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TOE factors and value chain effects of e-business adoption on SMEs

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A B S T R A C T

The purpose of this study is to determine the effect of the Technology-Organization-Environment (TOE) on e-business adoption and the impact of e-business adoption on the value chain of Small and Medium Enterprises (SMEs). The study uses a quantitative approach where the respondents are 389 SMEs that use e-business in Indonesia. Partial Least Square - Structural Equation Modeling analysis is used in this study to analyze data and test hypotheses. The study results describe that technology, organization, and environment significantly influence the e-business adoption of SMEs. Furthermore, e-business adoption has a substantial impact on the value chain of SMEs. The study provides an overview of SMEs in Indonesia to determine the factors used as references in e-business adoption and how good e-business adoption will add value to businesses, especially in the value chain.

1. Introduction

According to the World Bank, Small and Medium Enterprises (SMEs) are critical in most countries, particularly developing countries. SMEs make up the majority of businesses globally and play a vital role in job generation. SMEs account for about 90% of all enterprises and more than half of all jobs globally. Formal SMEs provide up to 40% of national income in emerging nations (GDP). If the SMEs are informal, this number could be more significant. Due to their economic impact and employing a large number of people., SMEs have become a study subject and a high priority for many governments (Thaha et al., 2021). In Indonesia, SMEs play a strategic and vital role in the country's economic development. SMEs have proven to be unaffected by the crisis. When the monetary crisis hit Indonesia in 1997 – 1998, only SMEs could remain firmly established as the backbone of the economy at that time. The Indonesian government believes that success in the sustainability of SMEs will be able to enhance the economic foundation of the people. SMEs can develop and sustain and provide satisfaction to their customers and earn profits if the value obtained is greater than the cost of production and services provided. Adopting the right technology in the business will accelerate processes and focus on the core skills and capabilities that set it apart from its competitors. Business activities using internet technology are an innovative way of carrying out company activities to enter the cyberspace market, known as electronic business (e-business) and electronic commerce (e-commerce) (Tamimi et al., 2005; Davis, 1989). The development of a more globalized and digital economy makes SMEs expected to use e-business to remain relevant and more competitive. On the other hand, consumers generally like e-business to conduct transaction activities, but not all SMEs do the same (Putra & Santoso, 2020).

The result of the adoption and utilization of e-business in SMEs is a value-added factor (Harindranath et al., 2008). The use of e-business which is not limited to only the marketing aspect will provide added value for SMEs to utilize e-business more effectively and optimally in other business processes. Value added in a business process can be seen from the value chain, defined as a set of business activities. At each stage in the business, activity adds value or benefit to the goods and services of the organization concerned (Porter, 2001). Over the years, SMEs have continuously demonstrated their ability to maintain company development and employment creation levels. The ability of SMEs to learn and acquire information is a crucial

determinant of whether or not they can go to the next level of development. SMEs worldwide that adopt e-business can revolutionize the way they run their operations.

This study aims to investigate the relationship between the factors that influence e-business adoption in SMEs and the value chain impact resulting from the adoption of e-business. This study tries to see the effect that will later serve to prepare possible strategies for increasing e-business adoption among SMEs in Indonesia.

2. Literature Review

2.1 Technology adoption

According to Adeosun et al. (2008), the use of Information Technology (IT) in management techniques linked to communication, access to information, data management, decision making, and knowledge management in an organization has a positive value. IT may be a strategic asset and tool for businesses, allowing them to gain benefits in terms of promotion and competition. (Buhalis, 2003). Den Hengst & Sol (2001) argue that IT assists businesses by lowering expenses and improving their capacity to collaborate with other parties. Information technology is believed to provide a competitive advantage for companies by using it as a tool to improve information quality, control company performance, and improve customer service. In other words, companies use information technology both as a tool and a strategy to integrate and process data quickly and accurately and to create new service products as a competitive edge to face the competition (Oetomo, 2002). In addition, the use of information technology for companies is expected to reduce costs, increase production without a significant increase in costs and improve the quality of services and products (Mirani & Lederer, 1998).

