INTERNATIONAL JOURNAL OF APPLIED BUSINESS RESEARCH
2021, VOL. 3, NO. 2, PP. 81–97
https://ijabr.polban.ac.id/ijabr/

Boosting Emerging Technology Adoption in SMEs: A Case Study of the Fashion Industry

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Received 06 April 2021; accepted 04 June 2021

ABSTRACT

Small and medium enterprises (SMEs) provide a significant contribution to the economy and are amongst the target of governments' digital transformation programs. Yet, existing advanced technology adoption models are based upon and targeted for large-scale companies and might not be applicable to the majority of firms in this segment. To address this issue, this study aims to explore ways in boosting the adoption of technologies relevant to SMEs by employing a qualitative research approach through in-depth interviews and focus group discussions with manufacturing SMEs in the fashion industry. Evidence of this study points to several main findings: (1) Leader's competencies, technology literacy, growth mindset, and supportive SME conditions provide positive sentiments towards emerging technologies. However, (2) SMEs must also consider the compatibilities of the technology and evaluate its advantage to the firms prior to adoption. Lastly, (3) stakeholders support and competitors influence are also shown to affect SME leaders, the SME, and the technology itself in terms of supporting technology adoption. This research contributes to the literature by uncovering current condition and needs of SMEs for their technological transformation. For relevant stakeholders, targets of transformation might be achieved if the particular concerns of SMEs have been addressed.

KEYWORDS

Emerging Technologies
Fashion Industry
Small and Medium Enterprises
Technology Adoption

INTRODUCTION

Since the last decade, the adoption of emerging technologies (ET) has been the notorious mission of many governmental bodies around the world (Kearney, 2017; Kagermann, Whalster, & Helbig, 2013). New technological innovations such as the Internet of Things (IoT), big data, and artificial intelligence (AI) have gained prominence as a new mechanism to support business growth. However, ET has been exclusively used by large-scale corporations, and studies show that the level of technological readiness of other firms, especially small and medium enterprises (SMEs), is relatively low (Garzoni et al., 2020).

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In Indonesia, where SMEs dominate 99,9% of the business landscape (Indonesian Ministry of Cooperatives and Small and Medium Enterprises, 2018), ET readiness is only 2.6 out of 4 (Indonesian Ministry of Industry, 2018). A McKinsey survey (2018) also find that only 13% have begun the Industry 4.0 (I4.0) transformation. These findings indicate the low levels of technology adoption amidst global business competition. Therefore, the national government is determined to change the current scenario by initiating the 'Making Indonesia 4.0' plan. Amongst its target is the fashion sector that contributes a quarter of the total manufacturing workforce, is the nation's second-biggest contributor to manufacturing export, and primarily supports the tourism sector (Arsha &Suardika, 2013; Indonesian Ministry of Industry, 2018). Equipping SMEs in this sector with relevant ET will successfully generate improvement in growth.

Indeed, the existing literature indicates that ET can generate positive effects in their establishments. The majority of the research is based upon samples of large companies and the findings show that ET can improve businesses due to better reaction time or increased transparency (Theuer & Pahl, 2016), real-time market trend analytics for new product development (Bertola & Teunissen, 2018), increased productivity (Agarwal, 2016), improved innovation capability (Morrar & Arman, 2017; Kiel et al., 2016), cost reduction (Agarwal, 2016; Preuveneers & Ilie-Zudor, 2017), easy monitoring (Wang et al., 2016), faster product development process (Maier & Brem, 2015), and increased access to global markets (Muller, et al., 2018).

The benefits iterated above will distinctively help SMEs boost performance and remain competitive in the global fashion market. However, it was not until recently that researchers began to explore the barriers of emerging technology adoption (ETA) in SMEs. Besides, most works were quantitative and insufficient to provide a wholesome insight into the current state of small and medium enterprises (m-SMEs). Thus, our paper addresses these concerns by focusing on the SMEs as the unit of analysis and answering the questions: "Why is the emerging technological readiness of SMEs low?" and "How can stakeholders boost the adoption of emerging technologies in SMEs?". Through this study, we aim to explore the current state of technology management and adoption readiness in small and medium firms and understand their attitudes towards the adoption of emerging technologies.

This study thus extends the previous research by Ghobakhloo and Ching (2019) and Kohnová, Papula, and Salajová (2019) by providing new in-depth empirical evidence on technology adoption of ET in SMEs. It is also one of the few that have examined technology management amongst Indonesian SMEs in the fashion industry by adopting the qualitative approach. We have specifically chosen this sector because of its contribution to the gross domestic product (GDP) in several emerging countries, including Indonesia.

