavior (TPB) (Apau & Koranteng, 2019) the Technology Acceptance Model (TAM) (Fayad & Paper, 2015) and Technology-Organisation- Environment (TOE) (Setiyani & Yeny Rostiani, 2021). Similar to TRA, applying intention requires two critical explanatory variables: the consumer's subjective norm and attitude toward a particular behavior (Fishbein & Ajzen, 1975). The TPB, which Ajzen (1991) extended from TRA, postulates that beliefs influence behavioral perceptions and actual behavior. TAM, regarded as the theoretical foundation for research

on technology adoption behavior, was developed by revising TPB (Noor Ardiansah et al., 2020).

However, this study adopted the TOE framework as its theoretical foundation due to its strong explanatory power in intra-firm innovation adoption (Alshamaila et al., 2013). The framework's multi-dimensional approach, encompassing technological characteristics, organizational factors, and the external environment, aligns well with the research objective of investigating how perceived usefulness, perceived ease of use, top management support, and organizational readiness influence e-commerce adoption. Furthermore, the TOE framework's successful application in previous studies conducted within developing countries (e.g., Rawash, 2021; Awa et al., 2015; Alshamaila et al., 2013; Wanyoike et al., 2012; Ghobakhloo et al., 2011; Gilaninia et al., 2011) provides a robust foundation for interpreting these findings within the relevant social and economic context. Additionally, the TOE framework's dynamic nature (Al-Somali et al., 2015; Rahayu & Day, 2015) allows this study to examine the complex interplay between these multiple influences, leading to a richer understanding of the innovation adoption process within the research context.

2.2. E-commerce adoption

E-commerce, a form of online trade utilizing digital technologies (Setiyani & Yeny Rostiani, 2021), is concisely described by Sombultawee (2020) as the use of information technologies to support a company's commercial activities, such as managing orders and inventories, interacting with customers, and selling products. In essence, e-commerce involves the buying and selling of goods and services, enabling two or more individuals to conduct transactions using electronic equipment (Mahliza, 2020).

Driven by its multifaceted impact, e-commerce adoption has become a prominent research theme across diverse disciplines. Investigations into B2B transactions (Lip-Sam & Hock-Eam, 2011), SME retail sector practices (Govinnage & Sachitra, 2019; Kurnia et al., 2015), and overall SME adoption (Rahayu & Day, 2017) exemplify this growing scholarly interest. Notably, e-commerce offers significant potential to empower SMEs, particularly in developing economies. By facilitating access to broader customer bases globally and reducing market entry and distribution costs (Hajli et al., 2013), e-commerce can significantly enhance SMEs' competitiveness and growth prospects.

Despite a rich body of prior research on e-commerce in Malaysia (e.g., Arshad et al., 2018; Suhaimi Baharudin et al., 2016; Kurnia, Choudrie et al., 2015; Mahroeian, 2012), gaps persist in understanding SMEs' nuanced opportunities and challenges within this rapidly evolving landscape. This is particularly critical given the remarkable growth of the Malaysian e-commerce market, evidenced by a 68% year-over-year increase in 2021 and a projected value of \$9.2 billion in 2022 (Trends, 2021). Additionally, Malaysia experienced a 47% increase in online shopping year over year, with 14.43 million individuals engaging in online shopping at the beginning of 2022. These figures demonstrate a significant annual increase in Malaysia's e-commerce penetration rate, offering substantial opportunities for SMEs to incorporate e-commerce into their operations. With advancements in technology and an increase in internet users, owners of e-commerce businesses can anticipate

opportunities arising from Malaysian customers' growing interest in online shopping (Vaicondam, 2020).

2.3. Hypotheses Development

2.3.1 Perceived usefulness (PU) and e-commerce adoption

The degree to which someone believes using a system will benefit them is referred to as its perceived usefulness (Davis, 1989). According to Hussein et al. (2019), perceived usefulness stems from the "usefulness" of the system in the context of e-commerce adoption by SMEs, and it can be evaluated by examining how e-commerce impacts job performance through indicators such as speed and productivity. Huang (2017) further asserted that perceived usefulness represents the projected value of using a specific information system.

Numerous studies have explored perceived usefulness in various contexts, including m-commerce (Kasuma et al., 2020), e-government (Chen & Aklikokou, 2020) and e-filing (Tahar et al., 2020). Perceived usefulness plays a crucial role in technology adoption, as noted by Abed (2020) who suggests that users are more inclined to try and continue using new technologies they find beneficial.