2.2 E-Business in SMEs

According to Zhu et al. (2006), e-business can transform entire organizations, alter organizational structures, and drastically alter business processes. In addition, e-business impacts relationships with customers, partners, and suppliers. E-business can be described as integrating communication technology, business processes, and management practices (Efraim, 2011; Simpson & Docherty, 2004). Bordonaba-Juste et al. (2012) argue that the internet helps organizations understand customer needs, adopt product market solutions, customize products and services, and receive orders from customers. Measurement of e-business adoption in SMEs can be done by examining the use of e-business for communication, inventory management, order processing or sales, marketing, customer management, financial management, human resources (Dyerson et al., 2016; Putra & Santoso, 2020).

2.3 Value chain in SMEs

Over the last several years, there has been a lot of research done on the role and influence of IT and systems on a company's competitiveness. It has gotten more attention from firms and academia than any other aspect (Chen et al., 2010). The study of competitive advantage based on the value chain is the most extensively utilized academic approach from a strategic perspective (Hemmatfar et al., 2010). The value chain in most SMEs is applied to access and physical distribution management related to warehousing and transportation of goods. In addition, a value chain-based approach can assist in identifying the most appropriate locations for implementing competitive advantage plans and actions of strategic significance through the use of e-business in various company operations. (Kaplinsky & Morris, 2000). The value chain consists of main activities and supporting activities. The main activities of the value chain are concerned with the physical creation of the product, its sale and distribution to buyers, and after-sales service. This activity consists of inbound logistics, operations, outbound logistics, marketing and sales, service. Limited resources in SMEs make inbound logistics and outbound logistics activities into one activity, namely logistics (Putra et al., 2017).

2.4 Technology – Organization – Environment (TOE) framework

TOE framework is a set of factors that predict the level of adoption and innovation barriers in IT. According to Tornatzky et al. (1990), TOE factors affect a business's decision to implement technological advancements. The TOE framework is used because it has been validated by various literature. (Chatzoglou & Chatzoudes, 2016; Lin & Lin, 2008; Zhu et al., 2004). Other technology adoption models such as the Technology Acceptance Model (TAM), Theory of Planned Behavior (TPB), Diffusion of Innovation (DOI) lack a holistic approach from the TOE framework (Rogers, 1995). The TOE framework includes an environmental dimension, making it superior in highlighting the significance of both inter-and intra-firm linkages in a technology's adoption. Srivastava & Teo (2010) argue that not only is the TOE framework consistent with DOI, but actually increases its reach by incorporating the intra-firm diffusion of innovation. It may be inferred that the TOE framework is appropriate for use in the current empirical study's environment. Factors related to e-business applications such as perceived usefulness, suitability, acceptable cost, perceived risk, complexity, observability, and trialability can be considered technological factors. Meanwhile, internal SME resources such as management support, finance, innovation, rules, and e-business expertise can be considered organizational factors. The e-business skill factor is crucial in today's digital workforce because it provides insight and influences the progress of SMEs when adopting e-business (Siddoo et al., 2019). Several studies suggest that contextual factors such as industry, firm size, and market scope can be described as organizational factors (Zhuang, 2005). Other studies consider it a demographic characteristic of a particular company. In some cases, studies may

consider this factor a control variable as part of their conceptual model or exclude it altogether (Newby et al., 2014). This study does not include the proposed conceptual model's industry, size, and scope.

Factors that are considered as external and environmental forces for SMEs such as competitive pressure, technology infrastructure, financial support, government support, and vendor support are considered as environmental factors (Awa et al., 2015; Ramdani et al., 2009). These factors are very relevant to the growing literature on SME e-business adoption.