LITERATURE REVIEW

Technology Adoption in the Fashion Industry

The fashion industry is an industry that is continuously fraught with uncertainties (Gonzalo et al., 2020). As have been pointed out by Christoper et al. (2004), several characteristics of this business include short life cycles of products, low predictability of market demands, and high uncertainty of trends. Salim and Ernawati (2015) have affirmed this condition in fashion SMEs, which face several similar challenges, such as demand uncertainty and the highly volatile supply chain. Thus, past researchers have discussed the application of Industry 4.0 technologies to enhance several aspects in the fashion industry, such as the improvement of the fashion supply chain or the development of

new fashion products. Especially in the context of the former, calls have been made towards the incorporation of new technologies to provide a solution in managing the increasingly complex fashion supply chain operations (Carmignani & Zammori, 2015; Takamitsu & Gobbo, 2019).

According to Braglia et al. (2019), the existing fashion supply chain has two critical issues: (1) managing real-time communication for planning and scheduling production activities and (2) managing operations and information in the new product development phase. With the growth of demands, fashion leaders are required to work faster and more flexibly. Aside from customers, they also must be able to manage information from vendors that could influence their production decisions (Liu and Ozer, 2010). To address these critical issues, therefore, fashion leaders can alternatively attempt to implement Industry 4.0 technologies in their business process.

Several types of Industry 4.0 technologies have been proposed to be implemented in the fashion industry, including blockchain, big data analytics, the Internet of Things, artificial intelligence, cloud services, and augmented reality (Braglia et al., 2019; Gonzalo et al., 2020). Enabling the integration of all these technologies could suggest the possibility of a smart fashion factory (Bertola and Teunissen, 2019). For example, De Silva et al. (2019) present a new product development process model using augmented and virtual reality technologies to accommodate the co-creation of products. Another study (Kim & Cheeyong, 2015) uses the same mix of technology to create a virtual clothing simulation for customers in a store. This technology can benefit customers by helping them coordinate matching fashion pieces.

Kang et al. (2014) also use augmented reality technology to directly capture consumer perception and values towards fashion consumption. Using webcams on 806 participants during their online shopping experience, the researchers are able to verify their theoretical conceptions regarding the implementation and development of e-shopping applications that use webcams and motion capture technology. However, the future development of such technology to understand consumer behavior raises questions on consumer privacy. Other emerging technologies associated with Industry 4.0 that can be used in the fashion industry are the internet of things and blockchain, which enhance the sustainability of supply chains (Choi & Luo, 2019; Majeed & Rupasinghe, 2017).

The above-mentioned Industry 4.0 solutions are proposed to improve the overall management of businesses in the fashion industry; however, their adoption process has not been discussed in detail for fashion SMEs. It is imperative for researchers and other stakeholders alike to understand the conditions related to the adoption of I4.0 technologies for SMEs, especially for the fashion industry, as the survival of a business is now connected with the adoption of innovation and in embracing digital transformation (Scardovi, 2017).

Technology Adoption of Emerging Technologies

The concept of technology adoption (TA) has been well-established in the management literature. Technology adoption models identify specific variables associated with establishing general acceptance of a particular technology. The key theoretical bases of TA can be divided into two: individual-level and firm-level.

For the former, the theoretical bases include the Theory of Reasonable Action (TRA) (Fishbein and Ajzen, 1975) and the Theory of Planned Behavior (TPB) (Ajzen, 1985, 1991). Several scales and conceptual models have also been proposed to explain the acceptance of new technologies and their intention to use. Some of the most cited in the literature are: Technology Acceptance Model (TAM) of Davis, Bogozzi, and Warshaw, (1989), Technology Acceptance Model 2 (TAM2) of Venkatesh and Davis (2000), Unified Theory of Acceptance and Use of Technology (UTAUT) of Venkatesh, Morris, Davis, and Davis (2003), and Technology Acceptance Model 3 (TAM3) of Venkatesh and Bala (2008).

While these theoretical models focus upon individual-level factors that determine technology adoption, they do not fit into the current research objective-which is to understand firm-level determinants. Hence, the focus of the theoretical bases of technology adoption reviewed in this paper is at the firm-level, such as the theory of Diffusion of Innovation (DOI) (Rogers, 1962; 1995) and the Technology-Organizational-Environment (TOE) (Tornatzky & Fleischer, 1990).

The DOI is one of the pioneering theories by Everett Rogers that has influenced many other theories and models in the field of technology adoption. Rogers finds that the innovation adoption process does not happen simultaneously in a social system, in such that there will be individuals who are more open to the adoption of innovation than others. This discovery propels him to propose the 'S-shaped' adoption curve which becomes widely refer to in the topic of innovation research. The innovation adoption curve denotes different aptness in the population, which can be broken down into five segments: the innovators, early adopters, early majority, late majority, and laggards. Furthermore, Rogers (1995) discovers that individual characteristics, organizational characteristics, and system openness determine the degree of willingness of an organization to adopt an innovation.

Another well-cited theory in the field of TA is the technology-organizational-environment (TOE) model by Depietro, Wiarda, and Fleischer in Tornatzky & Fleischer (1990). The theory states that the technology adoption of a firm is influenced by technological, organizational, and environmental determinants (as can be seen in Figure 1). The TOE framework differs from DOI in that it considers the environmental context. This category is a vital component to the organizational context since it either provides support or becomes a barrier for an organization to adopt a technology. Nevertheless, while an abundant number of researchers have investigated technology adoption using the TOE framework, they have been mainly concentrated on the investigation of large enterprises.

