



E-Commerce Adoption Among Businesses in Indonesia

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ABSTRACT

Despite the substantial engagement of Indonesian consumers in e-commerce, there remains a noteworthy disparity in the adoption of e-commerce among businesses. By integrating the Technology Acceptance Model (TAM) and the Technology-Organisation-Environment (TOE) framework, the aim of this research was to identify the direct and indirect influences of selected factors on e-commerce adoption intention among businesses in Indonesia. Self-administered questionnaires were distributed to respondents from the manufacturing and service industries for data collection. The results of structural equation modelling analysis revealed that TOE factors directly influence the TAM factors of perceived usefulness, perceived ease of use, and adoption intention towards e-commerce in Indonesia. Additionally, perceived ease of use was found to mediate the effect of the TOE factors on businesses' adoption intention.

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INTRODUCTION

As an important marker of technological advancement, the emergence of Industry 4.0 has been lauded as a crucial contributor towards global logistical coordination and consequently, higher business productivity. Many countries have therefore made substantial investments to encourage businesses' adoption of technology, including for research, information, communication, entertainment, and online transactions (Yacob et al., 2021). In response to this digital transition, businesses have been compelled to innovate and shift to brand-new business models. A notable part of such innovation is modifying traditional methods of doing business into modern systems like e-commerce. Indeed, businesses are strongly encouraged to adopt e-commerce (Hasan et al., 2021), as consumers prefer the convenience of e-commerce platforms over conventional ones. Thus, businesses must implement a trustworthy e-commerce system that supports an innovative business model and facilitates consumer transactions in the current era (Jamra et al., 2020).

In Indonesia, the growth in e-commerce is intensifying rivalry among business competitors vying for stronger market positions (Chong and Ali, 2022). The Indonesian economy is almost entirely composed of small and medium-sized enterprises (SMEs). According to the Ministry of Co-operatives and SMEs, there were about 64 million SMEs in the country in 2019, representing 99.99% of the nation's business population. SMEs also employ 96.9% of Indonesia's workforce (OECD, 2022). However, these businesses' adoption of cutting-edge technologies, primarily e-commerce, has been reportedly low (Hasan et al., 2021), despite e-commerce being widely preferred by Indonesian consumers.

Internet users in Indonesia predominantly fall within the age range of 16 to 64, with their total number reaching 202.6 million as of January 2021. A study on Indonesian Gen Zs highlights the importance of individual preferences in product or service evaluation, whereby certain direct and indirect factors drive e-commerce adoption as an individual consumer behaviour (Lestari, 2019). Accordingly, statistics show that up to 90% of internet users in the country participate in online purchases (The International Trade Administration, 2022). Indonesians also spend more time on social media than on broadcast or cable TV, averaging more than two and a half hours a day (We Are Social, 2023). Social media plays an increasingly significant role in connecting consumers to businesses for shopping, entertainment, and information. Consequently, mobile devices appear to be the primary mechanism by which Indonesians engage in e-commerce, as evinced by shopping site reports that around 75% of online shoppers utilise mobile devices instead of desktop computers for online shopping (The International Trade Administration, 2022).

Consumers' strong preference for mobile e-commerce platforms indicates that businesses' failure to implement this technology can severely impede their market competitiveness and survival. Given their limited adoption level, it is imperative to explore the determinants of Indonesian SMEs' e-commerce adoption. Therefore, this research aimed to analyse the direct and mediating effects of factors that influence Indonesian businesses' intention to adopt e-commerce. To achieve this objective, an integrated framework combining the Technology Acceptance Model (TAM) and the Technology-Organisation-Environment (TOE) model was utilised.

LITERATURE REVIEW

E-commerce

In essence, e-commerce involves establishing connections and conducting business transactions via computer and telecommunications networks, typically for the purchase and sale of products, services, and information. The proliferation of digitalisation, the positive response of business owners towards it, and the subsequent application of e-commerce in SMEs has resulted in e-commerce's recent emergence as a popular research topic in the information systems field. Notably, scholars and governments alike have been paying considerable attention to the growing trend of e-commerce adoption among SMEs over the past several years, with theoretical and practical evidence indicating that entrepreneurs and owners of SMEs benefit significantly from e-commerce businesses. Despite extant knowledge, limited research has been conducted on SMEs' approach to e-commerce adoption in developing countries, particularly Indonesia.