2.5 Conceptual Model

This study uses TOE, e-business adoption, and value chain as constructs based on the previous literature. The research hypotheses were formulated, namely:

Hypothesis 1 (H1). *Technology has a positive influence on the adoption of SME e-business.*
Hypothesis 2 (H2). *Organization has a positive influence on the adoption of SME e-business.*
Hypothesis 3 (H3). *Environment has a positive influence on the adoption of SME e-business.*
Hypothesis 4 (H4). *There is a positive influence between e-business adoption and the SME value chain.*

The constructs and hypotheses regarding their interaction are illustrated in the conceptual model of Fig. 1.
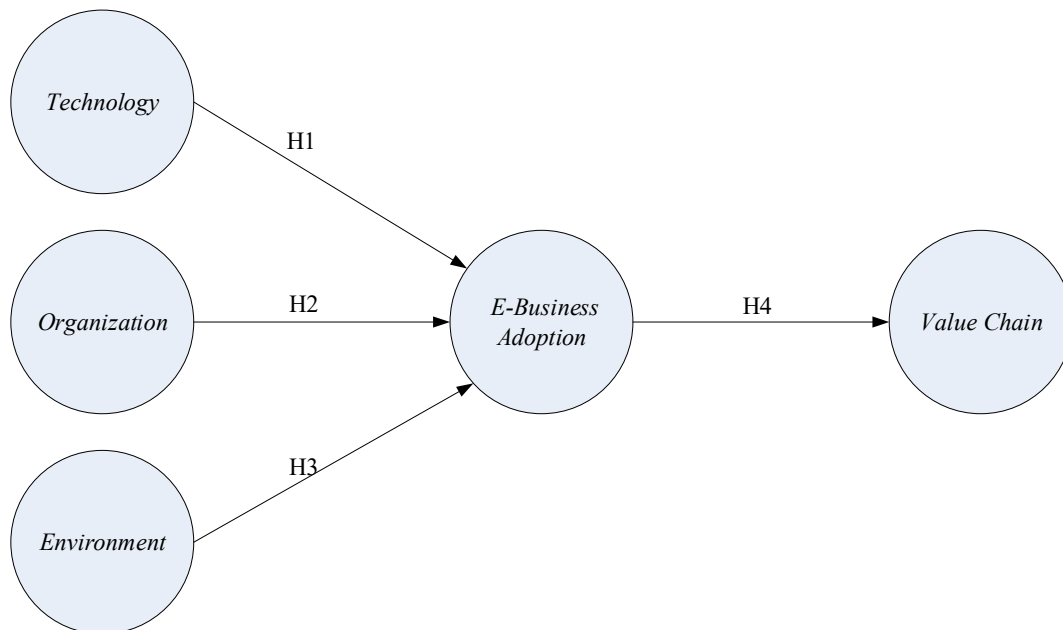

Fig. 1. Conceptual model

3. Method

Systematically the procedure in this research can be seen in Fig. 2. The previous two steps, framework and construct and formulation of hypotheses, have been carried out. Next is a survey, measurement model assessment, structural model assessment and hypotheses, and results and discussion.
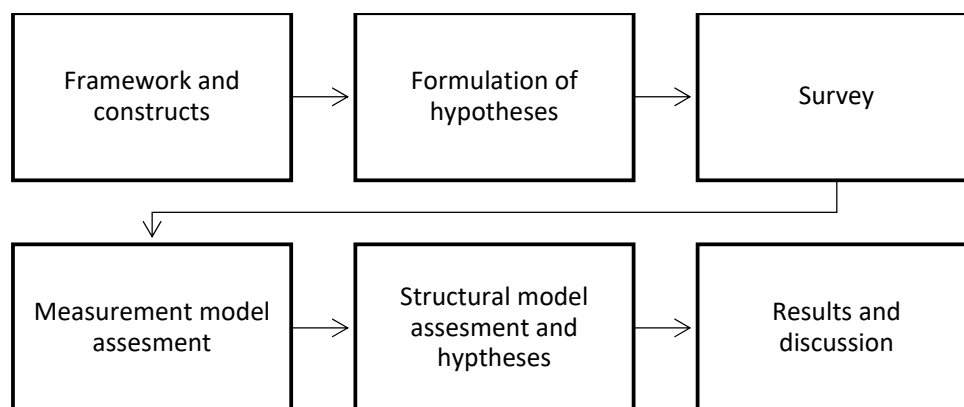