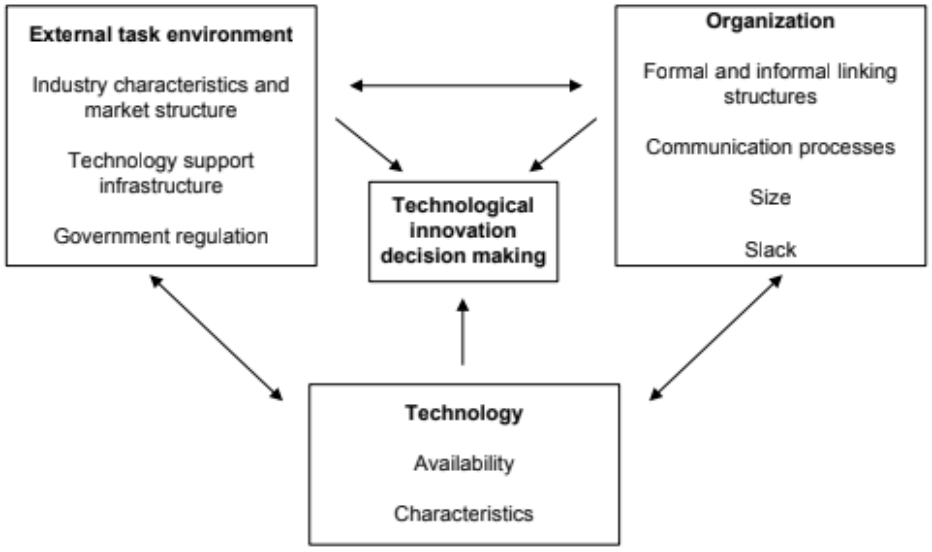

Figure 1. TOE Framework (Tornatzky and Flesicher, 1990)

With the emergence of novel technologies relating to I4.0, emerging technology adoption becomes a novel research area of relevance and interest. The technologies today differ from others as they can be autonomous and require minimal human interaction (Frank et al., 2019; Schwab, 2016). As such, the adoption process of these technologies dramatically differs from the previous ones.

Our previous observation discovered several central themes in the recently published articles of ETA. The first pertains to the industry being studied. Most of them are from the automotive, health, and telecom sectors. However, it is interesting to note that these studies focus on industries in developed countries.

Besides, we found that research on ETA focuses more on implementing technology in large-scale firms. Results of such ETA have been shown to benefit companies, such as increasing product quality and making manufacturing processes more efficient (Tortorella & Fettermann, 2018). It is also associated with back shoring or reshoring, in which companies withdraw their manufacturing operations overseas back to their original countries (Ancarini et al., 2019). The 2019 Fashion Industry Report (McKinsey, 2018) confirms that the reshoring of operations in the fashion industry is due to the implementation of ET, which significantly reduces costs in production.

One of the earliest journal articles of I4.0 technology adoption was in 2016 of the General Electric company. Following this research, most have discussed ETA through the lens of multinational or large corporations. For example, in the perspective of the multinational company, Ajmera (2019) finds that financial capabilities and top management support, as well as human capital capabilities (Agarwal, 2019) influence I4.0 technology adoption.

Lastly, we observed that the technology-organization-environment (TOE) framework (Depietro, Wiarda, & Fleischer, M. in Tornatzky & Fleischer, 1990) is most extensively used by researchers who study ETA. The framework is considered generic and, as such, making it highly adaptable to the research context (Arnold & Votgt, 2019). Thus, We also continue to adopt the TOE framework in this research based on such argument.

Technology Adoption in Small and Medium Enterprises

Small and medium enterprises (SMEs) are essential for a country as they provide the creation of many job opportunities and fuel economic growth (Matt & Rauch, 2020; Selamat, Jaffar & Nadir, 2013). Equipping SMEs with relevant technologies can nonetheless contribute significantly to their development and ensure their competitiveness in the market. Several factors that influence the adoption of technologies in SMEs can be investigated through the TOE framework.

For SMEs in the creative industry, technological factors are found to be most significant in e-commerce adoption (Dhewanto et al., 2020; Nurrohmah & Alfanur, 2016). The relative advantage of technologies such as for business communication, selling products, branding, and promotion, seems to provide a driver of TA for these SMEs. Meanwhile, other researchers find that the organizational context also has a determining role in the TA of SMEs. SMEs that are compatible in terms of top management commitment, organizational strategy, human resource practices, and organizational culture have reaped better benefits through the TA (Darbanhosseiniamirkhiz & Ismail, 2012). Last, environmental factors such as competitive pressure, consumers, and business partners are also found to be highly significant for technology adoption (Olatokun et al., 2011).