Suryawirawan (2021) identified a positive correlation between e-commerce usage and perceived usefulness. Moreover, perceived usefulness can significantly influence individuals' decision-making processes (Gantulga et al., 2021). Upadhyay et al., (2018) demonstrated that perceived usefulness is a key factor in how individuals accept new technology. Consequently, this study posits that perceived usefulness positively impacts e-commerce adoption.

H1: There is a positive relationship between perceived usefulness and e-commerce adoption in Sabah and Sarawak

2.3.2 Perceived ease of use (PEOU) and e-commerce adoption

Perceived ease of use is defined as "the degree to which a person believes that using a certain system would be free from effort." (Davis, 1989). It can also be understood as the extent to which a business can effectively adopt new technology that is easy to use (Puspitaningtias et al., 2022). Cho & Sagynov (2015) asserted that people's perceptions of the method influence usability, leading to the desired result.

Previous research demonstrates that perceived ease of use has been explored in various contexts, including mobile payment (Mensah, 2019), social media (Puspitaningtias et al., 2022) and kiosk (Taufik & Hanafiah, 2019). Research by Hoque et al. (2015) emphasizes perceived ease of use as a pivotal factor in technology acceptance and usage. This idea is further corroborated by Awa et al. (2015), who found a strong connection between ease of use, positive service attitudes, and user intention to adopt technology.

This variable indicates that a person's decision to use (or not use) a program is influenced by their belief that it will improve their performance in a specific activity. However, if the technology is difficult to use, it may negatively impact their performance. Therefore, this study proposes the following hypothesis:

H2: There is a positive relationship between perceived ease of use and e-commerce adoption in Sabah and Sarawak.

2.3.3 Top management support and e-commerce adoption

Top management support is a critical factor in the adoption of technology, particularly e-commerce (Hussain et al., 2020). The extent to which top managers endorse e-commerce as a strategic tool to enhance performance and gain a competitive advantage within an organization is referred to as top management support (Acheampong Otoo et al., 2019). Hussain et al. (2021) emphasized that top management's involvement in e-commerce adoption is vital, as it facilitates the transition from traditional to technological infrastructure.

Moreover, top management support has been examined in various studies, including those focused on e-business (Hussain et al., 2021), electronic procurement (Marei et al., 2021), and e-marketplace (Purwandari et al., 2019). According to Hussain et al. (2021), information seldom flows from the bottom to the top in organizations, highlighting senior management support's importance in driving technological change, such as e-commerce adoption, particularly in SMEs.

Given this, the study posits that top management support positively influences the adoption of e-commerce. Top management support is a crucial determinant of an organization's willingness to adopt new information technologies (Hussain et al., 2020b) and directly impacts SME technology adoption (Ocloo et al., 2020). Therefore, this study proposes the following hypothesis:

H3: There is a positive relationship between top management support and e-commerce adoption in Sabah and Sarawak.

2.3.4 Organisation readiness and e-commerce adoption

Organisational readiness refers to an organisation's capability to adapt its IT, financial, and human resource infrastructure to meet the demands of digital innovation (Atan & Mahmood, 2022). The extent to which a firm's financial infrastructure aligns with its processes and the skills of its human resources determines the influence of these factors on e-commerce adoption (Fadilla et al., 2023). In Malaysia, organisational readiness has been categorized into technological and financial resources by some authors (Lim et al., 2016b, 2018; Chee et al., 2016).

Previous studies have widely examined organisational readiness across various domains,

including business analytic (Atan & Mahmood, 2022), healthcare management (Vaishnavi et al., 2019) and social media (Abed, 2020). It has been identified as a significant contributor to the adoption of e-commerce, making it a key variable in related research (Nurlinda & Muda, 2020).

Organisation readiness is one of the essential variables in e-commerce adoption (Effendi & Subroto, 2021; Abed, 2020; Ocloo et al., 2018; Omar et al., 2015). The impact of organisational readiness is particularly pronounced in developing countries. Therefore, this study posits that organisational readiness positively influences e-commerce adoption. To effectively increase e-commerce adoption, SMEs must consider and plan for their organisation's readiness, ensuring synchronization and coordination across people, processes, systems, and performance assessments. Consequently, this study proposes the following hypothesis:

H4: There is a positive relationship between organisation readiness and e-commerce adoption in Sabah and Sarawak.

2.3.5 Government support and e-commerce adoption

Government agencies that provide technical assistance, commercialisation opportunities, subsidies, and incentives to business sectors are considered to be offering government support (Noni & Ibrahim, 2020). It has been demonstrated that government actions and regulations, both directly and indirectly, influence information availability, accelerating technology's spread. Additionally, as computer and telecommunications technology advances, many governments are shifting their focus from traditional "brick and mortar" infrastructure development to electronic communications and transportation programmes (Bagale, 2014).

