ATTRIBUTES OF INNOVATION, DIGITAL TECHNOLOGY AND THEIR IMPACT ON SME PERFORMANCE IN INDONESIA

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ABSTRACT

This study examines digital technology for innovation adoption in mediating the relationship between the attributes of innovation adoption towards the performance of SMEs. A quantitative method was used in the study by distributing questionnaire manufacturing SMEs in East Java Province Indonesia. This study found that organizational readiness, firm characteristics, strategic orientation and persuasion of innovation, are determinants of digital technology for innovation adoption. Furthermore, digital technology for innovation adoption significantly influences SME's performance. Thus, this study provides practical implication for policymakers to provide programs and policy systems to an improved information to trigger newness in innovation, the adoption process and agendas to enhance SME's performance.

Keywords: Innovation, Innovation Adoption, SMEs Performance, Digital Technology.

INTRODUCTION

The emergence and deployment of digital technology are intended to increase the innovation potential of organizations. The relationship between digital technology and innovation had been broadly discussed by both academia (Melville et al., 2004; Chae et al., 2014) and practitioners (Davenport & Short, 1990), with previous studies contended that technology has positive view in assisting innovation (McAfee & Brynjolfsson, 2008). In a world where companies live in a highly competitive environment, the organization is increasingly under pressure to maximize their resources for innovation to improve their organization performance (Swanson, 2012). Thus, companies that adopt innovation using digital technology can enhance performance and advance in becoming innovative companies (Sedera et al., 2016; Tan et al., 2016; Harris et al., 2012; Weiß & Leimeister, 2012).

In the context of SMEs, innovation is key for sustainability and competitive advantage but also performance. SMEs can obtain superior performance from new technological and non-technological innovation adoption (Price et al., 2013). Although, Fagerberg et al. (2004) indicate that innovation in different countries show different productivity rate, however, studies of innovation in the context of SMEs, is still considered to be important due to the unique sets of process and resources it possessed. This study of innovation in the context of SMEs is important

as it aims to provide support for the role of digital technology for innovation adoption in the relationship between the attributes of innovation and performance of SMEs.

This study considers Indonesian manufacturing SMEs as an interesting observation for studying the attributes of innovation adoptions. In fact, Indonesia SMEs are key driver to the nation's economy as they contribute to 60 percent of the GDP. According to the report Making Indonesia 4.0 in 2018, the manufacturing industry which accounts over 20% of the nation PDB and employed 14 million workers nationally is estimated to decrease its contribution to the national economy in future years to come (Indonesia Ministry of Trade, 2018). Due to Indonesia's national strategic initiative, shifting from agriculture-based economy to a service economy, it is imperative that the manufacturing sector necessitates new intervention. Under the industrial revolution 4.0 perspectives, the application of the advancement of new technology being introduced it is expected to revitalize the manufacturing industry (Kagerman et al., 2013). Indonesia has predicted that through revitalizing the manufacturing sector, through the application of technology 4.0, it will increase workers' productivity, encouraged net export and open up additional jobs which accumulate as the cornerstone of the nation economic growth towards becoming the 10th largest economy in the world (Indonesia Ministry of Trade, 2018). Therefore, in order to support the initiative, this study aims to identify the attributes of innovation and the performance of Indonesian manufacturing SMEs. By empirically examining the various attributes of innovations, in turn, lead to an increase in the nation SMEs competitive advantage and superior performance.

LITERATURE REVIEW

The Attributes of Innovation

New technological development emerges throughout the industry enabling companies with new opportunities for digital transformations to offer innovative products and services. The first attribute of innovation is the organizational readiness for digital innovation. Previous studies have explored the concept of "*readiness*" and "*innovation*" extensively which can be concluded falling into two distinctive perspectives: (i) the readiness of an organization to withstand innovation, and (ii) the readiness of an organization to deliver and enable innovation. In the literature, the concept of organizational readiness for innovation is understudied (Snyder-Halpern 2001). This study refers organizational readiness for digital innovation as the readiness of SMEs to make changes and in accordance with the development of digital technology. The construct of organizational readiness for digital innovation is derived from Lokuge et al. (2018), which consist of the availability, accessibility, scalability and ease-of-use and ease-of-deployment of digital technologies for organization to innovate. By using this construct by Lokuge (2018), it allows organization to guide their ambitions based on the current capabilities and external environmental factors. As argued by Yoo et al., (2010), the pervasive digitization influence organization to give birth to a new type of product innovation. Other scholars have indicated that readiness to innovate with digital technologies has a direct influence on innovation outcome

while inversely proportional to innovation risk (Snyder-Halpern 2001; Walczuch et al., 2007). This study suggests that organizational readiness is one of the factors influencing the success of digital technology for innovation adoption, and hence the hypothesis pertinent to this study is:

> *H1: Organizational readiness for digital innovation positively influences digital technology for innovation adoption.*

The second innovation attributes in this study is firm characteristic. Firm characteristic in this study refers to the antecedents of innovation among manufacturing SMEs. As indicated in the literature, most enterprises are continuously scanning for innovation to counter problems they face (Rogers, 2003). Prior studies which focuses on firm antecedents of SMEs had also confirmed that internal drivers to have positive effects on innovation adoptions (Leenders & Chandra, 2013; Walker, 2014). Following the theory of DOI and ODI, this study has selected three antecedents expected to affect innovation adoption (prior conditions, knowledge and risk taking). Previous study had indicated that as components of firm characteristic, prior conditions (Ko and Lu, 2010), knowledge of innovation (Zhou & Li, 2012) and risk taking (Lathan & Braun, 2009) influences innovation adoption. Hence, the hypothesis of the extant research is:

> *H2: Firm characteristic positively influences digital technology for innovation adoption.*

The third attribute of innovation in this study is the strategic orientation of SMEs. Strategic orientation is the context in which enterprises formulate their internal capacity and resource in responding to the changing business challenges and environment. Strategic orientation shapes an enterprise culture by accommodating the creation of shared value and behavior throughout the organization. In accordance to the internal resources and changing environment of an industry, strategic orientation formulates the strategic adaptability of an organization, improving greater innovative capacity, superior performance and sustainability (Baker & Sinkula, 2009; Kumar et al., 2012). Prior studies have reported that strategic orientation is the determinant which affects innovation, competitive advantages, sustainability, and performance of SMEs (Grawe et al., 2009; Slater et al., 2006; Grinstein, 2008). Although previous studies provide a broad range of explanations from different sectors in overcoming business challenges, this study will be focusing on three key components of strategic orientation: market orientation, consumer orientation and entrepreneurial orientation. Despite the mixed outcome of studies on strategic orientation on innovation and performance (Kumar et al., 2012; Campbell, 2015), yet this study perceived the needs of a deeper exploration of the strategic orientation of SMEs towards innovation. Therefore, the hypothesis relevant to this study is:

> *H3: Strategic orientation positively influences digital technology for innovation adoption.*

Perceived attributes of innovation are represented by persuasion of innovation, firm characteristic, strategic orientation and organizational readiness for digital innovation. Persuasion of innovation is introduced from the theory of DOI which explains how innovation

adoption is form by the characteristic of individual decision-making process, the communication medium involved, the potential consequences and the characteristics of the innovation being considered (Rogers, 2003; Song, 2014). This study uses the DOI model as introduced by Rogers (2003), which consist of the perceived characteristics of innovation (relative advantage, compatibility, complexity, trialability and observability). Moreover, this study argued that the perceived characteristics of innovation could influence SMEs' intentions and contribute significantly to digital technology for innovation adoption. As argued by Schienstock (2011), the existing technological advantages and knowledge base is the foundation for succeeding innovation from future technological development. Therefore, hypothesis relevant to this extant research of SMEs firm performance is:

H4: Persuasion of innovation positively influences digital technology for innovation adoption.