Technology-Organisation-Environment (TOE) Model

Depietro al. (1990) first proposed the TOE framework to analyse the adoption of technological innovations by firms and organisations. The technological (T) context of the TOE model provides insight into an organisation's internal and external technology characteristics; the organisational (O) context discusses the organisational characteristics (e.g., firm size) that significantly impact how technology is incorporated and employed within an organisation; and the environmental (E) context concerns the organisation's operating environment (Sulaiman et al., 2023).

Technological context

When evaluating the impact of technological revolutions on an organisation, it is widely acknowledged that the technological context is one of the most crucial factors to consider. According to Tornatzky and Fleischer (1990), at its core, innovation is determined by the usefulness of a technology and its effect on the adoption process. In this study, security concern was selected as a technological factor that is relevant for examination in the context of Indonesian SMEs' e-commerce adoption.

Security concern

In the case of businesses' selection of cloud computing platforms or systems like e-commerce, the reliability and security of public databases are vital considerations (Asiaei and Rahim, 2019). For instance, a study on SMEs in Nigeria revealed that the SMEs' adoption of new technology is significantly impacted by technical considerations such as safety and security (Awa and Ojiabo, 2016).

Organisational context

The organisational setting is another essential aspect that determines, to a significant extent, the degree to which a technology is accepted. According to Lippert and Forman (2006), the organisational context is characterised by firm-level characteristics that influence the availability of resources that either facilitate or impede technology adoption. Consequently, organisational context factors are regarded as internal, as they are within the control of the technology adopter, i.e., the organisation. For instance, the adoption of cloud computing depends on organisational environment factors like senior management support and the organisation's scale. In this study, top management support was included as an important organisational variable affecting Indonesian SMEs' perceptions towards e-commerce adoption.

Top Management Support

The top management of an organisation plays a key role in ensuring that the organisation's members adopt new computer-based technology. Only with their support can an adoption-friendly environment for technology be established and necessary resources be made available (Kumar et al., 2017). Previous research on the usage of e-commerce among Pakistani SMEs has validated that top management support significantly enhances their e-commerce adoption (Hussain et al., 2020).

Environmental Context

In the context of the environment, the TOE model stipulates that an organisation must effectively manage its external environment, which includes customers, competitors, regulatory requirements, and external pressure. Against the background of the competitive SME sector in Indonesia, this research incorporated competitive pressure as an environmental factor pertinent to SMEs' e-commerce adoption.

Competitive Pressure

The development of innovative information technology is, to a large degree, driven by externally originating competitive forces (Mehrtens et al., 2001). The resulting advancements in networking technology have driven significant shifts in businesses' transaction models and market structures. To improve productivity and respond more quickly to global market demands ahead of their competitors, businesses are under pressure to make efficient use of information technology in their internal and external processes. Accordingly, a previous study

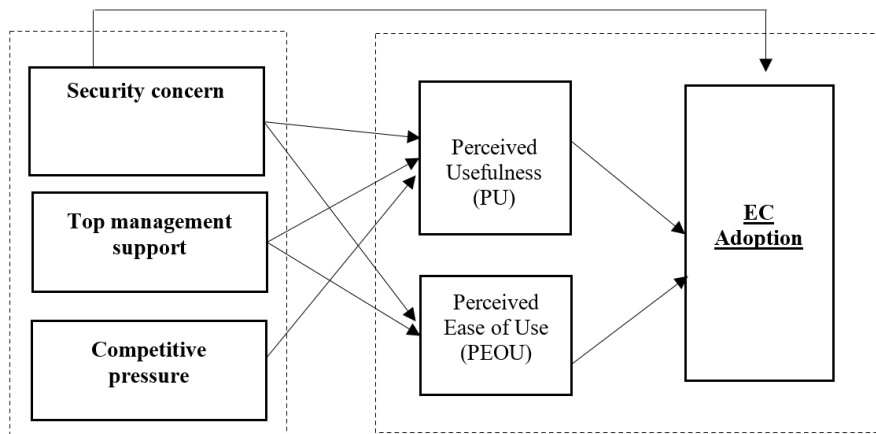
of 5,000 large Chinese companies revealed that competitive pressure significantly impacts the adoption of e-business (Yeh et al., 2015).