Government support, such as e-training (Bankole, 2016), ICT Adoption (Miraz & Habib, 2016) and green innovation (Miraz & Habib, 2016) has been widely examined in previous studies. This variable has been frequently explored because the government significantly promotes and supports SMEs' networking and ICT adoption (Hussin et al., 2017).

Consequently, this study proposes that government support positively impacts e-commerce adoption. Governments can create enabling infrastructure (Mohtaramzadeh et al., 2018; Awiagah et al., 2016), provide financial aid, and offer SMEs technical workshops and training programmes (Ocloo et al., 2020; Mohtaramzadeh et al., 2018; Chee et al., 2016).

However, this study also suggests that the relationship between perceived usefulness, perceived ease of use, top management support, and organisational readiness in adopting e-commerce is moderated by government support for three reasons. First, environmental modifications (opportunities and risks) encourage organisations to operate more effectively and efficiently. Second, environmental factors can enhance the quality of services and goods produced by a company (Aigul, 2021). Based on this discussion, the following hypotheses are proposed:

H5A: Government support positively moderates the relationship between perceived usefulness and e-commerce adoption in Sabah and Sarawak

H5B: Government support positively moderates the relationship between perceived ease of use and e-commerce adoption in Sabah and Sarawak

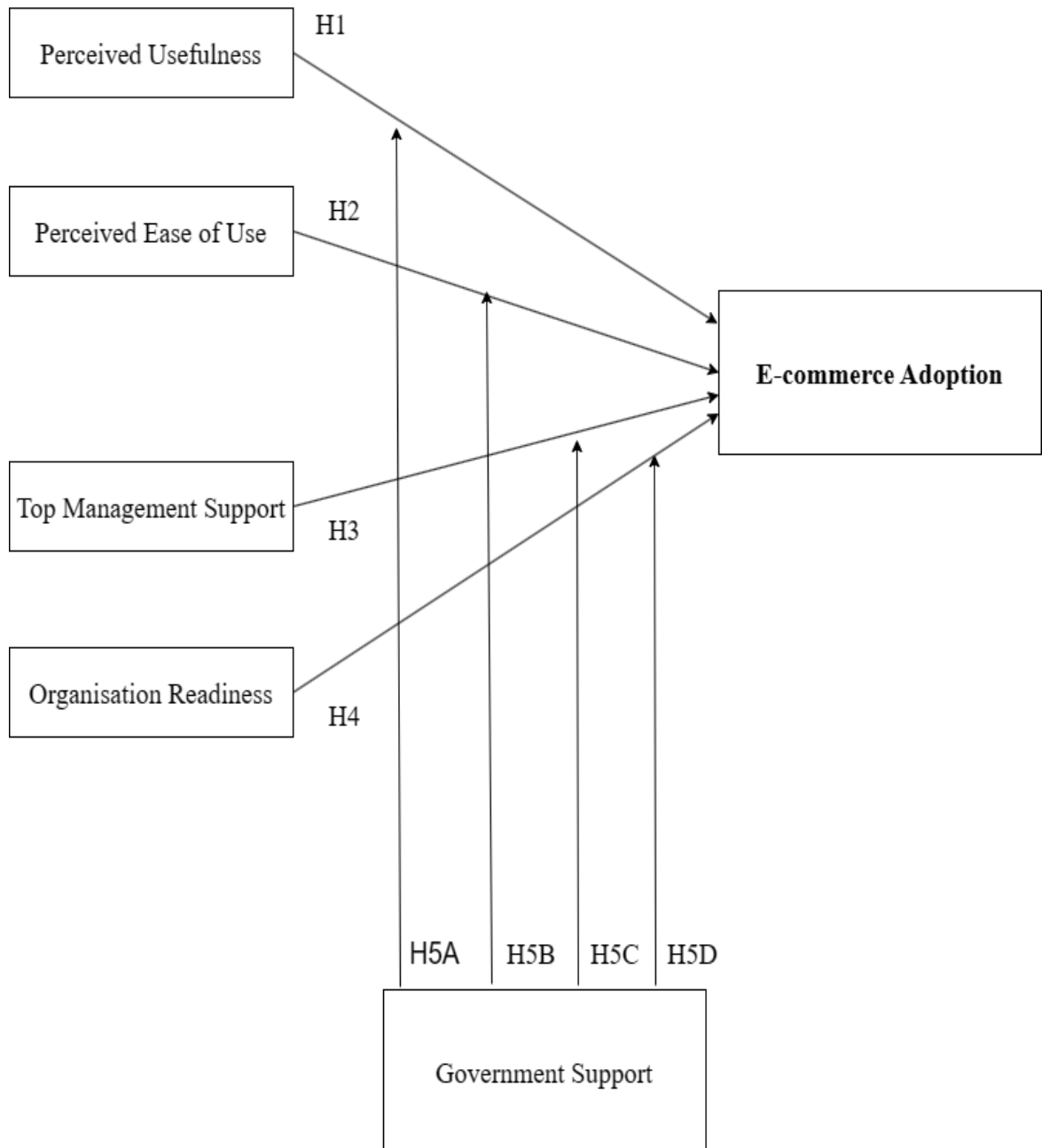
H5C: Government support positively moderates the relationship between top management support and e-commerce adoption in Sabah and Sarawak

