

Raharjo, Kusdi; Afrianty, Tri Wulida; Prakasa, Yudha

Article

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Suggested Citation: Raharjo, Kusdi; Afrianty, Tri Wulida; Prakasa, Yudha (2024) : Digital literacy and business transformation: social-cognitive learning perspectives in small business enterprises, Cogent Business & Management, ISSN 2331-1975, Taylor & Francis, Abingdon, Vol. 11, Iss. 1, pp. 1-18,
<https://doi.org/10.1080/23311975.2024.2376282>

This Version is available at:

<https://hdl.handle.net/10419/326421>

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To cite this article: Kusdi Raharjo, Tri Wulida Afrianty & Yudha Prakasa (2024) Digital literacy and business transformation: social-cognitive learning perspectives in small business enterprises, Cogent Business & Management, 11:1, 2376282, DOI: [10.1080/23311975.2024.2376282](https://doi.org/10.1080/23311975.2024.2376282)

To link to this article: <https://doi.org/10.1080/23311975.2024.2376282>



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Digital literacy and business transformation: social-cognitive learning perspectives in small business enterprises

Kusdi Raharjo , Tri Wulida Afrianty  and Yudha Prakasa 

Department of Business Administration, Brawijaya University, Malang City, Indonesia

ABSTRACT

Technological disruption and the COVID-19 pandemic have challenged SMEs to adapt to digital consumer behaviour, necessitating digital transformation. This study examines the impact of digital literacy on digital transformation, exploring the antecedent factors shaping digital literacy and the government's role in providing IT infrastructure. A survey method was undertaken for this study with a total sample of 293 small businesses in East Java, Indonesia. This study employed structural equation modeling through PLS-SEM for the data analysis. The research results show that locus of control, need for achievement, and social capital significantly and positively influence digital literacy. Digital literacy has been proven to significantly and positively impact digital business transformation. IT infrastructure does not significantly affect the moderation between digital literacy and digital transformation. The findings of this research will assist in overcoming technology usage challenges faced by SMEs in East Java, particularly those exacerbated by the COVID-19 pandemic. Business actors can leverage the Indonesian government's efforts in business incubation and facilitating access to technology and the internet to enhance their social capital. SMEs should consider joining sectoral organisations or associations to build relationships with other business actors and engage in training and capacity-building initiatives.

ARTICLE HISTORY

Received 3 January 2024
Revised 19 June 2024
Accepted 30 June 2024

KEYWORDS

Digital literacy; business transformation; social cognitive learning; SMEs; technology adoption

REVIEWING EDITOR

Eric Liguori, Florida State University, United States

SUBJECTS

Asian Studies;
Entrepreneurship and Small Business Management;
Management of Technology & Innovation;
Business, Management and Accounting

1. Introduction

Business organisations have been facing an uncertain environment since the outbreak of the COVID-19 pandemic. The business entities that have been most affected by the pandemic are SMEs. A survey by the Asian Development Bank (2020) shows that nearly 49% of the SME sector in Indonesia has temporarily closed, experiencing a sales decrease of more than 30%, and more than 50% of SMEs have temporarily laid off employees. Government policies to control the spread of the COVID-19 virus through physical restrictions on the population have resulted in a slump in various economic activities, except for economic players who can adapt and move to digital platforms Mas'udi and Winanti (2020).

The COVID-19 pandemic has accelerated the technological disruption that has already been a problem for SMEs in Indonesia. These two disruptive changes demand that companies, including SMEs, change their business models. The impact is that business models that previously functioned well are no longer relevant. Social restrictions require companies to change their business processes, many of which use digital technology. Digital transformation has become the key solution to these two simultaneous changes (Mas'udi & Winanti, 2020). Research shows that digital business transformation increases resilience and drives the creation of new business models (Rogers, 1983; Venkatesh & Davis, 1996), new distribution channels, and ways of creating value needed by various customer segments (Rogers, 1983). Digital transformation, in addition to being the right alternative solution to the COVID-19 pandemic and

CONTACT Kusdi Raharjo  Kusdi@ub.ac.id  Department of Business Administration, Brawijaya University, Malang City, Indonesia.

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information technology disruption, also provides other advantages, such as the ability to reach a broader market, including exports. However, the digital transformation of SMEs in Indonesia is still very low, only around 8%. Therefore, this research was conducted to explore the importance of digital transformation for small business actors in Indonesia, and this is because the level of transformation of small business actors in Indonesia is still low.

Two relevant theories explain the level of technology adoption: the technology diffusion theory Rogers (1983) and the technology acceptance model (Davis, 1989). Technology diffusion is carried out by inventors, change agents, or parties interested in disseminating new technology to encourage behavioural change. As a relatively new innovation, diffusion activities regarding digital technology have been massive. However, SME actors' adoption of digital technology in Indonesia is still relatively low. The second theory, the technology acceptance model, can explain this phenomenon. The Technology Acceptance Model (TAM) can predict the acceptance of new technology, including digital technology. Acceptance and adoption of new technology are determined by perceived usefulness and ease of use. This theory was developed based on the Theory of Planned Behavior, where the intention to behave is influenced by perceived behaviour control, social norms, and attitude (Ajzen, 2011; Truxillo et al., 2015). Among these three determinants of behaviour, perceived behaviour control is crucial for SMEs, as they need the necessary competence to adopt digital technology. SMEs, especially small businesses, typically have limited financial capital, simple organisation and management, a high mortality rate, low capacity for knowledge absorption, low employee skills, low investment capability, and limited market (Lekhanya, 2016).

Digital technology has benefitted small businesses, but its adoption is still varied. For micro, small, and medium enterprises [MSME] actors, although they have a positive attitude towards digital technology, limited abilities have become a barrier to its use. This is due to the limitation of their digital literacy. Technology that provides high benefits for the smooth running of businesses but has not been able to be used optimally due to knowledge and skills limitations. Several studies have shown that digital literacy is one of the antecedent factors influencing the speed of digital transformation (Cetindamar et al., 2024; Kulathunga et al., 2020; Okundaye et al., 2019; Priyono et al., 2020; Zhang et al., 2022). The level of information technology literacy reflects a person's competence in the digital field. The digital literacy of MSME actors is still very limited (Erlanitasari et al., 2020). This is reflected in the ability of MSME actors to carry out marketing activities. As many as 36% of MSMEs in Indonesia are still engaged in conventional marketing, while 37% of MSMEs only have basic online marketing capacities such as access to computers and broadband. The remaining 18% of MSMEs have medium-level online capacities, such as using websites and social media. Only 8% have advanced digital marketing capacities. This means that the ability of MSMEs to utilise digital technology is still low. In contrast, the ability to undergo digital transformation is an essential requirement that must be mastered by MSMEs in order to adapt to the environmental uncertainties caused by the COVID-19 pandemic (Priyono et al., 2020). In other words, digital literacy is a problem for small businesses to undergo digital transformation.