Fig. 2. Research procedure

This study used a quantitative method with a survey approach to obtain empirical data and information. The population in this study are SMEs in Indonesia who adopt e-business in their business activities. This study collected quantitative data through questionnaires distributed randomly to the company in terms of the company's income and the number of employees of less than 100 people. The primary respondents targeted were owners, managers, and executives because they have the most understanding of the state of their company. This study used Google Form as an online questionnaire tool for data collection. Questionnaires were distributed to various SME associations in multiple cities and sent directly to SME contacts based on data from local governments. The distribution of the questionnaire resulted in 389 valid responses. The measurement scale used in this study is a Likert scale with a value from 'strongly disagree (1)' to 'strongly agree (5)'. The data analysis technique in this study used Partial Least Square - Structural Equation Modeling (PLS-SEM) to test the hypothesized model. Technological factors are assessed from six items, namely: perceived usefulness, suitability, complexity, perceived cost, observability, and trialability. Organizational factors were assessed using five things: IT knowledge, financial resources, innovation, management support, and process management (SOP). Four items were considered environmental factors: competitive pressure, government policies, digital infrastructure, and vendor support. The adoption of e-business is assessed from eight items, namely the use of e-business for communication needs, consumer management, financial management, human resources management, marketing management, orders and sales, product production, procurement, and inventory. Finally, the value chain is assessed from thirteen items, namely the benefits of procurement of goods and raw materials, product distribution, inventory management, product manufacturing planning, product manufacturing efficiency, product manufacturing innovation, product pricing, selection of marketing channels, promotions, increased activity sales, branding activity, customer complaint records, and customer satisfaction after-sales.

4. Results

4.1 Descriptive Information

Based on Table 1, it can be concluded that the 389 SMEs who were respondents in this study came from various industrial sectors. 82.5% of SMEs have 1-4 employees, 15.1% have 5-19 employees, and 3.9% have 20-99 employees. Based on annual income in IDR, 86.9% of SMEs have income < 300 million per year, 10.8% have income of 300 million – 2.5 billion per year, and the remaining 2.3% have income > 2.5 billion per year.

Table 1
Demographic statistics of respondents

Demographic Characteristics		Frequency	Percentage
Area	West Java	178	45.8%
	Sumatera	80	20.6%
	Central Java	26	6.7%
	Banten	25	6.4%
	Jakarta	23	5.9%
	East Java	20	5.1%
	Sulawesi	13	3.3%
	Others	17	4.4%
	Kalimantan	7	1.8%
Industry sector	Food and drink	192	50.1%
	Fashion	74	19.3%
	Wholesale and retail	50	13.1%
	Design & Printing	15	3.9%
	Manufacture	14	3.7%
	Arts & Entertainment	10	2.6%
	Automotive	10	2.6%
	Agriculture, forestry, and fisheries	8	2.1%
	ICT	8	2.1%
	Others	4	1.0%
	Property	4	1.0%
Position	Owner	299	78.1%
	Manager	79	20.6%
	Executive	11	2.9%
Employees	1-4	316	82.5%
	5-19	58	15.1%
	20-99	15	3.9%
Income per year (IDR)	< 300 million	338	86.9%
	300 million - 2.5 billion	42	10.8%
	> 2.5 billion	9	2.3%

4.2 Model Analysis

The measurement model is assessed to ensure adequate quality of the measurement construction. The assessment is in the form of factor analysis, measurement of indicator reliability, and discriminant validity. Each assessment has a recommended minimum value. For outer loading items, the minimum is 0.7, the internal consistency of Cronbach's Alpha (CA) is at least

0.7, and the Average Variance Extracted (AVE) is at least 0.5. The results showed that the outer loadings item and CA on each construct were higher than the minimum value. Furthermore, the AVE results for each construct exceed the minimum value, which indicates the validity is fulfilled. The complete results regarding the measurement constructs are shown in Table 2. After assessing the measurement model and evaluating the results, the data analysis continued with the structural model assessment to assess the hypothetical relationship between the construct and the predictions of the conceptual model.