H5D: Government support positively moderates the relationship between organisation readiness and e-commerce adoption in Sabah and Sarawak.

2.4. Conceptual Framework

Based on the literature review discussion about e-commerce adoption, Figure 1 shows the proposed research framework of this study.

Figure 1: Conceptual Framework



3. Methodology of Study

3.1. Research Design

Using a quantitative approach, this study investigates the relationship between perceived usefulness, perceived usability, top management support, organisational readiness, and government support. Data were collected through purposive sampling, a quantitative

research technique, with information gathered from a sample of potential respondents via a series of questionnaires.

A questionnaire served as the primary research instrument. The study's hypotheses were tested using cross-sectional data collected from SMEs in Sabah and Sarawak, with small and medium-sized businesses serving as the unit of analysis, each represented by one respondent. Using questionnaires, a cross-sectional, or one-shot, study design was employed to gather primary data over two months, from 20 September 2022 to 30 November 2022. Sekaran and Bougie (2010) assert that cross-sectional studies collect information at a single point in time. The data collection phase, which primarily involved distributing questionnaires to respondents without disrupting their regular activities, involved minimal interference.

3.2. Population and Sample Selection

The term "population" refers to the entire group of subjects the researcher is interested in studying, including individuals, events, or objects of interest (Et. al., 2021). The population is the set or group of all units to which the research findings will be applied. The population encompasses the entire group about which conclusions are to be drawn.

For this study, the target respondents are SMEs from Sabah and Sarawak. SMEs are defined as companies in the manufacturing sector with annual sales of less than RM50 million and fewer than 200 full-time employees, or companies in the services or other sectors with annual sales of less than RM20 million and fewer than 75 full-time employees. According to the annual report of SME Corporation Malaysia, Sabah has 55,702 SMEs, while Sarawak has 61,036 SMEs (National Entrepreneur and SME Development Council, 2020). Therefore, the total population of SMEs in Sabah and Sarawak for this study is 116,738.

Regarding the sample size, this study follows the recommendations of Memon et al. (2021), who suggest setting the effect size to 0.15 (medium effect), 0.05, and 0.80 for power settings. Consequently, the G-Power calculation indicated that a minimum sample size of 114 responses was required. This study achieved a sample size of 152 respondents, providing greater statistical power and confidence in the findings.

Additionally, this study employed purposive sampling as its sampling approach. Purposive sampling involves selecting informants who are in the best position to provide an in-depth understanding of the research target (Siamagka et al., 2015). This method has also been used in previous studies on e-commerce (Aditya, 2020; Mahliza, 2020; Yeni & Yasri, 2020; Suryawirawan, 2019).

In this study, purposive sampling was applied to select a "representative" sample aligned with the research objectives. Participants were recruited based on their responses to the screening question, "Does your company use e-commerce in its business?" This question aimed to ensure the relevance and validity of the responses with respect to the research focus on businesses utilizing e-commerce. Respondents who answered "No" were excluded from the study, as their experiences would not directly contribute to the investigation.

3.3. Data Analysis Methods

Many researchers find the PLS-SEM method particularly appealing for estimating large models with multiple constructs, indicator variables, and structural paths without imposing distributional assumptions on the data (Hair et al., 2019). More importantly, PLS-SEM emphasizes prediction when estimating statistical models designed to offer causal explanations (Hair et al., 2017).

PLS-SEM analyses commonly aim to identify critical success factors and sources of competitive advantage for key constructs such as customer satisfaction, loyalty, behavioral intentions, and user behavior (Hair et al., 2019). Notably, PLS is an analytical technique that imposes few assumptions, such as requiring a small sample size or normally distributed data. It is employed for causal predictive analysis (Mahliza, 2020). The availability of user-friendly software with graphical user interfaces, such as ADANCO, PLS-Graph, SmartPLS, and XLSTAT, along with the statistical computing software environment R, which includes cSEM, matrixpls, SEMinR, and SmartPLS as supplements to other programs, further supports its use (Sarstedt et al., 2017).