However, several restraints faced by SMEs can ultimately affect their capacity in adopting ET (Kennedy & Hyland, 2013; Muller, et al., 2017). Therefore, it is crucial to identify barriers and motivations of ETA in SMEs. Our analysis of past research on ETA in SMEs found that researchers are just embarking on the discussion of the relevance and role of I4.0 technologies in SMEs. Barriers to the adoption of ET in SMEs are mainly approached using quantitative research methods. Organizational and customer-related factors are found to significantly inhibit the ETA of SMEs in France (Peilon & Dubrue, 2019). Meanwhile, the most significant determinants of the adoption are if the firm has a strategic roadmap for ET and a high perceived value of those ETs (Ghobakhloo and Ching, 2019). Their study is based on a large-scale survey of Iranian and Malaysian SMEs. Other psychological variables that may lead to barriers in adoption include trust in the technology

(Dalmarco, 2019; Lin. et al., .2018), resistance to change (Agostini, 2019; Pivoto, 2019), and willingness to try (Rodi, 2017).

Nevertheless, researchers have also discovered several indicators that could prompt SMEs to adopt emerging technologies. Prause (2019) states that market uncertainty is the most significant factor in determining SME's intentions. It refers to external organizational factors that include political, social, technological, and economic uncertainty. This indicator certainly relates to the market of the fashion industry.

RESEARCH METHOD

As has been suggested by Creswell (2014), given the nature of the inquiries of this study, qualitative research offers an excellent way to understand the current situation faced by SMEs. The grounded theory approach, which is 'a design of inquiry in which the researcher derives a general, abstract theory of a process, action, or interaction grounded in the views of participant' (Creswell, 2014, p.14), was also specifically chosen for this research. The homogeneous purposive sampling technique was used to select fourteen SMEs in the fashion industry. This type of sampling was chosen because it will 'allow characteristics to be explored in-depth and minor differences to be more apparent (Saunders & Lewis, 2012)'. They were identified based on information available in the Ministry of Industry. The business owners who were willing to share were contacted and asked several questions regarding their business.

The SMEs were selected based on these criteria:

a. The same type of industry

We have chosen to study SMEs in the manufacturing fashion industry. The government defines it as businesses that include "making apparel from textiles/fabrics (woven or knitted) by cutting and sewing so that it is ready to use, such as shirts, pants, kebaya, blouses, skirts, baby clothes, dance clothing, and sportswear, both from woven cloth or knit fabric that is sewn (Kamus Klasifikasi Baku Lapangan Usaha Indonesia, 2017)".

b. Firm Location

Differences in market demands, national cultures, regulatory, and political as well as economic factors can cause differences in management and business practices (Bartlett & Ghoshal, 1998; Bloom & Reenen, 2010; Deresky, 2017). Therefore, there is a need to control these external factors by choosing SMEs in the same region. This study specifically chose SMEs in West Java, Indonesia, for the following reasons: 1) Indonesia is one of the leading garment manufacturers in the world, and 2) West Java province has the highest amount of SME manufacturers (ILO, 2017).

c. Firm Size

Firms chosen in this study are of the same size (small enterprises, of which is defined by the Indonesian government as a business that owns not more than 500 million Rupiahs in net assets, excluding land or buildings, or has an annual sales between 300 million Rupiah to 2,5 billion Rupiah (Constitution of Indonesia, 2008).

Through such criteria, we found fourteen SMEs that were willing to participate in the research. Data collection methods included focus group discussions and in-depth, semi-structured interviews with the owners. The focus group discussions were conducted in two sessions, approximately two hours each. The discussion questions involved: the current situation of the fashion industry and the role of technologies to SMEs. For the interview sessions, the researcher inquired general information about the company, including the company's history, human resources, the owner's educational and managerial background, and information about the types of technologies used in the company. The

owners were also asked about the perspective of using ET in their respective companies and their knowledge of ET. Additionally, secondary data of the cases were obtained through the company's website and social media. As suggested by Yin (2014), these multiple sources of data are needed for the triangulation of our findings.

Prior to the data collection, the researcher had several years of experience in the fashion industry and had interactions with garment manufacturers that might affect the result of the observation. As such, the researcher took the effort to minimize bias of the observation by confirming assumptions with the owner of the firm after the observation and interview sessions.

RESULTS

After the FGDs and interviews were transcribed, the Nvivo 12 software was employed to code the main ideas. The concepts were validated through observations and secondary data of the SMEs obtained from the internet. The findings of this research were then organized into a conceptual framework in Figure 2.