Technology Acceptance Model (TAM)

Technology adoption refers to the degree to which an organisation employs or accepts new technologies. Various theories have been devised to examine individual adoption of a particular technology (Mahomed et al., 2017), among which the TAM, developed by Davis (1989), has been frequently and widely employed. The TAM posits that the perceived usefulness and perceived ease of use of a technology influence individuals' intention to adopt the technology. Perceived usefulness and perceived ease of use are prospective users' perceptions that using a particular technology system would increase their job performance and be easy to use, respectively, within the organisational context (Davis et al., 1989). Li and Huang, (2009) discovered a positive effect of perceived usefulness and perceived ease of use on customers' adoption of an e-commerce channel.

In total, 11 direct hypotheses and six mediating hypotheses were proposed in this study. Specifically, in the context of Indonesian SMEs' e-commerce adoption, the following relationships were predicted: (i) the three TOE factors (security concern, top management support, and competitive pressure) influence the three TAM factors (perceived usefulness, perceived ease of use, and adoption intention); (ii) perceived usefulness and perceived ease of use impact adoption intention; and (iii) perceived usefulness and perceived ease of use mediate the relationships between the TOE factors and adoption intention. The research framework depicted in Figure 1 illustrates these factors and their relationships.

RESEARCH FRAMEWORK



Source: Adapted from Davis's (1989) TAM and Tornatzky and Fleischer's (1990) TOE framework

Figure 1 Research Framework

RESEARCH METHODOLOGY

This quantitative study involved the distribution of self-administered questionnaires to employees of manufacturing and service SMEs in Indonesia. SPSS was employed to perform descriptive analysis of the respondents' demographic data, while the hypotheses were tested using partial least squares structural equation modelling (PLS-SEM) via SmartPLS.

DATA ANALYSIS AND RESULTS

The comprehensive demographic data of the 270 valid respondents are provided in Table 1. The table shows that out of these respondents, 128 were male (47.4%), while 142 were female (52.6%). The majority of respondents, constituting 75.9%, fell into the age group of 18 to 30. The remaining were distributed among various age groups as follows: 31 to 40 (n=41, 15.2%), 41 to 50 (n=17, 6.3%), 51 to 60 (n=5, 1.9%), and 61 years and older (n=2, 0.7%). In terms of marital status, 187 respondents (69.3%) were single, while 83 (30.7%) were married. Regarding professional experience, 141 respondents (52.2%) had between one and five years of experience, 101 respondents (37.4%) had between six and 10 years of experience, 20 respondents (7.4%) had over 10 years of experience, and only eight respondents (3%) had no prior experience. The duration of the respondents' current employment varied as well, as 51 respondents (18.89%) had worked for less than one year, 45 (16.67%) for one to five years, 48 (17.78%) for six to 10 years, 70 (25.93%) for 11 to 20 years, 17 (6.30%) for 16 to 20 years, and 39 (14.44%) for more than 20 years.

Table 1 Respondents' Demographic Profile

Variable	Indicator	Frequency	Percentage (%)
Gender	Male	128	47.4
	Female	142	52.6
Age	18-30 years old	205	75.9
	31 – 40 years old	41	15.2
	41 – 50 years old	17	6.3
	51 – 60 years old	5	1.9
	Above 61 years old	2	0.7
Marital status	Single	187	69.3
	Married	83	30.7
Years of working experience	1 – 5 years	141	52.2
	6 – 10 years	101	37.4
	More than 10 years	20	7.4
	No experience	8	3.0
Length of service with the organisation	Less than 1 year	51	18.89
	1 – 5 years	45	16.67
	6 – 10 years	48	17.78
	11– 15 years	70	25.93
	16 – 20 years	17	6.30
	More than 20 years	39	14.44

Assessment of Measurement Model

All the study's constructs were classified as reflective. When evaluating a reflective measurement model, it is essential to confirm that it meets three primary criteria: internal consistency reliability, convergent validity, and discriminant validity. Internal consistency is determined by the composite reliability (CR) of the constructs, whereas convergent validity is demonstrated by item loadings and average variance extracted (AVE) values. According to Table 2, all items were maintained as their loadings exceeded the 0.708 threshold for acceptability (Hair et al., 2014). The CR and AVE values of the constructs were also greater than 0.70 and 0.50, respectively (Hair et al., 2014), establishing the constructs' reliability and convergent validity.