SmartPLS offers a path model that can elucidate the relationships between variables and indicators. These models are crucial as they provide a clear representation and supporting evidence for the findings (Sander & Lee, 2014). Additionally, SmartPLS is user-friendly and suitable for small sample sizes (Purwanto et al., 2019) making it a comprehensive tool for PLS-SEM analysis (Sarstedt & Cheah, 2019).

Therefore, this study employs SmartPLS and PLS-SEM to analyze the collected data, which includes 29 questions divided across six sections for dependent and independent variables, and one section for the moderator variable. This detailed structure aims to rigorously test the study's hypotheses and achieve its research objectives. All questions from relevant previous studies were meticulously selected to ensure their validity and alignment with the research goals.

4. Findings and Discussion

4.1. Demographic Profile of the Key Respondents

Table 1 contains all the profiles of key respondents, such as gender, age, race, level of education and position in the company.

Table 1: Profile of Key Respondents

Demographic Variables	Categories	Frequency	Percentage (%)
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Gender	Male	49	35.0
	Female	91	65.0
Age	20-29 years	57	40.7
	30-39 years	62	44.3
	40-49 years	17	12.1
	50-59 years	3	2.1
	Over 60 years	1	0.7
Race	Bumiputera Sabah	68	48.6
	Bumiputera	18	12.9
	Sarawak	29	20.7
	Malay	25	17.9
	Chinese		
Level of Education	Master	14	10.0
	Degree	59	42.1
	Diploma	43	30.7
	High School	24	17.1
Position in the Company	Owner / Director	94	67.1
	Chief Executive Officer (CEO)	2	1.4
	Executive	8	5.7
	Manager	14	10.0
	Supervisor	22	15.7

Table 1 shows that men comprised 35 percent of respondents, or 49 individuals, while women accounted for 65 percent, or 91 individuals.

Regarding age, 62 respondents, or 44.3 percent, were between 30 and 39 years old. This was followed by those aged 20 to 29, comprising 40.7 percent, and those aged 40 to 49, making up 2.1 percent. Respondents aged 50 to 59 accounted for 0.7 percent.

In terms of race, Bumiputera Sabah represented the majority, with 68 respondents, or 48.6 percent. This was followed by Malay respondents, who made up 20.7 percent, or 29 individuals, Chinese respondents at 17.9 percent, or 25 individuals, and Bumiputera Sarawak, with 18 respondents, or 12.9 percent.

Concerning education, the findings revealed that 59 respondents, or approximately 42.1 percent, held a bachelor's degree. Following this, 30.7 percent of respondents, or 43 individuals, had a diploma, 17.1 percent, or 24 individuals, had completed high school, and 10 percent, or 14 individuals, held a master's degree.

The positions held within the corporation included Owner/Director, Chief Executive Officer (CEO), Executive, Manager, and Supervisor. The majority of respondents in this survey (67.1 percent, or 94 individuals) were from the Owner/Director category, followed by 15.7 percent, or 22 individuals, from the Supervisor category, 10 percent, or 14 individuals, from the Manager category, and 5.7 percent, or 8 individuals, from the Executive category. Only

1.4 percent of survey participants, or 3 individuals, identified themselves as Chief Executive Officers (CEO).

4.2. Demographic Profile of the Key Respondents

Table 2 summarises the key characteristics of the sampled firms, including their use of e-commerce, type of industry, year, firm scale, and main business area.

Table 2: Profile of Key Firm

Demographic Variables	Categories	Frequency	Percentage (%)
Type of Industry	Manufacturing	42	30.0
	Services	98	70.0
Year	1 - 5	119	85.0
	6 - 10	15	10.8
	> 11	6	4.2
Firm's Scale	Small	110	78.6
	Medium	30	21.4
Main Business Area	<u>Sabah</u>		
	West coast division	55	39.3
	Sandakan division	12	8.6
	Tawau division	11	7.9
	Interior division	8	5.7
	Kudat division	4	2.9
	<u>Sarawak</u>	13	9.3
	Kuching division	7	5.0
	Sibu division	6	4.3
	Sri Aman division	5	3.6
	Mukah division	5	3.6
	Bintulu division	5	3.6
	Miri division	4	2.9
	Betong division	2	1.4
	Samarahan division	1	0.7
	Serian division	1	0.7
	Sarikei division	1	0.7
	Kapit division		

Of the respondents, 140, or 92.1 percent, indicated that they have utilized e-commerce, while 12 respondents, or 7.9 percent of the sample, did not implement e-commerce in their business. Among the SMEs, 42, or 30 percent, were in the manufacturing sector, whereas the services sector comprised 70 percent, or 98 firms.