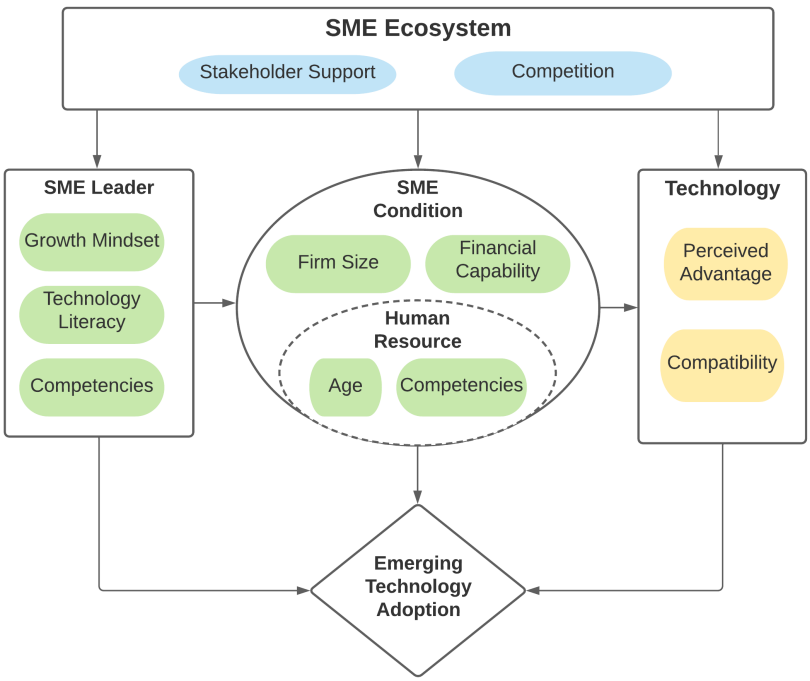

Figure 2. Driving Factors for Emerging Technology Adoption in SMEs

SME Leader

Our qualitative inquiry finds that SME leaders play a pivotal role in the growth of the firm. They are ultimately the decision-maker to the direction of growth and whether the firms would implement technologies in their existing production and management systems.

a. Growth Mindset

The leader's growth mindset is shown to impact the development of SMEs significantly and may contribute towards their attitude in implementing ETs. The cases in this study present contrasting situations, whereby several SME leaders, such as SME A, were very much intent on growing their company while several other founders stated that they did not have such intentions.

"We really want to build a business that we can give to our children and grandchildren. So, from the beginning, we strived to build a system, like the flow of business, such as pre-ordering for production and payroll. Basically, we are building a system so that anyone can (easily) continue the business." (Co-founder, SME A)

Additionally, when reasoned about the applicability of ETA in their respective firms, these SMEs showed a positive attitude towards the new possibility and admitted that they were currently trying new digital solutions for their management process. However, this is in contrast to other SMEs, where we can conclude from their statement, they had little intention towards business growth. When inquired about the application of ET in their business, they referred back to their company's initial goal.

"Okay, so ... back again, maybe the company has a different vision and mission. My Mom's (the founder) vision and mission was...she just wanted to look for activities (to do) at home. So that is why the firm was made... Furthermore, it can give additional support to the family. So (the founder) did not think of making the firm bigger like a well-known company. It is just really a home-based business until now." (Manager, SME F)

Growth-minded SME leaders strive for learning continuously, seeking external funding opportunities, involving the organization and the employees in various development programs, and expanding their networking. These may impact their attitudes and chances towards the use of technologies in their respective firms. For example, SME C, which had acquired funding for their business through an SME development program, chose to invest in clothing printing machinery.

b. Leader's Competencies

We argue that education and management competencies are variables that can influence SME leaders' attitudes towards ETA. Specifically, the co-founder of SME A shared how the business was able to scale up after the founder pursued a higher degree in management. The co-founder also contributed to the improvement of the business process by referring to her skills she learned from her previous management occupation in a multinational company.

"So, he (the founder) went straight to do masters at that time. I resigned, continued to take an MBA, too. We finally focused on the business. We will improve the management. We will enhance the marketing, and so on. We can finally do so now." (Co-founder, SME A)

Similarly, the co-founder of SME H recounted that the leader and management team in his firm were recruited from reputable schools. They were shown to have better adaptability skills than other employees.

"In my opinion, having the leader and management team from a good and talented school... maybe, that's what helps. It's easier to adapt to the technology because the people in it are very adaptive, they are fast learners... all of them." (Co-founder, SME H)

Other SME leaders with a degree in higher education were also observed to be more enthusiastic in our FGD discussion regarding emerging technologies. These participants were able to cite technologies relevant to the fashion industry, such as 3D printing, extensive data analysis for fashion forecasting, and blockchain technology for the transparency of the fashion supply chain.

c. Technology Literacy

As has been mentioned, though several SME leaders were aware of ETs, there are still some of them who were not acknowledged of the latest technological developments in the field of fashion. Some others were aware but unsure how to apply these technologies in their respective firms. For instance,

the co-founder of SME D was well versed with the possibilities of ET. However, he did not know how to use these technologies.

"*Now I know that blockchain for fashion is already being used out there, but I haven't found the exact way to put it into practice."* (Co-founder, SME D)

It is interesting to note that some SMEs have started digitalizing, ensuing the manager's or founder's entry to higher education. Business growth through technology implementation is acquired throughout their educational pursuits. Hence, we deduce that the dissemination of ET information to SMEs and its benefits to the firm by relevant stakeholders in the SME ecosystem is an important aspect that can influence the technology adoption in SMEs.