The Heterotrait-Monotrait Ratio (HTMT) criterion was employed to determine discriminant validity in this study. According to Gold et al. (2001) HTMT values must be less than 0.90 to demonstrate that constructs measure distinct phenomena and do not correlate too highly with one another. Table 3 indicates that the research constructs met these criteria; thus, the discriminant validity of the measurement model was proven.

Table 2 Reflective Measurement Model Results

Construct	Indicator	Loading	AVE	CR	Item Deleted
Security Concern	SC 1	0.901	0.834	0.962	None
	SC 2	0.907			
	SC 3	0.936			
	SC 4	0.936			
	SC 5	0.886			
Top Management Support	TM 1	0.864	0.767	0.952	None
	TM 2	0.895			
	TM 3	0.871			
	TM 4	0.876			
	TM 5	0.903			
	TM 6	0.845			
Competitive Pressure	CP 1	0.850	0.683	0.928	None
	CP 2	0.872			
	CP 3	0.868			
	CP 4	0.862			
	CP 5	0.725			
	CP6	0.771			
Perceived Usefulness	PU 1	0.889	0.797	0.951	None
	PU 2	0.905			
	PU 3	0.873			
	PU 4	0.912			
	PU 5	0.884			
Perceived Ease of Use	PEOU 1	0.870	0.724	0.929	None
	PEOU 2	0.711			
	PEOU 3	0.904			
	PEOU 4	0.856			
	PEOU 5	0.898			
Adoption Intention	AI 1	0.884	0.771	0.944	None
	AI 2	0.898			
	AI 3	0.910			
	AI 4	0.852			
	AI 5	0.845			

Table 3 Discriminant Validity using HTMT Criterion

	Adoption Intention	Competitive Pressure	Perceived Ease of Use	Perceived Usefulness	Security Concern	Top Management Support
Competitive Pressure	0.697					
Perceived Ease of Use	0.749	0.558				
Perceived Usefulness	0.756	0.682	0.713			
Security Concern	0.533	0.563	0.455	0.559		
Top Management Support	0.589	0.562	0.504	0.601	0.596	

Assessment of Structural Model

Based on the path analysis results in Table 4, eight of the 11 hypothesised direct relationships were significant in this study. In terms of the TOE model factors, competitive pressure was found to significantly increase businesses' perceived usefulness, perceived ease of use, and adoption intention towards e-commerce. Top management support showed a significant positive influence on perceived usefulness and perceived ease of use, but not on adoption intention. Lastly, security concern exhibited a significant positive relationship only with the perceived usefulness of e-commerce. From the TAM perspective, both perceived usefulness and perceived ease of use demonstrated significant positive impacts on adoption intention.

The coefficient of determination (R^2) values for adoption intention, perceived usefulness, and perceived ease of use were 0.638, 0.494, and 0.324, respectively (see Table 5). It can thus be inferred that the independent factors in the framework had substantial explanatory power, having explained 63.8% of the variation in adoption intention, 49.4% of the variation in perceived usefulness, and 32.4% of the variation in perceived ease of use.