The level of digital literacy is an outcome of a learning process. The success of a learning process is determined by individuals' internal factors, such as locus of control and motivation for achievement, and external factors, such as social capital (networks possessed). Locus of control affects the length of learning time Bodill and Roberts (2013), entrepreneurial intention Córcoles-Muñoz et al. (2019), and self-efficacy (McGee & McGee, 2016). Other studies have revealed that locus of control, self-efficacy, and need for achievement are antecedent factors determining the progress of MSME businesses (Pramono et al., 2021). Individuals with high achievement motivation tend to have moderate risk liking, forward and dynamic orientation, strong work resilience, confidence in performing tasks to achieve goals, time discipline, responsibility, and always learning from their own experiences and others.

Meanwhile, external factors such as social capital have also been shown to encourage MSME actors to improve their digital literacy. Findings from Priyono et al. (2020) have shown that limitations in the digital literacy of individual MSME actors can be improved by strengthening the social capital ecosystem within the MSME environment. It can be concluded that individuals' internal and external characteristics are inseparable in improving digital literacy. Furthermore, studies on internal and external factors in increasing SMEs' digital literacy in Indonesia have not been found so far. Based on these factors, this

study aims to examine the effect of Digital Literacy on Digital Transformation by exploring antecedent factors that shape digital literacy and the role of the government in providing IT infrastructure.

2. Theoretical background and hypotheses development

2.1. Theoretical background

2.1.1. Social cognitive theory

The Social Cognitive Theory (SCT) was developed by Bandura (1986). Wang et al. (2019) state that there is mutual causation in this SCT model. In this reciprocal causality model, personal internal factors such as cognitive, affective, and biological events, behaviour patterns, and environmental influences are interactive determinants that influence each other in two directions (Wang et al., 2019). In the SCT Bandura (1986), which is the development of social learning theory (Bandura, 1971), individual personal and external characteristics are believed to be two important factors that greatly determine the outcome of the learning process. Personal characteristics include the perspective and motivation possessed by individuals. In contrast, external characteristics that are believed to influence the outcome of a learning process are social interactions carried out by individuals with other individuals or activities and collaboration within a community of the individual concerned (Lee & Lee, 2018).

Specifically, social cognitive theory explains that the learning process occurs in a social context where dynamic and reciprocal interactions occur between individual personal factors, the environment, and their behaviour (Bandura, 1986). One of the basic principles of social cognitive theory is that individuals will develop or adjust their judgments and opinions about something through observation and by learning from the experiences of other people in their environment, in addition to through the individual's direct experience (Bandura, 1986, 2001; Stegmann et al., 2012). Social cognitive theory emphasises our ability to learn without direct experience. Based on research from Yilmaz (2011), according to cognitive learning theory, learning that occurs in individuals (one of which can produce digital literacy) is a cognitive process influenced by individual internal and external factors. Therefore, social cognitive theory is relevant to this research because digital literacy is one of the results of learning, and the learning process is obtained from external factors such as social capital and internal factors, namely locus of control and need for achievement. Specifically, social cognitive theory explains that the learning process occurs in a social context where dynamic and reciprocal interactions occur between individual personal factors, the environment, and their behaviour (Bandura, 1986).

2.1.2. Technology acceptance model

TAM (technology acceptance model), created by Davis (1989), is a hypothesis that may be used to consider how new technologies are accepted. The simplicity of use and the advantages of renewable technology for users are the two factors described in this theory that determine whether a technology will be adopted, and both can affect people's behavioural intentions (Chen & Aklikokou, 2020). Consequently, when a new technology emerges due to human ingenuity, other people who will utilise it will prioritize it. The same is true for East Java's micro and small firms, who will consider factors such as convenience and advantages of utilizing technology.

Furthermore, the TAM theory is a development of the theory of planned behaviour, where the intention to behave is influenced by perceived behaviour control, social norms, and attitude (Ajzen, 2011; Truxillo et al., 2015). Of these three behavioural determinants, perceived behaviour control is crucial for MSME actors because they must have competence in that field to adopt digital technology. A positive attitude towards digital technology and conformity with social norms that apply in society is not enough to support the decision to accept and use new technology. MSME actors must have confidence that they can use the technology properly (perceived behaviour control). The latter is highly determined/influenced by the digital literacy level of MSME actors. Understanding of the ease of use of technology and the usefulness of this technology can be obtained by business actors through the learning process as described in social cognitive theory Bandura (1986) and obtained through internal and external micro and small business actors (Yilmaz, 2011).

2.2. Hypotheses development

Literacy is a cognitive component that can be learned (Dinç Aydemir & Aren, 2017). Digital literacy can be defined as an individual's understanding or knowledge of things related to digital technology, which can be acquired through the learning process. From the perspective of social cognitive theory (Bandura, 1986), which is a development of social learning theory Bandura (1971), individuals' personal and external characteristics are believed to be two important factors that determine the outcome of the learning process. Personal characteristics include an individual's perspectives and motivation, while external characteristics believed to influence the outcome of a learning process are social interactions between individuals or activities and collaborations within a community of the individual concerned (Lee & Lee, 2018). Based on cognitive learning theory, the learning that occurs in individuals [which can produce digital literacy] is a cognitive process influenced by internal and external factors (Yilmaz, 2011). Specifically, social cognitive theory explains that the learning process occurs in a social context with dynamic and reciprocal interaction between an individual's personal factors, environment, and behaviour (Bandura, 1986). One of the basic principles of social cognitive theory is that individuals will develop or adjust their judgments and opinions about something through observation and learning from the experiences of others in their environment, in addition to their own direct experiences (Bandura, 1986, 2001; Stegmann et al., 2012). Using the perspective of social cognitive theory, this research also examined the influence of individuals' internal and external characteristics on digital literacy, which we identified as an outcome of the learning process in this study. Two internal characteristics of individuals, namely locus of control and need for achievement, will significantly influence digital literacy possessed by small business owners or managers. At the same time, the external characteristic we examine to influence digital literacy in this study is the social capital of small business owners or managers.