The number of employees was used to categorize the size of the companies. Of the firms, 78.6 percent, or 110 companies, were classified as small enterprises, while 21.4 percent, or 30 organizations, were medium-sized businesses.

Eighty-five percent of the 119 SMEs in the sample employed e-commerce within the first five years of operation. In contrast, 15.8 percent, or 10.8 percent of SMEs, adopted and utilized e-commerce in the subsequent six to ten years. Six firms, or 4.2 percent, have used e-commerce for over ten years.

SMEs from the West Coast division comprised the majority of respondents to this survey, representing 39.3 percent, or 55 individuals. This was followed by SMEs from the Kuching division, accounting for 9.3 percent, or 13 respondents. The Sandakan division contributed 8.6 percent, or 12 respondents, while the Tawau division represented 7.9 percent, or 11 respondents. The interior section had 5.7 percent, or 8 respondents, and the Sibu division had 5.0 percent, or 7 respondents. The Sri Aman division had 4.3 percent, or 6 respondents. Each Mukah, Bintulu, and Miri division had 3.6 percent, or 5 respondents each. The Betong and Kudat divisions accounted for 2.9 percent of the total respondents, or 4 percent, and the Samarahan division had 1.4 percent, or 2 respondents. The Serian, Sarikei, and Kapit divisions each had 0.7 percent, or 1 respondent.

4.3. Common Method Bias

Common method bias often occurs in studies where data for both independent and dependent variables are collected from the same individual in a single assessment setting, using the same item context and features (Podsakoff et al., 2003). Harman's Single-Factor Test can be employed to assess this bias by examining whether the first extracted component accounts for more than 50 percent of the variance in an exploratory factor analysis. If this is the case, any inferences drawn from the data should be approached with caution, as a significant proportion of common method bias may be present in the sample (Aguirre-Urreta & Hu, 2019).

Table 3: Common Method Bias

Factor	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% Of Variance	Cumulative %	Total	% Of Variance	Cumulative %
EC1	14.502	50.007	50.007	14.08	48.552	48.552
EC2	2.823	9.735	59.742			
EC3	1.663	5.736	65.477			
EC4	1.585	5.464	70.942			
EC5	1.184	4.084	75.026			
EC6	1.071	3.693	78.72			
EC7	0.808	2.788	81.507			
PU1	0.741	2.554	84.061			

PU2	0.567	1.954	86.015
PU3	0.467	1.612	87.627
PU4	0.457	1.575	89.202
PU5	0.427	1.472	90.674
PU6	0.359	1.239	91.913
PEOU1	0.336	1.16	93.073
PEOU2	0.299	1.031	94.104
PEOU3	0.242	0.834	94.937
PEOU4	0.235	0.81	95.748
PEOU5	0.196	0.676	96.424
TMS1	0.173	0.598	97.021
TMS2	0.143	0.491	97.513
TMS3	0.131	0.451	97.964
TMS4	0.114	0.394	98.358
OR1	0.098	0.337	98.695
OR2	0.088	0.302	98.997
OR3	0.083	0.287	99.284
OR4	0.072	0.248	99.532
GS1	0.06	0.208	99.74
GS2	0.044	0.152	99.892
GS3	0.031	0.108	100

Table 3 shows that the total variance retrieved by one factor is 48.552 per cent, under the advised cutoff point of 50 per cent. Hence, common method bias in this data is not an issue.

4.4. Individual Item Reliability: Factor Loading

According to Yong & Pearce (2013), high factor loading scores indicate that the variables more effectively account for the dimensions of the factors, as factor loading measures the extent to which a variable contributes to a factor. Additionally, Sarstedt et al. (2017), note that external loadings greater than 0.70 suggest that all indicators exhibit adequate reliability. The PLS results for each construct are presented in Table 4.