Table 4 Path Coefficient Assessment

Hypothesis	Relationship	Standard Beta	Standard Deviation	p-value
H1a	Security Concern -> Adoption Intention	0.043	0.058	0.462
H1b	Security Concern -> Perceived Usefulness	0.164	0.061	0.008
H1c	Security Concern -> Perceived Ease of Use	0.118	0.068	0.083
H2a	Top Management Support -> Adoption Intention	0.103	0.074	0.167
H2b	Top Management Support -> Perceived Usefulness	0.254	0.069	0.000
H2c	Top Management Support -> Perceived Ease of Use	0.223	0.079	0.005
H3a	Competitive Pressure -> Adoption Intention	0.236	0.071	0.001
H3b	Competitive Pressure -> Perceived Usefulness	0.415	0.055	0.000
H3c	Competitive Pressure -> Perceived Ease of Use	0.334	0.059	0.000
H4	Perceived Ease of Use -> Adoption Intention	0.329	0.067	0.000
H5	Perceived Usefulness -> Adoption Intention	0.258	0.081	0.002

Table 5 Coefficient of Determination (R²)

	R ²
Adoption Intention	0.638
Perceived Ease of Use	0.324
Perceived Usefulness	0.494

Assessment of Mediation Effects

The roles of perceived usefulness and perceived ease of use as mediators between the effects of security concern, top management support, and competitive pressure (TOE model variables) on adoption intention (TAM variable) were analysed using bootstrapping in SmartPLS. As shown in Table 6, perceived usefulness has a significant mediating effect on the links of top management support and competitive pressure with adoption intention, but not on that of security concern. Similarly, Table 7 shows that perceived ease of use significantly mediates the impact of top management support and competitive pressure on adoption intention, but not that of security concern. Thus, the technological factor (security concern) has neither a direct nor indirect relationship with e-commerce adoption intention, while the organisational factor (top management support) only has an indirect relationship with it. Notably, the environmental factor (competitive pressure) has both direct and indirect relationships with e-commerce adoption intention through the TAM constructs.

Table 6 The Mediation Effect of Perceived Usefulness

Hypothesis	Relationship	Standard Beta	Standard Error	p-value
H1d	Security Concern -> Perceived Usefulness -> Adoption Intention	0.042	0.025	0.087
H2d	Top Management Support -> Perceived Usefulness -> Adoption Intention	0.066	0.024	0.007
H3d	Competitive Pressure -> Perceived Usefulness -> Adoption Intention	0.107	0.037	0.004

Table 7 The Mediation Effect of Perceived Ease of Use

Hypothesis	Relationship	Standard Beta	Standard Error	p-value
H1e	Security Concern -> Perceived Ease of Use -> Adoption Intention	0.039	0.025	0.117
H2e	Top Management Support -> Perceived Ease of Use -> Adoption Intention	0.073	0.027	0.007
H3e	Competitive Pressure -> Perceived Ease of Use -> Adoption Intention	0.11	0.029	0.00

CONCLUSION

The rapid growth of information technology in the globalisation era has pushed many industries, including SMEs, to utilise technology-based business models, particularly e-commerce. E-commerce implementation accelerates the sale of goods and services as well as the promotion of items to the general public (Hasan et al., 2021). In light of Indonesian SMEs' low adoption of e-commerce, this study developed and tested an integrated model of the TOE framework and the TAM to offer SMEs opportunities to enhance their competitive advantage in the digital era. This integrated model was proposed as a viable alternative to prevalent innovation theories and models, which have been proven to be less applicable in characterising the adoption of advanced technologies.

Based on the current study's findings, the TAM and TOE factors play instrumental roles in facilitating the adoption of e-commerce among Indonesian businesses. This is in line with Awa et al., (2015) assertion that the TAM and TOE provide valuable insights into how companies implement e-commerce. Consistent with

earlier studies on the adoption and usage of technologies like cloud computing and email (Gangwar et al., 2014; Mahomed et al., 2017; Mokhtar et al., 2020) the present findings revealed that both perceived usefulness and perceived ease of use are critical in determining businesses' e-commerce adoption intention. Notably, this study adds to the literature by establishing perceived usefulness and perceived ease of use as significant mediating mechanisms through which organisational and environmental factors can enhance or impede e-commerce adoption intention. Therefore, this research extends previous knowledge on the TOE model and TAM by combining them and expanding their applicability to the context of e-commerce adoption in a developing economy.

Future research on this topic should consider increasing the sample size to compare e-commerce adoption across SMEs, micro-businesses, and/or other sectors in Indonesia to obtain more comprehensive findings. In addition, given the significant findings on the environmental variable in this study, subsequent studies should consider incorporating more external environmental variables to expand the scope of the current framework.

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