Locus of control refers to a person's belief in control over life events. Some people feel personally responsible for things that happen to them. These people are labelled as internal. Others feel that forces outside their control determine their life outcomes, and these people are labelled as external. Most people fall somewhere between these two extremes, forming a continuous distribution of locus of control beliefs. Locus of control is considered a relatively stable dispositional characteristic, although it can be certified through experience (Craig et al., 1984; Phares, 1976; Reid, 1985).

Locus of control is defined by Rotter (1990) as an individual's perception of their ability to control specific actions or events that affect their lives. Locus of control is also related to an individual's belief about whether social outcomes (i.e. everything that happens to or is obtained by the individual) are caused by their efforts or are the result of luck, chance, fate, or the intervention of others. Individuals who connect social outcomes with their efforts are categorised as having an internal locus of control. On the other hand, individuals who associate social outcomes with factors such as chance and the like are believed to have an external locus of control (Gupta et al., 2018). If connected with social cognitive theory, locus of control is one of the individual's factors that can influence their behaviour in learning so that the learning outcomes will be different between individuals with an internal and external locus of control. Individuals with an internal locus of control will make more diligent and serious efforts to develop their digital literacy, and vice versa for individuals with an external locus of control. In other words, it can be said that the locus of control influences the digital literacy acquired through the learning process.

The need for achievement is one of the strong psychological motivators for individual actions. Based on McClelland's theory of the need for achievement, it is assumed that individuals with a high need/motivation for achievement will also have a high desire for success. Need for achievement, abbreviated as NACH, is a motivation to excel and is referred to as a need to achieve. Individuals are motivated to achieve something when they feel challenged and realise that the results they will obtain reflect their success or failure. The need for achievement has been studied in business and educational settings. McClelland concluded that the level of need for achievement demonstrated by leaders in a business directly affects the economic growth of a business (Atkinson, 1964; Harackiewicz et al., 1997; McClelland, 1961). Similar to the locus of control, if related to social cognitive theory, the need for achievement is also included in the individual's factor that strongly influences digital literacy. We believe that individuals

with a high need for achievement will make more diligent and serious efforts to develop their digital literacy, and vice versa for individuals with a low need for achievement. In other words, it can be said that the need for achievement/motivation for achievement influences the digital literacy acquired through the learning process.

The World Bank defines social capital as the groups, networks, norms, and trust individuals possess to be utilised for productive purposes. Social capital generates opportunities for business actors to obtain economic benefits through social and economic interactions (Svendson, 2003). Social capital is considered the sacrifice of an individual's time, energy, and thoughts designed to improve cooperative relationships with others (Oxoby, 2009). Furthermore, Felício et al. (2014) believed that social capital relates to solidarity, self-confidence, and social relationships involving family, friends, and colleagues in business operations. Moreover, the social exchange theory of George C. Homans forms the basis of the social capital theory. Social exchange theory helps the dynamics of one individual exchanging with another voluntarily, providing benefits to others in a reciprocal relationship. This means that social capital is the ability of society to establish relationships and cooperation based on shared goals and plans. Social capital is needed in micro, small, and medium-sized enterprises (MSMEs) to create relationships between consumers and stakeholders. Social capital provides a source of energy for a group to face business challenges. In this study, social capital is an external factor contributing to the development of digital literacy possessed by business actors, including small businesses. This is in line with one of the basic principles of the social cognitive theory that individuals will form views, opinions, and understandings of something through observation and learning from the experiences of others in their environment, in addition to the direct experiences of the individual concerned (Bandura, 1986, 2001; Stegmann et al., 2012). Therefore, based on the explanation of the relationship between Locus of Control, Need for Achievement, Social Capital, and their relationship with Digital Literacy, the hypotheses developed in this research proposal are:

Hypothesis 1: 'The Locus of Control held by small business owners/managers has a significant influence on the digital literacy of small business owners/managers.'

Hypothesis 2: 'The Need for Achievement held by small business owners/managers has a significant influence on the digital literacy of small business owners/managers.'

Hypothesis 3: 'The Social Capital held by small business owners/managers has a significant influence on the digital literacy of small business owners/managers.'

As explained in the background section, digital transformation is necessary for business enterprises, including small-scale businesses, in the current digital era and driven by the COVID-19 pandemic. Digitisation is the implementation of IT or technology to change existing business processes. For example, new online or mobile communication channels can be created that allow all customers to connect with the company, easily changing the company's interaction with customers who use traditional methods (Ramaswamy & Ozcan, 2016). Information technology is the main driver for capturing new business opportunities by changing existing business processes such as communication, distribution, and business relationship management (Baraldi & Nadin, 2006; Leviäkangas, 2016; Ramaswamy & Ozcan, 2016; Van Doorn et al., 2010). Furthermore, Verhoef et al. (2021) define digital transformation as how companies use digital technology to develop new digital business models that help create and adapt more value for the company. The measurement of digital transformation in this study is consistent with the research conducted by (Lin et al., 2020; Venkatesh et al., 2003; Yu et al., 2018), first, the company intends to continue using e-business. Second, the company expects to continue using e-business. Third, the company plans to continue using e-business. Digital transformation can be defined as 'the change in the way a company uses digital technology to develop new digital business models to create added value that is suitable for the company' (Verhoef et al., 2021). In other words, digital transformation is a process of utilizing digital technology to create or modify existing business processes to meet the changing needs of the business and market. To successfully carry out and manage digital transformation, adequate and relevant capabilities are required. Information technology can help improve organizational performance. However, to utilize technology, organizations must have access to technology and possess digital literacy. Digital literacy is one of the most important skills, especially in today's increasingly competitive business environment (Mahapatra & Lai, 2005).