Table 4: Factor Loadings of the Construct Items

Constructs	Items	Scale item	Factor Loading
E-Commerce Adoption	EC1	General marketing activities	0.750
	EC2	To communicate with customers	0.716
	EC3	To market research	0.783
	EC4	Find new suppliers	0.727
	EC5	Gain international penetration	0.724

	EC6	Implement sales configuration management software	0.754
	EC7	Do B2B transactions with suppliers	0.822
Perceived Usefulness	PU1	Using e-commerce would enable the company to accomplish specific task more quickly	0.921
	PU2	Using e-commerce would improve the company job performance	0.919
	PU3	Using e-commerce in my job would increase the company productivity	0.862
	PU4	Using e-commerce would enhance the company's job effectiveness	0.950
	PU5	Using e-commerce would make it easier to do the company's job	0.961
	PU6	The Company would find e-commerce useful in its job	0.949
Perceived Ease of Use	PEOU1	Learning to operate e-commerce would be ease for the company	0.934
	PEOU2	The company would find e-commerce to be flexible to interact with	0.954
	PEOU3	The company interaction with e-commerce would be clear and understandable	0.853
	PEOU4	It would be ease for the company to become skillful at using e-commerce	0.928
	PEOU5	Company would find e-commerce easy to us	0.912
Top Management Support	TMS1	Management is interested in the use of e-commerce technologies in our operations.	0.850
	TMS2	Management is supportive of the use of e-commerce technologies in our operations.	0.929
	TMS3	Our business has a clear vision regarding the use of e-commerce technologies.	0.912
	TMS4	Management communicates the need for e-commerce technologies usage in the firm	0.889
Organisation Readiness	OR1	Our firm knows how information technology (IT) can be used to support our operations.	0.896
	OR2	Our firm has a good understanding of how e-commerce technologies can be used in our business.	0.939

OR3	Our company have the necessary technical, managerial and other skills to implement e-commerce technologies	0.794
OR4	Our business values and norms would not prevent us from adopting e-commerce technologies in our operations.	0.867

This analysis builds upon the e-commerce adoption construct to assess the internal consistency of its various components. All constructs demonstrate strong reliability, with factor loadings ranging from 0.716 to 0.961 across individual items. The perceived usefulness construct, consisting of six measurement items, has factor loadings ranging from 0.862 to 0.961. The perceived ease of use construct includes five measurement items, with factor loadings ranging from 0.853 to 0.954. The top management support construct comprises four measurement items, with factor loadings ranging from 0.850 to 0.929. The organisational readiness construct consists of four measurement items, with factor loadings ranging from 0.794 to 0.939. Thus, each construct's measure exceeds 0.7, meeting the established criteria.

4.5. Path Coefficient

The path coefficient was developed to evaluate the importance of the proposed relationships between variables. Therefore, the t-value can only be calculated using a bootstrapping function. This study considered nine predictors and hypothesized their direct and indirect impacts. The t-values for all variables were generated using SmartPLS 4.0 bootstrapping to analyze the significance level of each independent and dependent variable.

A path coefficient represents the ratio of the standard deviation of the total impact. Path coefficient analysis, a fundamental statistical method, reveals the effects of multicollinearity and identifies the factors (causes) that influence other variables (responses). This analysis provides a more precise index for selection, illustrating the cause-and-effect relationships among multiple yield components, rather than relying solely on correlation (Abebe & Girma, 2017). The significance threshold was met through bootstrapping with 5000 samples when the p-value was less than 0.05 (Hair et al., 2017). Crucial t-values at this level must be greater than 1.96 (for one-tailed tests) or greater than 1.645 (for two-tailed tests). Consequently, a coefficient is considered statistically significant when the empirical t-value exceeds (or the p-value is less than) the critical value; this study used a benchmark of 1.645. The results are presented in Table 5.

Table 5: Path Coefficient, Mean, Standard Deviation, T-value, and P-value (Indirect Relationship: Moderating Effect)

Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics ((O/STDEV))	P values	Result
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Perceived Usefulness -> E-Commerce Adoption	0.441	0.451	0.126	3.506	0.000	Supported
Perceived Ease of Use -> E-Commerce Adoption	0.199	0.174	0.120	1.666	0.048	Supported
Top Management Support -> E-Commerce Adoption	0.133	0.147	0.103	1.291	0.098	Not Supported
Organisation Readiness -> E-Commerce Adoption	0.000	0.004	0.115	0.004	0.498	Not Supported
GS x PU -> E-Commerce Adoption	-0.044	-0.070	0.141	0.313	0.377	Not Supported
GS x PEOU -> E-Commerce Adoption	0.211	0.206	0.091	2.325	0.010	Supported
GS x TMS -> E-Commerce Adoption	-0.064	-0.062	0.098	0.652	0.257	Not Supported
GS x OR -> E-Commerce Adoption	-0.085	-0.061	0.097	0.875	0.191	Not Supported

5. Discussions and Conclusion

5.1. Implication of Study

This study aims to contribute to the existing literature on supply chain technology and enhance understanding of the application of the TOE framework to real business operations. The goal is to present the research findings to practitioners, academics, and policymakers. The general implications of these findings for theoretical and managerial perspectives are outlined below.