SME Factors

a. SME Size

The size of the firm relates to how the SMEs position themselves towards ETA. Although we have tried to find a homogenous size in our sampling method, there are still differences within the 'small and medium enterprise' category. The smaller SMEs, which had fewer employees, were reluctant to apply such emerging technologies as the conventional way is enough to meet the demands. However, SMEs with more employees were more open to the possibility of integrating ET in their manufacturing process. Another important point relating to SME size is that there might not be a need to implement ETs for smaller-scale businesses which did not have a high production demand yet.

"*So, you might need to implement ETs if you intend to scale-up. In terms of output... if your demand is bigger, then you need more."* (SME F)

b. Financial Capability

While adopting new technologies has been reported to reduce costs, firms must first allocate their budget to acquire them. In the case of SMEs with limited financial capabilities, this is observed to be a challenge, as, usually, the cost of new technologies is higher. Inherent also from the focus group discussion is the topic of acquiring digital or technology consultants for SMEs to assist in digital transformation, which '*simply is not included in the budget*' (SME E). Several other SMEs agreed with this, as *"most SMEs do not have a large capital, so to hire other people, especially in times like this.... They'll have to think twice."* (SME D).

Human Resource

To SMEs in the fashion industry, employees play a crucial role in the development and resiliency of the firm. SME founders continuously mentioned their employees as detrimental factors to growth. Aside from the organization itself, many respondents also called its human resources, in particular those who will operate the technologies. In our viewpoint, a sub-category of these factors is deemed necessary to include.

a. Age

A factor that has frequently been mentioned by our respondents relates to the age of the technology operators. Younger workers were viewed as more adaptive and digitally savvy. As such, several participants argued that age was one of the factors that lead to ETA.

*"People that are still young, that's the easiest keyword, although the young ones are not necessarily adaptive, right? There are also many young ones who are not adaptive. So, young and adaptive, that's the first thing that must be pursued. An adaptive and innovative young worker will have the ability to do that, right?" (*SME J)

"*Moreover, for employees who are already 40 and over, now that is quite difficult... you have to be patient. They are usually confused about how to operate it (when asked to operate a new technology).* Alhamdulillah*, we still have employees who are around 29 (years old). They still understand and are faster (on operating new technologies). So, the age is around twenty-nine... thirty.*" (SME K)

b. HR Competencies

Employees or external consultants with the necessary competencies are also highly sought by SMEs. Several respondents chose to provide training or educational opportunities to employees; however, some others argued that it was quite complicated for SMEs with limited budgets or was time-consuming. They would prefer to outsource or hire other people who have the necessary competencies.

"We are putting people in our firm... I send people to South Korea to study, then to the US, to Malaysia, to all places. Yes, we send people for learning...To fill in the gap, we try to convert intangible assets into more tangible." (SME H)

"Most of the (technology) consultants simply do not enter the budget. Another point is that people who know how to do it are still really hard to find. However, sometimes we really need it, but we cannot do it ourselves. We will not be able to do it ourselves... not capable yet... so that is complicated." (SME E)

SMEs also voiced that technology operators should understand how to operate the needed technologies for their respective firms. These people should not only be aware of the technology but also have a grasp on operating it. As illustrated by an SME leader:

"Maybe theory-wise, our team, understand how to use it (the theory). Oh, we know that this will benefit us in this, this, and this. But in practice, it is a whole different story!" (SME C)

Technological Factors

a. Compatibility

In implementing emerging technologies in the production process, firms need to consider the technical and organizational compatibility of the technology to the firm, including whether it is compatible with the existing infrastructures or not. In the interview session, RH from SME C commented that SMEs in the fashion industry might lack the necessary technical infrastructure to adopt emerging technologies.

"Sometimes the SMEs... their devices might not yet qualify (for implementing the ETS). There are a lot of SMEs whose devices lacks the specifications needed...It will be hard to implement them (ET)." (RH, Co-founder, SME C)

Another focus group participant, SH from SME G, noted that in several areas, even internet connection is hard to find. This was agreed upon by all participants in the FGD session, indicating that the government and relevant stakeholders should assist in providing basic infrastructure requirements for the SMEs to ensure compatibility with the ET.

The researchers also found that the SMEs under scrutiny have different compatibilities in technology implementation. Several SMEs are more advanced than others, with more updated sewing machines and production machines to assist in mass production. Their production planning department also relies on computer programs. Nevertheless, several divisions still rely on conventional methods, such as in the pattern cutting and garment or screen-printing process. In the latter, workers are observed to hand-paint multicolor designs in each garment piece. Meanwhile, four SMEs have not used any computer technologies aside from marketing to assist in any of their

production processes. Thus, ETA might not be relevant yet to these SMEs, which have not taken up digitalization in any of their production processes.

b. Perceived Advantage

Each SME participating in this study has instances of using digital means in its business process. However, upon direct observation, most are limited to the product planning and marketing divisions. Most other divisions still rely on conventional techniques in producing garments. For example, in the pattern making and cutting of garments, most of these firms do not have a specific machine to assist the workers, and they still rely on the accuracy of the worker to cut the fabrics. This is especially apparent in SME B, in which they relied heavily on specific individuals that have years of experience in the division.