Table 2
Constructs and items measurement results

| Constructs and Items	Outer Loadings	Cronbach's Alpha	CR	AVE
Technology		0.915	0.934	0.704
Perceived usefulness	0.879			
Suitability	0.877			
Complexity	0.871			
Perceived cost	0.714			
Observability	0.842			
Trialability	0.839			
Organization		0.904	0.929	0.723
IT knowledge	0.853			
Financial resources	0.803			
Innovation	0.87			
Management support	0.911			
Process management (SOP)	0.81			
Environment		0.859	0.896	0.685
Competitive pressure	0.805			
Government policies	0.756			
Digital infrastructure	0.878			
Vendor support	0.865			
E-Business Adoption (Use)		0.936	0.947	0.691
Communication needs	0.864			
Consumer management	0.861			
Financial management	0.762			
Human resources management	0.782			
Marketing management	0.902			
Orders and sales	0.86			
Product production	0.813			
Procurement and inventory	0.795			
Value Chain (Benefit)		0.963	0.971	0.706
Goods and raw materials procurement	0.831			
Product distribution	0.866			
Inventory management	0.8			
Product manufacturing planning	0.834			
Product manufacturing efficiency	0.841			
Product manufacturing innovation	0.833			
Product pricing	0.864			
Selection of marketing channels	0.851			
Promotion activity	0.841			
Increased activity sales	0.82			
Branding activity	0.828			
Customer complaint records	0.837			
Customer satisfaction after-sales	0.827			

4.3 Evaluation of the Measurement Model

After running the PLS-SEM algorithm, the evaluation results of the hypothetical relationship and path coefficients between constructs were obtained. This study employed several criteria to assess the hypothesis, including coefficient, t-statistics, and p-values. The coefficient value indicates the link between the variables; if the coefficient value is positive, the relationship between the variables is positive. In this study, the significance level used was 5%, so that in this study, having a 95% confidence level, the t-statistic value was 1.97. If the t-statistic value shows a value > 1.97, the effect between variables is significant. P-Values aim to test the significance of a research result, the p-values that must be obtained so that the hypothesis can be accepted are < 0.5% or < 0.005. If the three criteria are met, then a hypothesis that has been formulated previously can be accepted, and vice versa; if one of the criteria is not met, it means that a hypothesis that has been formulated previously is not accepted. Figure 3 shows the positive effects of the three constructs on e-business adoption: technology, organization, and environment. Overall, the relationship hypothesis in H1-H3 is supported by data emphasizing technological, organizational, and environmental factors as significant predictors of e-business adoption. In this case, all the path coefficients in the construction in the structural model meet this criterion. This result implies the importance of the TOE factor for SMEs. The result shows the importance of developing technology, internal organizational resources, and environmental support as these factors might influence the level of e-business adoption in SMEs.

To further test the model hypotheses, t-statistics were evaluated. The results shown by all constructs are significant. This result is different from several other studies where environmental factors are not enough to encourage SMEs to use e-business (Chatzoglou & Chatzoudes, 2016; Putra & Santoso, 2020). In this study, SMEs in Indonesia have started to get sufficient ecosystem, support, and environmental pressure to implement e-business.