According to Alshare et al. (2004), previous researchers have no agreement regarding the definition and measurement methods of digital literacy. Some researchers define digital literacy as computer ownership and look at the time spent in front of a computer. Meanwhile, Ezziane (2007) defines digital literacy as a person's ability to understand the characteristics of computers and to operate and utilize information technology to support their goals. In this study, the Ministry of Communication and Information developed the digital literacy measurement tool to establish the digital literacy index, which includes information and data literacy, critical thinking, communication skills, ethics in technology, personal security, device security, and technology proficiency (Doni, 2022; UNESCO, 2018). In this research, we believe that digital literacy possessed by small businesses is one of the determining capabilities for their success in carrying out and managing digital transformation. The importance of digital literacy for the success of a company's digital transformation, including small businesses, can be explained using dynamic capability theory. Dynamic capability theory suggests that a company's success is largely driven by its ability to adapt to a changing environment to create value for the company, thereby achieving a competitive advantage. Teece et al. (1997) defines dynamic capability as a part of the competence/ability that enables a company to produce new products or services to respond quickly to a changing environment. In this research, we consider digital literacy as one of the forms of dynamic capability required for the success of an organisation in carrying out and managing its digital transformation. Several studies have shown that digital literacy is one of the antecedent factors influencing the speed of digital transformation (Cetindamar et al., 2024; Kulathunga et al., 2020; Okundaye et al., 2019; Priyono et al., 2020; Zhang et al., 2022). Therefore, based on dynamic capability theory and previous research on digital literacy as one of the antecedent factors of digital transformation, the hypothesis that we developed is:

Hypothesis 4: 'Digital literacy significantly influences the digital transformation of small businesses.'

Regarding digital literacy, which significantly influences the success of digital transformation, the availability of adequate digital infrastructure in a business's operational area, including small-scale businesses, also affects the level of success of the digital transformation. In this study, we believe that the better the quality of digital infrastructure accessible to small businesses, the stronger the influence of digital literacy on the success of the digital transformation they undertake. Conversely, suppose the quality of digital infrastructure accessible to small businesses is low. In that case, the influence of digital literacy on the success of the digital transformation they undertake will also be lower. Information technology is a major investment for companies, with companies typically spending over 4.2% of their annual revenue on IT, and typically around 55% of a company's IT budget is on infrastructure. Infrastructure capabilities are difficult to create because they are a complex combination of technology, processes, and human assets, and competitors need a long lead time to imitate them, so IT infrastructure can become a source of competitive advantage. The demands of new business initiatives are immediate, but building an infrastructure that enables adaptable strategies often takes a lot of time and expertise. The identification process is not an easy task. In conclusion, IT infrastructure is a technological facility that serves as a company's resource in creating competitiveness and competitive advantage (Weill et al., 2002). Therefore, the hypothesis developed is:

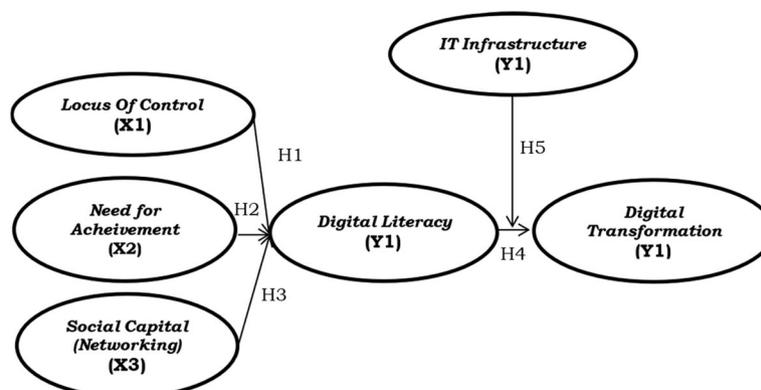


Figure 1. Research model.

Hypothesis 5: 'The influence of digital literacy on small business digital transformation will be moderated by digital infrastructure.'

Based on our hypothesis development, the hypothesis model in this study is shown in [Figure 1](#).

3. Research methodology

3.1. Ethical approval

This research has undergone a review process conducted by the ethics committee within the Department of Business Administration through the Research and Community Service Agency, Brawijaya University. It has been assigned the reference number 01053/UN10.F00301/B/PG/2022, indicating compliance with ethical procedures in accordance with the Declaration of Helsinki.

3.2. Participant and procedure

The study has also fulfilled the consent form requirements included in the questionnaire (Gform online) in writing and has obtained approval from the respondents.

3.3. Sampling and data collection

The total number of small businesses in East Java in the non-agricultural sector is 700 units, hereinafter referred to as the population. We applied non-probability sampling with a convenience sampling technique. From 700 questionnaires distributed through online and offline questionnaire distribution to small business actors in 38 districts/cities in East Java, 304 respondents returned the questionnaires to the researchers, of which only 293 responses can be included in the data analysis. Data analysis was performed using Partial Least Square with variance-based SEM with the help of SmartPLS software.

3.4. Measurement

A measurement instrument was adapted from the available literature to verify and validate the proposed model and test the research hypotheses. A five-point Likert scale was used, ranging from [strongly agree] to [strongly disagree]. The Locus of Control measurement was adapted from Toti et al. (2021); The Need for Achievement measurement from Saif and Ghania (2020). The measurement of the Social Capital variable was adapted from Huang and Liu (2019). Furthermore, we measure Digital Literacy using the instrument from the Ministry of Communication and Information of the Republic of Indonesia (2020). For the IT Infrastructure variable, we adapted the measurement from Barykin et al. (2020), Purbasari et al. (2021), Sataalkina and Steiner (2020), Schiavone et al. (2021), Subramaniam et al. (2021). The last variable, Digital Business Transformation, was adapted from Gupta and Bose (2022).