"We even have a worker that has worked with us for ten years. He has many skills... is multi-talented (in producing garments). He is actually the key (to our production). We have not found anyone else who can be as meticulous as him. It is because of his years of experience too... Other employees keep changing each year." (Manager, SME B)

From the above interview excerpt with the Manager of SME B, human power remains central to SME's production. Employees' skills evidently influence production results. We confirmed with SME owners that the perceived advantage and reliability of human resources provide reasons to maintain the status quo. This factor thus might prevent the SMEs from utilizing relevant emerging technologies to assist in their production process. Nevertheless, we can see from the interview passage below that m-SMEs were willing to adopt ET if it could reduce human error in the manufacturing process.

"*For garment manufacturing, I think it's still okay to use human resources (than completely relying on ET). Actually, (I know) there is ET for cutting (the fabric) ... It has already started. Now we can enter patterns digitally, and immediately it cuts, digitally ... Actually, yes, the cutting phase has already started anyway (to use digital technologies) ... We can begin to be digitalized. It's actually better in terms of reducing human error.*" (co-founder, SME A)

SME Ecosystem

Aside from the leader, SMEs' ecosystem also provides a vital role towards ETA. From the data collection, we found several emerging factors that affect the attitudes towards ETA. These two factors are mainly related to competitor pressure and stakeholders' support.

a. Competition

There are two different opinions regarding competition from our respondents. There were SMEs who would consider implementing ETs if their immediate competitors had utilized them in the production process. This can be seen from a statement from SME F:

"So, we would consider ETA if a competitor has invested in ETs. But we actually have to evaluate first...is it more efficient or not?" (SME F)

Another competing opinion is that technology adoption is important to provide a competitive advantage amongst competitors. For these SMEs, being the first to master the technologies is an important competitive ability. An illustration of this opinion is provided below:

"*There are so many competitors (in the fashion industry)! So how can I get ahead of the others? You see, there is an indirect need for novelty... for technological innovation. So now, how am I able to take advantage of technologies (to get ahead of the others)?*" (SME I)

From these two viewpoints, we deduce that competitors have an essential role in ETA. For early adopters, ETA is used as a competitive advantage over other SMEs in the same industry. Meanwhile, for late adopters, ETA will only happen if their competitors have utilized these technologies.

b. Stakeholder support

Stakeholders for SMEs play a pivotal role in business growth, as they would either become part of the supporting ecosystem or insufficiently address SMEs' needs, which in turn will affect the attitude of implementing innovations to foster such business growth. Distinctively, stakeholders such as the government, academic institutions, large businesses, and communities could support ETA in many aspects of the SMEs. Examples of stakeholder assistance for SME leaders include training programs. SME H recalled an experience attending an accelerator program from the government. Through this experience, SME H was able to develop and grow his SME. Similarly, SME J was able to find new knowledge on the availability of new technologies from academicians. For the firm itself, several SMEs were able to gain funding from several different stakeholders such as the government, NGOs, or companies.

"Currently, the government has many programs that try to boost firms, right? Especially for the SME sector... For these SMEs, there are many programs from the government. So, although we try to look for investors from other places, it is quite difficult to find funds or grants other than the government. But I still often participate in other activities to look for business connections, to find (other) investors too." (SME J)

Lastly, stakeholders also play a significant role in supporting technology adoption through providing access to technologies, including setting the necessary infrastructure such as internet connection and cutting technology prices. The government, for instance, has made a program to support ETA by discounting the price of technologies.

DISCUSSION AND THEORETICAL IMPLICATIONS

The current study intends to investigate the reasons behind the low levels of emerging technological readiness in SMEs by adopting an explorative research approach to detect circumstances overlooked by previous researchers. Based on the findings, we postulate that SMEs are influenced by five dominant aspects, which are: SME leaders, SME conditions, human resources, the technology itself, and the SME's ecosystem.

In relation to established theories on TA, firstly, we observed that SMEs are starkly open to the possibilities of ETA if they are led by individuals with a growth mindset, have higher education and management competencies, and are literate on technologies. This crucial factor is unfortunately not inherent in the established TA frameworks such as DOI or TOE. Nevertheless, based on our empirical findings, we emphasize the need to consider SME leaders as a significant determinant of ETA. Mittal et al. (2018) similarly find that a leader's mindset can affect the company's culture in terms of encouraging new technology adoption. Garbellano & Da Veiga (2019) even suggest a need for leadership changes in SMEs that are intent in TA. Their study finds that new, young executives with a better growth mindset and capabilities are able to foster better digital transformation in Italian SMEs.

For the dimension of growth mindset, in particular, a portion of SME leaders evidently does not intend to grow the size of their business beyond their initial capacity. Though seemingly unique, several researchers discover that indeed women entrepreneurs tend to have businesses that have fewer assets and are smaller in size than their counterparts (i.e., Davis & Shaver, 2012; Powell, 2013). A prominent study argues that gender perception is the main contributor to this phenomenon

(Ladge, Eddlestonn, & Sugiyama, 2019), for example, because of their conflicting roles as a mother and a working professional. As this research finds that such variables can inhibit business growth, it would be interesting also to discover whether such implications of gender persist in ETA.