Digital Innovation for Innovation Adoption

Innovation is closely related to technology as it involves both the improvements of existing state of technology along with the shift of completely new and different technology trajectory (Gupta et al., 2006). Companies that adopt technological innovation will continue to adopt additional related technology (Koellinger & Schade, 2009). As other research suggest that technology merely used as tools to implement a business strategy, it also considers to potentially affect firm innovation strategy choice (Hewwitt-Dundas, 2004). Digital technology is a major part of supporting business innovation which enhances company competitiveness. Furthermore, companies that make innovations are triggered by companies that have also adopted digital technology (Yoo et al., 2012; Henfridsson et al., 2014). The extant literature on innovation adoption has validated the capacities of SMEs through the different abilities of SMEs adopting and implementing innovation. Furthermore, in relation to the adoption of digital technology for innovation it is reveal that both incremental innovation and radical breakthroughs help firms to acquire superior capacity (Hunt, 2013). In the quest of competitiveness among the manufacturing SMEs of Indonesia, manufacturing-based SMEs are urged to utilize digital technology in creating, adopting and implementing innovations. Following the Schumpeterian view, the adoption of digital technology implemented can further be exploited to the development of the types of innovation that includes product innovation, service innovation, process innovation, organizational innovation and marketing innovation (Schumpeter, 1935).

Despite the different types of innovation, various studies have reported that interdependence between types of innovation exist (Walker, 2014; Li et al, 2007). In order to achieve superior performance, companies require to adopt of portfolio of different types of innovations. Thus, enterprises which successfully adopt innovation are companies that able to address uncertainty and change in the global competitive business landscape (Damanpour & Aravind, 2011; Azar & Drogendijk, 2014). In accordance to early studies which has reported that

innovation positively effects enterprise performance, this study therefore, hypothesis' that:

H5: Digital technology for innovation adoption positively influences firm performance.

The Mediating Role of Innovation

The mediating role of innovation in this study was developed following with earlier studies (Benner & Tushmen, 2003; Al Mamun, 2017; Azari et al., 2017). The effect of innovation on firm performance has been widely tested empirically in the past. Furthermore, studies of innovation as mediating between different variables such as strategic orientation and firm performance, persuasion of innovation and firm performance, prior condition firm characteristic and firm performance, has been demonstrated in earlier studies. Therefore, following the path of those studies the hypothesis pertinent to this study is:

H6: Digital technology for innovation adoption positively mediates the relationship between organization readiness for digital technology, firm characteristics, strategic orientation, and innovation persuasion with firm performance.

RESEARCH METHOD

This research is an explanatory in nature by explaining the causal relationship among variables via the use of quantitative method. Further, the study took a random sample of 298 SMEs scattered in four major manufacturing SMEs cities in East Java: Surabaya, Sidoarjo, Pasuruan, and Malang (BPS, 2019). From the total number of samples distributed the number of return questionnaires was 102, thus the response rate in this study was 34 percent. Despite surveys of SMEs and entrepreneurship known to produce unsatisfying response rate (Rasmussen & Thimm, 2009), the response rate of this study shows greater result compared to the average response rate of 21% (Dillman, 2007). Statistical analysis used in this study as means of hypothesis testing and followed by interpretation of the results. Adding to that, data were processed via the use of SPSS 20. Thus, the statistical analysis in this study are based on two statistical equations:

(1) $Z = \alpha_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_3 X_3 + \varepsilon_0$; and,
(2) $Y = \alpha_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_3 X_3 + Z + \varepsilon_0$

RESULTS AND DISCUSSIONS

Demographics and Descriptive Statistics

The respondents of this research are the owners or managers SMEs in the manufacturing sector. The profile of respondents (Table 1) consists of gender, age, position in the SMEs, age of SMEs, number of employees, and sales turnover of SMEs.

Demographic		Frequency	Percent (%)	Demographic		Frequency	Percent (%)
Table 1 **DEMOGRAPHIC PROFILE OF SMES**							
Age of SMEs (in years)	<5	40	39.2	Gender	Male	63	61,8
	05-Oct	29	28.4		Female	39	38,2
	>10	33	32.3	Age	>25	14	13,7
SMEs Classification	Small	73	71,6		25-35	26	25,5
	Medium	29	28,4		36-45	25	24,5
Number of Employees	>10	53	51,9		46-55	28	27,4
	Oct-50	39	38,2		>56	9	8,8
	>50	10	9,8	Status	Owner	62	60,7
					Manager	40	39,2

The descriptive statistics provides a general description of the SMEs response on the predictors of this study based on mean statistics. Hence, the mean score of each predictor was obtained (Table 2).