Table 3
Structural path

Hypotheses	Path	Coefficient	T-statistics	P-Values
H1	Technology → E-Business Adoption	0.39	6.629	0
H2	Organization → E-Business Adoption	0.24	3.889	0
H3	Environment → E-Business Adoption	0.213	3.388	0.001
H4	E-Business Adoption → Value Chain	0.82	23.242	0
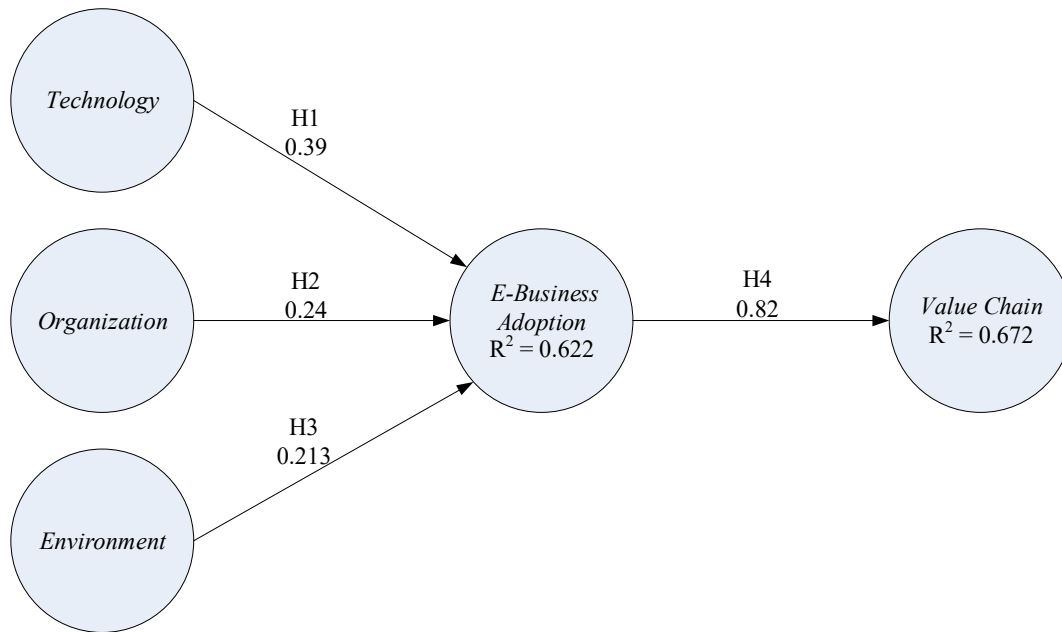
Fig. 3. Structural model assessment

According to Hair et al. (2011), the minimum value range used for the R^2 value is 0.25, 0.5, and 0.75. These values are described respectively as weak, moderate, and substantial. Based on the PLS-SEM algorithm, the value shows that R^2 for e-business adoption is 0.622. This value indicates that the three TOE factors explain 62.2% of the variance of e-business adoption. This result indicates that the conceptual model is sufficiently predictive capacity in explaining e-business adoption. In addition, the adoption of e-business can lead to an increase in the value chain as indicated by the value chain R^2 of 0.672. As the results show, e-business adoption strongly influences the value chain.

The results generally describe the factors that influence the priority of e-business adoption, starting with technological factors, organizational factors, and then environmental factors. On the other hand, from the perspective of SMEs, good e-business adoption in companies will provide added value to businesses, especially in the value chain. This study's findings are expected to have contributed to the literature to improve e-business adoption and advantages among SMEs.

5. Conclusion

This study provides an overview of the impact of technological, organizational, and environmental factors on the value chain of SMEs in Indonesia. The study results also provide an overview of the role of e-business adoption media. The findings show that SMEs who want to use e-business as a comprehensive must pay attention to TOE factors and develop e-business adoption capabilities in all SME business activities. Another finding shows that the adoption of e-business has a significant effect on the value chain, thereby providing added value for these SMEs. Therefore, SMEs and stakeholders must begin to understand the importance of e-business adoption by increasing knowledge and understanding of technological, organizational, and environmental factors.

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