3.5. Data analysis

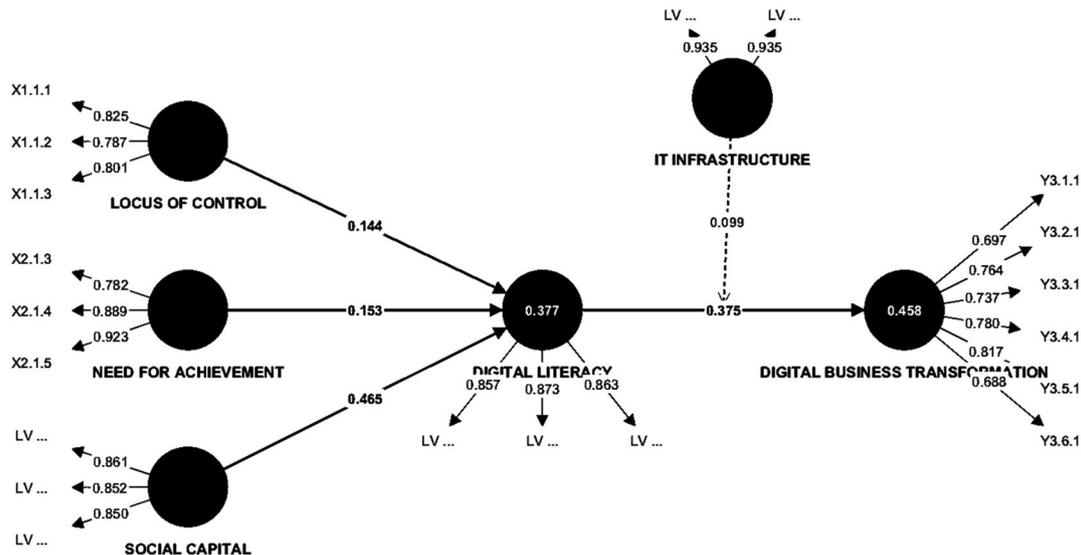
In this study, we are utilising a quantitative technique to answer questions of an explanatory nature. It is essential to evaluate hypotheses using a statistical method, specifically the PLS-SEM technique. This approach is reliable and has a lot of potential for academics studying entrepreneurship. According to Hair and Hult (2021), the PLS-SEM technique is more robust, has fewer identification issues, works with smaller and larger samples, and incorporates both formative and reflective constructs. We are using the SmartPLS software to implement the PLS-SEM in this work.

4. Result and analysis

Data processing was carried out using PLS-SEM-based method, using SmartPLS software version 4.0. The steps undertaken in the Partial Least Square (PLS) method include designing the outer model, designing the inner model, and testing the hypotheses.

Table 1. Demography characteristics.

Demographic		Frequency	Percent (%)
Gender	Male	102	35%
	Female	191	65
Age	17 s/d 23	18	6.14
	24 s/d 30	41	13.99
	31 s/d 37	52	17.75
	38 s/d 44	65	22.18
	45/d 51	82	27.99
	52 s/d 58	28	9.56
	>60	7	2.39
Number of employees	1 s/d 4	229	78
	5 s/d 19	64	22

**Figure 2.** Measurement of the outer model.

4.1. Demographic characteristics

The largest group of respondents (i.e. small business owners) was aged between 45 and 51, representing 27.99% of the sample. The largest sector was the food sector, at 32.8% who participated in this study. And then it was 29.4% in the food and beverage sector, and the lowest was in the Groceries, Fishery, and Art and Culture sectors at 0.3%. It was found that the majority of the respondents were female, with a total number of 191 (i.e. about 65%) (Table 1). This is interesting as it indicates that most owners are women. According to Saudah and Djatmikowati (2018), women set up a business to support the economic needs of their families

4.2. Measurement model

A research model's fit is evaluated in two steps, the first involves evaluating the outer model using the three criteria of composite reliability, convergent validity, and discriminant validity. The criteria were established in accordance with the technical recommendations from SmartPLS version 4.0 (see Figure 2 for an evaluation of the outer model). This study employs the use of several variables relevant: Locus of Control (X1), Need for Achievement (X2), Social Capital (X3), Digital Literacy (Y1), IT Infrastructure (Y2), and Digital Business Transformation (Y3). The measurement of these variables is presented in Figure 2.

The evaluation of the research model is carried out to meet the criteria of good constructs where the outer loading value >0.7 ; AVE value >0.5 ; composite reliability value >0.7 ; Cronbach's Alpha value >0.7 ; and HTMT value <0.9 [51]. Based on the table above, the results show that the outer loading value is more than 0.7, so this value meets the construct criteria, and the research results are valid (Hair & Hult, 2021).

Table 2. The statistical result of composite reliability, Cronbach's alpha and AVE.

Variable	AVE	Composite reliability	Cronbach's alpha
Locus of control	0.648	0.734	0.729
Need for achievement	0.751	0.872	0.835
Social capital	0.729	0.823	0.816
Digital literacy	0.747	0.833	0.831
IT infrastructure	0.874	0.856	0.856
Digital business transformation	0.560	0.846	0.842

Table 3. The R -square (R^2) value estimate.

Variable	R -square
Digital business transformation	0.458
Digital literacy	0.377

Table 4. The Q -square (Q^2) value estimate.

Variables	Q^2 (=1-SSE/SSO)
Digital literacy	0.413
Digital business transformation	0.351

The average variance extracted (AVE) test in this study was declared valid in terms of measuring model validity, which is comprised of convergent validity and discriminant validity. The value of cross-loadings of all items from the used constructs serves as evidence for this. Therefore, based on the AVE value, it can be said that the evaluation of the measurement model has strong discriminant validity (Table 2).

4.3. Structural model

The inner Model seeks to examine the relationship between latent constructs and explore the relationship between the constructs in the research model. There are several tests for the inner model/structural model, such as R -square, Q -square, path coefficient test, and hypotheses tests. Testing of the structural model is done by examining the value of R -square (R^2) and Q -square (Q^2).

The structural model was adjusted by evaluating R squared (R^2) and path coefficient analysis. R squared (R^2) is the proportion of variation in the dependent variable that can be predicted from the independent variable (Hair et al., 2021). Table 3 shows the R^2 (R -squared value), also known as the coefficient of determination, and the goodness of fit measure. The R^2 (R -squared) reading analyses the collective value of the variance in percentage terms treating the change in the dependent variable due to the independent variable. Therefore, Table 3 shows that digital literacy's R -squared (R^2) is 0.371. This explains that a total change of 37.1% in digital literacy is experienced due to the influence of small businesses' internal and external learning theory. R -squared (R^2) digital business transformation is 0.453, explaining that the 45.3% possibility of digital business transformation in micro and small businesses is due to digital literacy.

According to Hair and Hult (2021), the function of calculating Q^2 or Q -Square is to measure how well the Path Model can predict the values of the original research data. 2 (Two) approaches can be used in calculating Q -Square, namely cross-validated redundancy and cross-validated commonality. However, (Hair & Hult, 2021) suggest using cross-validated redundancy to measure Q -Square, because it includes a structural model, a key element of the path model to predict omitted data points. Furthermore, according to Hair and Hult (2021), if the Q^2 value is greater than 0, the model has predictive relevance for certain endogenous constructs. Conversely, if the value is 0 or below, it indicates a lack of predictive relevance. As relative measures of predictive relevance, values of 0.02, 0.15, and 0.35 indicate that exogenous constructs have small, moderate, or large predictive relevance for a given endogenous construct, respectively.