5.1.1. Theoretical Implication

Firstly, the results of this study contribute to the development of the research framework based on the TOE framework. The study addresses critical gaps in the literature regarding e-commerce adoption by applying the TOE framework in a developing country context. For this purpose, the researcher selected one variable for the environmental context (government

support) as a moderator to explain the relationship between TOE variables and e-commerce adoption. Additionally, two variables for the organisational context (organisational readiness and top management support), two variables for the technological context (perceived usefulness and perceived ease of use), and two variables for the environmental context (organisational readiness) were chosen. This application of the TOE framework enhances understanding of the factors affecting e-commerce adoption in Sabah and Sarawak.

Secondly, the study's framework, which supports theory development in SMEs, incorporates two variables: perceived usefulness and perceived ease of use. The findings indicate that the technological aspect of the TOE theory has the most significant impact on SMEs' adoption of e-commerce, particularly in Sabah and Sarawak. Users' experience with an e-commerce platform is crucial; customers and business owners are unlikely to adopt it if the platform is difficult to use or not useful. Consequently, the technological context should focus on advancing technology and consider the interaction between users and the e-commerce platform.

Thus, determining factors such as perceived usefulness and perceived ease of use significantly influence e-commerce adoption. This study provides empirical evidence for e-commerce adoption in developing markets, specifically in Sabah and Sarawak, Malaysia. By including relevant factors such as perceived usefulness, perceived ease of use, organisational readiness, top management support, and government support as a moderator, this research framework offers a novel perspective compared to earlier studies on e-commerce adoption. Ultimately, this research serves as a foundation for future investigations within the Malaysian context.

5.1.2. Theoretical Implication

For SMEs, e-commerce offers several advantages, including market expansion, sales growth, enhanced communication, improved brand perception, expedited business processes, and increased employee productivity. SMEs should actively promote e-commerce within their industries (Kareem et al., 2018). Consequently, businesses need to adopt e-commerce to stay competitive and adapt to ongoing changes and developments. Many SMEs have transitioned from physical stores to online platforms due to the Covid-19 pandemic. The Malaysian government has been supportive of this shift by launching the Go-eCommerce and Shop Malaysia Online campaigns in 2020 and 2021 (Mentek, 2022). Therefore, SMEs must select practical platforms in terms of perceived usefulness and ensure user-friendliness, or perceived ease of use.

For the government, the results indicate that perceived usefulness and perceived ease of use are crucial factors in the adoption of e-commerce by SMEs in Sabah and Sarawak. The government should develop policies that encourage SMEs to embrace e-commerce. This could include providing substantial support through workshops or seminars to help SMEs, especially in Sabah and Sarawak, stay informed about the latest developments in the business environment. Additionally, financial assistance through grants or loans could facilitate innovation among SMEs in these regions. Furthermore, the government should continue to enhance both urban and rural infrastructure. The government should create and implement

additional supportive policies to support SMEs in Sabah and Sarawak in achieving better outcomes.

5.2. Limitations and recommendations for future Research Study

The first limitation of this study is that it does not account for other potential and significant variables related to e-commerce adoption, such as organizational capacity and governmental regulation. Future research could explore additional relevant internal and external factors, such as complexity, compatibility, and external pressures, that may influence SMEs' adoption of e-commerce. To provide a more comprehensive understanding of e-commerce adoption, existing theories should be adapted and expanded to consider geographic and cultural differences (Khoo et al., 2018). Consequently, replicating this study with a focus on these additional variables would be beneficial to broaden its scope.

The second limitation pertains to the sample size. This study included only 140 respondents from both the manufacturing and service industries. As a result, perspectives on e-commerce and the impact of sample size may vary across different industries (Zain et al., 2020). This study did not compare e-commerce adoption across different sectors. Therefore, replicating this study with a sample that includes a broader range of essential industries in Sabah and Sarawak would be advantageous. Future research should consider including respondents from diverse personnel categories, SMEs in rural areas, and various industries. Additionally, employing alternative sampling methods could enhance the robustness of future studies.

5.3. Conclusion

The study examines various factors influencing e-commerce adoption, including perceived usefulness, perceived ease of use, organizational readiness, top management support, and government support. Hypothesis testing supported only perceived usefulness and perceived ease of use. Moreover, perceived ease of use interacts with government support in influencing e-commerce adoption. The TOE framework proves effective in explaining e-commerce adoption in developing countries, particularly in Sabah and Sarawak. It also offers empirical support for future research studies. In summary, e-commerce represents a promising future for SMEs.

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