Table 2 **MEAN STATISTICS**	
Variables	Mean Score
Organizational Readiness for Digital Innovation	3,19
Firm Characteristic	3,70
Strategic orientation	3,63
Persuasion of Innovation	3,56
Digital Technology for Innovation Adoption	3,76
Firm Performance	3,56

Path Analysis and Hypotheses Test

This study consists of two structural equations for the path analysis. The first structural equation aims to determine the Organizational Readiness for Digital Innovation (X1), Firm Characteristics (X2), Strategic Orientation (X3), Persuasion of Innovation (X4) and their effects on Digital Technology for Innovation Adoption (Z). The second equation seeks to determine whether these variables positively influence SME's firm performance. Further, direct and

indirect effects were also examined after the acceptance or rejection of hypotheses pertinent to this study.

Table 3 FIRST STRUCTURAL EQUATION PATH COEFFICIENT					
Independent Variables	Dependent Variable	B	T Score	Probability	Conclusion
Organizational Readiness for digital Innovation (X1)	Digital Technology for Innovation Adoption (Z)	0,524	6,147	0,000	Sig.
Firm Characteristic (X2)		0,478	5,440	0,000	Sig.
Strategic Orientation (X3)		0,548	6,553	0,000	Sig.
Persuasion of Innovation (X4)		0,676	9,184	0,000	Sig.
N = 102					
R Square = 0,502					
T_table = 1,984					
Significant at P-Value<0.001					

The first equation (Table 3) calculates the total path coefficient by employing the formula as follows:

$e^1 = \sqrt{1 - R2} = \sqrt{1 - 0,502} = 0,706$; and thus, the result is presented as:

$Z = 0,524\ X1 + 0,478\ X2 + 0,548\ X3 + 0,676\ X4 + 0,706$ (Table 3).

Table 4 SECOND STRUCTURAL EQUATION PATH COEFFICIENT					
Independent Variable	Dependent Variable	Beta	T_{score}	Probability	Conclusion
Organizational Readiness for digital Innovation (X1)	Firm Performance (Y)	0,428	4,730	0,000	Sig.
Firm Characteristic (X2)		0,485	5,551	0,000	Sig.
Strategic Orientation (X3)		0,597	7,473	0,000	Sig.
Persuasion of Innovation (X4)		0,433	4,804	0,000	Sig.
Digital Technology for Innovation Adoption (Z)		0,341	3,633	0,000	Sig.
N = 102					
R $_{Square}$ = 0,408					
T$_{table}$ = 1,984					
Significant at P-Value<0.001					

The second path coefficient aims to predict five determinants of firm performance. Further as firm performance is determined (Table 4), the total path coefficient result was calculated based on the formula:

$e^2 = \sqrt{1 - R2} = \sqrt{1 - 0,408} = 0,769$; and hence, the second path coefficient:

$$Y = 0,341 \, Z + 0,428 \, X1 + 0,485 \, X2 + 0,433 \, X3 + 0,597 \, X4 + 0,769.$$

Based on the second equation, direct and indirect impact were measured. A total of nine direct and four indirect effects were uncovered (Table 5). The structural model and the relationship among variables are depicted in Figure 1. As indicated, digital technology for innovation adoption fully mediates the relationship between predictors used in this study with the dependent variable. Further, hypotheses test of this study employs t-statistics or partial test into consideration. The results of the t-statistics on each relational measure in the model indicates that all the six hypotheses, included in thirteen relational measure are fully accepted.