As seen in Table 4, the Q -square measurement value for the digital literacy variable is 0.413, therefore $Q^2=0.413>0$. It can be concluded that X_1 , X_2 , and X_3 have predictive relevance for digital literacy. It is known that the value of $Q^2=0.413$ is greater than 0.35, so it is concluded that the relevance is classified as large. The Q^2 value for the digital business transformation variable is 0.351, therefore $Q^2=0.351>0$, it is concluded that X_1 , X_2 , and X_3 have predictive relevance for digital business transformation. The value of $Q^2=0.351$, which is greater than 0.25, so it can be concluded that the relevance of the prediction is large.

Table 5. HTMT ratio (heterotrait and monotrait).

	Digital business transformation	Digital literacy	IT infrastructure	Locus of control	Need for achievement	Social capital	Moderating effect IT infrastructure
Digital business transformation							
Digital literacy	0.713						
IT infrastructure	0.691	0.705					
Locus of control	0.438	0.439	0.320				
Need for achievement	0.475	0.463	0.376	0.386			
Social capital	0.624	0.692	0.565	0.424	0.497		
Moderating effect IT infrastructure	0.249	0.168	0.155	0.217	0.184	0.258	

Table 6. Hypotheses test results.

Relationship between variables	Direct effect [β]	Moderating effect (β)	T statistics [[O/STDEV]	p-Values	Summary
Locus of control → Digital literacy	0.144		2.693	0.007	Accepted
Need for ACHIEVEMENT → Digital Literacy	0.153		2.811	0.005	Accepted
Social capital → Digital literacy	0.465		7.880	0.000	Accepted
Digital literacy → Digital business transformation	0.375		5.340	0.000	Accepted
Digital literacy → IT infrastructure → Digital transformation		0.099	1.898	0.058	Rejected

4.4. Discriminant validity

According to Garson (2016), discriminant validity is also evaluated through the Heterotrait-Monotrait ratio (HTMT). An HTMT ratio value of less than 0.85 or less than 0.90 is valid (Henseler et al., 2014). The Table 5 shows the value of the HTMT ratio, it can be seen that the distribution of values is less than 0.85. Through the HTMT ratio criteria, it can be concluded that discriminant validity is fulfilled.

4.5. Hypotheses tests

Hypotheses testing is conducted by analyzing the t-statistic value generated from the PLS output. The test value criteria are based on the Alpha (α) of 5%. Also, the PLS bootstrap method is conducted to test the hypotheses (H1–H5). This test is intended to minimize the problem of abnormal research data. The result by using bootstrap is depicted in Table 6.

Based on the analysis, eight hypotheses' pertaining to this study were determined. Nonetheless, one hypothesis was rejected. The analyses indicated that seven relationships were found to be statistically significant. Each of the hypothesis' test is illustrated as follows:

1. H1 examined the relationship between the locus of control with digital literacy with a path coefficient value of 0.144 (sig, p -value < 0.001). Therefore, the hypothesis locus of control has a positive effect on digital literacy is accepted.
2. H2 examined the relationship between the need for achievement with digital literacy, it has a path coefficient value of 0.153 (sig, p -value < 0.001). Hence, H2 posits that the need for achievement has a positive effect on digital literacy is accepted.
3. H3 examined the relationship between social capital with digital literacy, it has a path coefficient value of 0.465 (sig, p -value < 0.001). Hence, H3 posits that social capital has a positive effect on digital literacy is accepted.
4. H4 explored the relationship between digital literacy and digital business transformation with a path coefficient of 0.375 (sig, p -value < 0.001). Based on the result, H4, which posits that digital literacy significantly affects digital business transformation, is accepted.
5. H5 explores the relationship between digital literacy and digital business transformation moderated by IT Infrastructure with a path coefficient value of 0.099 (sig, p -value > 0.1). The results of this research show that IT Infrastructure does not strengthen the relationship between digital literacy and digital business transformation, is rejected.

5. Discussion and implication

5.1. Discussion

The influence of locus of control on digital literacy was found to have a coefficient of 0.144 and a p -value of 0.007, which means these two variables have a positive and significant relationship. The positive coefficient of 14.4% indicates that the better the locus of the control value, the more digital literacy will increase by the related coefficient. The result regarding the positive relationship between Locus of Control and Digital Literacy is in line with the basic theory where Locus of control is defined by Rotter (1990) as an individual's perception of their ability to control certain actions or events that affect their lives. Locus of control is also related to an individual's belief about whether social outcomes (i.e. everything that happens to the individual or everything that is obtained) are caused by their own efforts or are the result of luck, chance, fate, or the intervention of others. Individuals who link social outcomes with their own efforts are categorised as having an internal locus of control. Therefore, if the small business actors have an excellent internal locus of control, they can be diligent and sincere in enhancing their digital literacy, including the knowledge, skills, and attitudes necessary to explore new technological environments and flexibly solve technical problems (Lei et al., 2024). Conversely, according to social cognitive theory (Bandura, 1986), locus of control is a personal factor that can influence an individual's behaviour in learning. Therefore, the learning outcomes will vary between individuals with an internal locus of control. Thus, the results of this research align with studies conducted by Amofah et al. (2020), Lingappa et al. (2020), Shimoli et al. (2020), Yilmaz (2011).

The influence of the need for achievement on digital literacy was found to have a coefficient of 0.153 and a p -value <0.05 , which is 0.005, indicating that these two variables have a positive and significant relationship. The positive coefficient of 15.3% indicates that the higher the need for achievement, the better the digital literacy will increase by the related coefficient. The results regarding the positive relationship between the Need for Achievement variable and digital literacy are consistent with the basic theory developed by David McClelland, in which individuals with high motivation for achievement will also have a strong desire for success. Therefore, this study shows that business actors in East Java are highly motivated to achieve their businesses, and as a result, they have improved their digital literacy earnestly. This study's results support theoretical aspects and corroborate the research conducted by Abimanyu et al. (2023), which found that the need for achievement has a significantly positive influence. Furthermore, the research by Anistyasari et al. (2024) indicates that intrinsic factors also play an important role in enhancing digital literacy. Therefore, the study by Sariwulan et al. (2020) on digital literacy demonstrates that it can improve business performance for entrepreneurs. This aligns with the findings of Yilmaz (2011), which highlight that the learning process involves internal and external factors. Consequently, when an entrepreneur's desire to achieve is high, their level of digital literacy increases accordingly. Furthermore, research conducted by Yilmaz (2011) indicates that the learning process or digital learning among internal business actors positively impacts their acquisition of digital literacy. Additionally, digital literacy is an outcome of this learning process. (Audrin & Audrin, 2022).