Furthermore, integrating ET in SMEs requires synchronous stimulation of the leaders' or managers' growth mindset with their technological capabilities. This statement is supported by Lee et al. (2020), who have experimented with 351 IT project managers and found that a growth mindset mediates poor judgments when working with unfamiliar technology. A relating finding that we have incorporated in our framework relates to the competencies and age of SME's human resources. Though not previously mentioned in the original firm-based theories of TA, we deduce that the characteristic of ET warrants new or upgrade of employees' competencies, particularly those of technology operators.

A discerning finding that relates to previous firm-based TA frameworks is the range of dimensions that support TA, which is not only restricted to a single entity. For example, the TOE framework has identified 'governmental regulation' and support for 'technology infrastructure.' However, SMEs in our study have reported a broader implication of government and other stakeholder supports. Respondents in our study, for instance, expressed the importance of funding opportunities from the government in scaling their businesses, acquiring knowledge of ETs from academic institutions, or training from incubator programs of large enterprises.

Through analysis of the empirical findings, we have also found many dimensions that fit into the original TA frameworks, such as the importance of firm size, compatibility, and perceived advantage of technologies to TA. Furthermore, in relating to the theory of diffusion of innovations (Rogers, 1962), the social system, especially competitors, also plays important role in boosting the ETA of fashion SMEs. Specifically, if competitors in the ecosystem have adopted technology, many would be more like to consider investing with ETFs.

CONCLUSION

This study has attempted to explore and identify barriers and determinants of ETA in SMEs of the fashion sector using a qualitative approach. The results discover new insights towards technology management in SMEs that are overlooked by previous studies which rely on purely quantitative methods (i.e., Ghobakhloo & Ching, 2019; Prause, 2019). A new model of technology adoption is developed, resulting in a new framework of studies on technology adoption. Several aspects to be concerned in boosting ETA in SMEs are SME leaders' competencies, technology literacy, and growth mindset. Stakeholders should also be aware of SME conditions, including the size, financial capabilities, and human resources (particularly the technology operators). For the technology itself, stakeholders should evaluate its compatibility with the existing SME conditions and its perceived advantage to the business. Lastly, we suggest building a supportive ETA ecosystem for SMEs, which implies cooperation from all relevant stakeholders. As SMEs are found to have limited capacities and capabilities in ETA (Ghobakhloo & Ching, 2019), creating an innovative ecosystem by involving relevant stakeholders such as the university and business associations could further stimulate the digital transformation of SMEs (Benitez, Ayala, & Frank, 2020).

MANAGERIAL IMPLICATION

SMEs' approach to business and management must evolve to survive the uncertainties. To remain competitive in the industry, the leaders are further urged to adopt innovations in their respective firms. There are several implications we suggest for SME leaders prior to adopting new technologies:

a. *Continous excellence.* SMEs that are interested in seeking better ways to meet demands must be proactive in finding innovative solutions that provide advantages to the firms. Numerous information could be obtained from community groups, seminars, training, or workshops.

b. *Upgrading Technical Knowledge.* Technologies should be seen as a supportive tool that assists the firm and its employees to reach goals. However, with a limited number of capable employees, SME leaders must invest time to learn the technological know-how. This knowledge can thus be transferred to employees assigned the task of operating the technology.

c. *Opportunity evaluation.* Not all technologies are suited for a firm, and as such, SME leaders should take precautions in adopting technological trends. A comprehensive evaluation of relevant technologies must be accomplished, particularly in terms of compatibility with existing infrastructures within the firm, such as electrical power, internet speed, devices, and the demands of the business. Such evaluation could be done with an expert or through cooperation with a local college or university. Leaders should also carefully consider the expense of implementing new technologies to the organization and reflect other types of technologies needed to be invested in the future.

d. *Seizing the Chance.* In scaling and upgrading the firm and existing technologies, SME leaders should take advantage of digital transformation programs or consultation programs provided by the government, community support, incubation, and university or large enterprises. Some of these programs give technical courses, workshops, or training for employees.

In general, SME leaders who are interested in digitalizing their firms are recommended to be concerned with improving their individual capabilities and the general conditions of their SME, such as financial capability and human resources. For the technology itself, SMEs are urged to evaluate technology compatibility with current circumstances. SMEs should also strive to build relationships with relevant stakeholders that could assist them in adopting the latest technology.

LIMITATION AND FUTURE RESEARCH

There are several limitations of this research. The qualitative approach, while providing extensive insights into SMEs' perceptions, may not have the same generalization power as the quantitative one. Therefore, it will be preferable for future research to generalize the current variables through the quantitative approach. This will also garner insight into identifying the readiest and willing to adopt ETs or industry-relevant technologies. Additional research should also identify relevant stakeholders and the roles they contribute to influence the performance of technology adoptions.

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