The influence of social capital on digital literacy was found to have a coefficient of 0.458 and a p -value <0.05 , which means that both variables have a positive and significant relationship. This positive coefficient of 45.8% indicates that the better the social capital value, the more digital literacy will increase by the related coefficient. The results regarding the positive relationship between the Social Capital variable and Digital Literacy are consistent with a study conducted by Yilmaz and O'Connor (2012) that social capital is one of the external factors that can influence digital literacy when associated with cognitive learning theory. This is in line with one of the basic principles of social cognitive theory, namely that individuals will form views, opinions, and understanding of something through observation and learning from the experiences of others around them and through their own direct experiences (Bandura, 1986, 2001; Stegmann et al., 2012). The findings of this study are consistent with the research conducted by Prayitno et al. (2022) and Rosyadi (2018), which shows that social capital in online community life generates information that can enhance interactivity and, particularly, knowledge exchange development. Since social relationships can increase knowledge from various sources, social relations within digital communities significantly improve digital literacy. This is important not only for identifying various problems faced (and seeking alternative solutions)

but also for creating and leveraging opportunities through information technology. Furthermore, Lee et al. (2023) research states that social capital and digital literacy can help a social group interact and gather information. Therefore, Tambunan (2019) suggests that in the context of SMEs in Indonesia, there is still a lack of intangible assets, even though knowledge is an intangible asset (Buonomo et al., 2020). Thus, these findings can motivate entrepreneurs to gather their digital knowledge.

The influence of digital literacy on digital business transformation was found to have a coefficient of 0.465 and a p -value <0.05 , which means that both variables have a positive and significant relationship. The positive coefficient of 46.5% indicates that the better the knowledge acquisition, the higher the increase in digital literacy associated with the coefficient. This study's results align with previous studies where several studies have shown that digital is one of the antecedent factors that affect the speed of digital transformation (Kulathunga et al., 2020; Okundaye et al., 2019). The results regarding the positive relationship between Digital Literacy and Digital Business Transformation variables in this study show that Digital Literacy is the key to success for Micro and Small Enterprises in carrying out Digital Business Transformation so that they can achieve a competitive advantage and also improve their performance after adopting technology. According to research conducted by Yilmaz (2011), digital literacy is an antecedent factor in digital transformation. Additionally, intuitive skills are essential for entrepreneurs in navigating the digital era (Aujirapongpan et al., 2020). Digital literacy is essential for overcoming obstacles to implementing digital strategies and for faster adaptation to digital transformation (Anatan et al., 2023; Lei et al., 2024; Mas'udi & Winanti, 2020; Sariwulan et al., 2020). Understanding how digital literacy supports digital transformation can lead to developing targeted interventions and support systems for SMEs, helping them become more sustainable and resilient Ben Ghrbeia and Alzubi (2024), and stimulatingly, will enhance small business performance in the digital era (Prakasa & Jumani, 2024). This study also reinforces previous research indicating that digital literacy is a key factor in the comprehensive digital transformation of businesses (Ben Ghrbeia & Alzubi, 2024; Cetindamar et al., 2024; Firmansyah & Saepuloh, 2022; Priyono et al., 2020).

Surprisingly, our study showed that the relationship between Digital Literacy and Digital Business Transformation with IT Infrastructure as a moderating variable was not statistically significant. It means that small business owners can increase digital transformation with excellent digital literacy, even if the IT infrastructure is still inadequate. The government's role is to provide the IT infrastructure to help SMEs in the digital era. Most SMEs cannot invest in their digital infrastructure, considering that digital infrastructure has high investment costs for SMEs (Phan & Dinh, 2023). According to Tornatzky and Klein (1982) Organisational environment Theory identifies three factors supporting technology adoption; one of these factors is the environment. This study highlights the influence of external factors, particularly IT infrastructure provided by the government (Ifinedo, 2012). Nowadays, the survey conducted by Statistics Indonesia (2021) in East Java shows that in urban areas of East Java, 22.97% of households have internet-connected computers, while in rural areas, the number is 8.55%. It reflects that the gap in digital infrastructure is a major barrier between rural and urban areas. A study from Mueller and Jungwirth (2022) shows that SMEs located in agglomerations (urban) areas benefit from increased agility compared to SMEs located in peripheral (rural) areas. IT infrastructure is the most difficult aspect of gaining digital transformation. Achieving digital transformation in IT and infrastructure requires modernising legacy systems, integrating new technologies, and ensuring the digital infrastructure's scalability, security, and resilience (Alojail et al., 2023). It is challenging for the government to accelerate SMEs' competitiveness by providing the IT infrastructure correctly and for the SMEs to ensure that everyone possesses excellent digital literacy.

5.2. Implication

5.2.1. Practical implications

The practical implications of this research for government and stakeholders include the necessity of providing robust IT infrastructure for business actors, particularly in rural areas where such infrastructure remains underdeveloped. Beyond merely supplying IT infrastructure, the government must also foster the development of business actors' potential by creating ecosystems that facilitate social interactions and collaborative networks among them.

5.2.2. Theoretical implications

Theoretically, social cognitive theory remains pertinent to contemporary research, particularly studies on digital transformation and digital literacy. However, the research findings indicate that IT infrastructure is still underutilised, highlighting the necessity for accelerated adaptation to technological advancements.

6. Conclusion and limitation

6.1. Conclusion

The conceptualisation model used in this study is a leading concept and model, namely the Social Cognitive Theory and the Technology Acceptance Model, which is a development of the Theory of Planned Behavior and the Diffusion of Innovation. The results of the study provide support for the theories used. This study shows how these theories and models can interact and shape to create new relationships, linkages, and correlations, thereby helping to better understand the antecedent factors influencing small business actors in digital transformation. In addition, this study seeks to develop a model of support from internal and external factors of small business actors in East Java. The study of the factors in the proposed research model explains internal and external support for small business actors for digital transformation during the COVID-19 pandemic.

The results of this study can be used to build more awareness of the importance of both internal and external factors of business actors in digital business transformation. In other words, the findings in this study are expected to provide an overview of what business actors can do to achieve digital transformation. In this study, the internal factors of business actors are the locus of control and the need for achievement, and the external factors in this study are social capital. The results demonstrated a significant positive effect of internal factors (locus of control and need for achievement) and external factors (social capital). However, the moderating role of IT infrastructure in supporting transformation was not found to be significant. This is attributed to the disorganised state of IT infrastructure in several regions, particularly in district areas of East Java. The government can use this information to improve public facilities and accelerate the digital transformation of small business actors.

6.2. Limitation

This study has several limitations. First, it focuses exclusively on digital transformation and has not yet demonstrated its impact on business performance. Second, its scope is restricted to measuring literacy through the lens of learning motivation.

7. Recommendation for future research

Future research should investigate the potential strong relationship between learning motivation and literacy, which was not addressed in this study. Additionally, it is recommended that the impact of digital transformation on business performance be examined, as it represents a key strategy for achieving optimal business outcomes.

Acknowledgment

The authors thank the research team and the Faculty of Administrative Sciences for providing the opportunity to carry out this research.

Author contributions

Conception: Kusdi Raharjo. Methodology: Kusdi Raharjo, Tri Wulida Afrianty. Data collection: Yudha Prakasa. Interpretation or analysis of data: Kusdi Raharjo, Tri Wulida Afrianty, Yudha Prakasa. Preparation of the manuscript: Kusdi Raharjo, Tri Wulida Afrianty. Revision for important intellectual content: Kusdi Raharjo, Tri Wulida Afrianty, Yudha Prakasa. Supervision: Kusdi Raharjo.

Disclosure statement

No potential conflict of interest was reported by the author(s).

About the authors



Kusdi Raharjo is currently a professor at the Department of Business Administration, Universitas Brawijaya. He completed his Masters in 1992 and Doctoral in 1996 at Universite De Nice - Sophia Antipolis France. His scientific field is HRM and organization. He has authored/co-authored several research papers and also have supervised several Doctoral students.



Tri Wulida Afrianty currently serves as head of the Master of Business Administration study program at Brawijaya University. he completed a master's double degree in 2005 at Gajah Mada University and in 2008 at monas university. and completed his doctoral degree at Curtin University 2003. His areas of expertise are organizational behavior and human resources.



Yudha Prakasa is currently an active lecturer at the Department of Business Administration, Brawijaya University. he completed his undergraduate program at Diponegoro University in 2010. and then completed his master's program at Brawijaya University in 2013. His scientific fields are human resources and Small Business.

Funding

This research was funded by the Brawijaya University through Professor Research [Grant No: 3/UN10.F03.06/PN/2022].

ORCID

Kusdi Raharjo  <http://orcid.org/0000-0003-4319-0644>

Tri Wulida Afrianty  <http://orcid.org/0000-0002-8746-4718>

Yudha Prakasa  <http://orcid.org/0000-0001-8358-8601>

Data availability statement

The authors are available to share the data collected for this purpose upon reasonable request, namely for research purposes. If you are interested in this data, please contact the corresponding author, Kusdi Raharjo.

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Appendix A. The survey instrument

The research construct/measurement scale is provided as follows. The scale of: (1) Locus of Control (X1), Need for Achievement (X2), Social Capital (X3), Digital Literacy (Y1), IT Infrastructure (Y2), and Digital Transformation (Y3). A 5-point interval scale adopted to indicate respondent's agreeableness. The scale response ranges from 'strongly disagree' (1) to 'strongly agree' (5).

Table A1. The survey instrument.

Variables		Item
Locus of control	LOC1	When I make plans, I'm almost certain to make them work
	LOC2	I can pretty much determine what will happen in my life
	LOC3	My life is determined by my own actions
Need for achievement	NFA1	I would rather do now and then.
	NFA2	I like doing.
	NFA3	I like doing very much.
Social capital	SC1	I interactively learn from others
	SC2	I discuss issues with others in a constructive way when things go wrong
	SC3	I usually exchange opinions and ideas during decision making on task issues
	SC4	I regularly exchange information with community
	SC5	I collaborate with different project members to get information about customers' needs
	SC6	I often connect with other projects within the organization to get new product ideas
	SC7	My colleagues are mutually trusting and supportive of change.
	SC8	My organizational climate welcomes the development of new ideas.
Digital literacy	DL1	I am able to search for and access data, information, and digital media content as needed
	DL2	I am able to filter data, information, and content as needed in digital media
	DL3	I am able to direct/manage the search for data, information and content according to my needs in digital media
	DL4	I'm used to finding out if the information I find on websites is true or false
	DL5	I am used to finding out who is the author of information to know its track record/credibility
	DL6	I am used to comparing sources of information to decide if the information is correct
	DL7	I am able to connect my device to the wifi network
	DL8	I am able to download files/applications from the internet
	DL9	I am able to upload (upload) files to the internet
Digital business transformation	DBT1	Novel partnerships for business transformation
	DBT2	Updated business transformation customer relationships for business transformation
	DBT3	Revisions to revenue architecture for business transformation
	DBT4	Novel delivery channels for business transformation
	DBT5	Re-segmentation for business transformation
	DBT6	Revised value proposition from the product/service for business transformation
IT Infrastructure	ITI1	the hardware that we have for business is always updated at least once every 2 (two) years
	ITI2	The hardware we have is adequate for business needs
	ITI3	the speed of the internet network that we have at our place of business is adequate
	ITI4	network/data security on our business computers can be maintained properly
	ITI5	the software available for our business is suitable for knowledge sharing needs
	ITI6	The software available for our business can be accessed through various devices (PC/laptop, cellphone, etc.)
	ITI7	the software we use for business can speed up the time to complete work
	ITI8	In my business environment there is an adequate internet network for cooperation and collaboration with partners
	ITI9	In my business environment there is adequate internet speed for cooperation and collaboration with partners
	ITI10	In my business environment there are sufficient applications for cooperation and collaboration with partners
	ITI11	In my business environment there are adequate alternative communication media for cooperation and collaboration with partners.
	ITI12	In my business environment there are adequate communication media tools for cooperation and collaboration with partners.
	ITI13	In my business environment there is an adequate database for cooperation and collaboration with partners and conducting market analysis