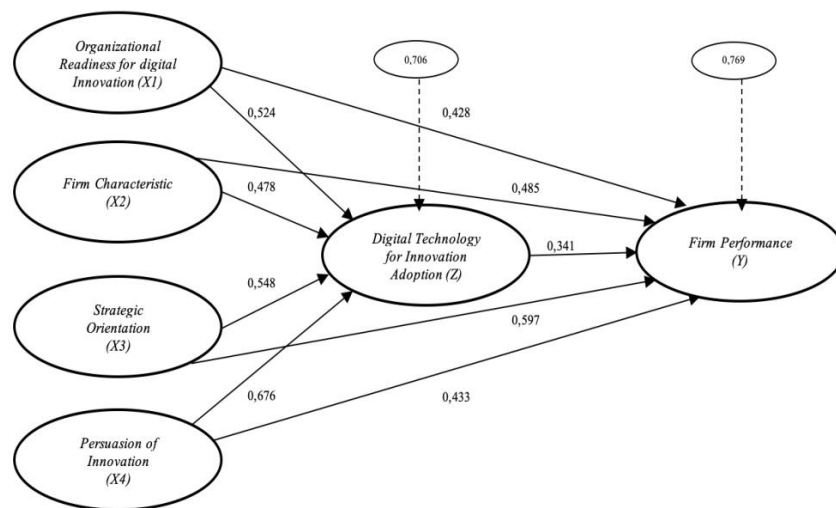| Table 5 DIRECT, INDIRECT EFFECT AND T-STATISTICS						
Relationship	Direct Effect	Indirect Effect	Total	t-score	t-table	Conclusion
X1→ Z	0,524		0,524	6,147	1,984	Accepted
Z → Y	0,341		0,341	5,440	1,984	Accepted
X1→ Y	0,428	0,524 X 0,341= 0,179	0,607	6,533	1,984	Accepted
X2 → Z	0,478		0,478	9,184	1,984	Accepted
X2 →Y	0,485	0,478 X 0,341= 0,163	0,648	3,633	1,984	Accepted
X3 → Z	0,548		0,548	4,730	1,984	Accepted
X3 → Y	0,597	0,548 X 0,341= 0,187	0,784	5,551	1,984	Accepted
X4 → Z	0,676		0,676	7,473	1,984	Accepted
X4 → Y	0,433	0,676 X 0,341= 0,230	0,663	4,804	1,984	Accepted

FIGURE 1
THE STRUCTURAL MODEL

DISCUSSION

The notion that the world has evolved in the age of digitalization, has created more opportunities to transform familiar products into something new (Verganti, 2009). The result of this study is consistent to that of notion, to which organizational readiness for digital innovation is a significant predictor of innovation adoption. Moreover, as organization becomes well prepared the shift towards digital technologies becomes primary necessity in the quest for a much more innovative outcome (Snyder-Halpern, 2001; Walczuch et al., 2007). Also, consistent to a previous study of innovation among Malaysian SMEs (Al Mamun, 2017), this study found that firm characteristic, strategic orientation, and persuasion of innovation are determinants SMEs innovation adoption. As firm is characterized by prior conditions, knowledge and risk orientation it could somewhat corroborate with its capacity to accept newness as the core of innovation. Alongside, innovation-related knowledge and risk-taking orientation plays an important role in ensuring how innovation are adopted particularly in small firms where its attributes are unique in nature (Latham & Braun, 2009; Al Mamun, 2017). Another key determinant of innovation adoption is strategic orientation. Following the path of Al Mamun (2017) who contends that strategic orientation as a representation of directions and adoptions undertaken by SMEs' to expedite competitive challenges via acquisition, dissemination and responsiveness to market information, as well as decision-making styles guided toward the enterprises' propensity in the exploitation of new opportunities. Thus, it is in line to the findings in the literature as reviewed by Al Mamun (2017) who identified several earlier findings prior to his' study pertinent to the theme of strategic orientation and innovation adoption of SMEs (iBaker & Sinkula, 2009; Laforet, 2009; Kumar et al., 2012; Deshpande et al., 2012). Despite the importance of organizational readiness, firm characteristics and strategic orientation, the lacked persuasion to innovation adoption businesses may not grow and shift themselves to necessitate innovation. Based on that premise, this study found that persuasion of innovation significantly determines an SME's adoption of innovation due to its capacity in perceiving drivers of performance such as: profitability, costs incurring, efficiencies vs deficiencies, and other outcome (i.e. social benefits, norms and values, ability to manage complexities) (Al Mamun 2017). These drivers must be aligned holistically to the condition whereby SMEs can run their own trial tests and observe with cautious to the outcomes that results in innovation adoption. Thus, it corroborates to earlier studies that measures similar drivers of innovation adoption (Beatty et al., 2001; Li et al., 2007).

While it had been mentioned in the literature how determinants of innovation adoption are crucial to benefit SMEs, it provides an incomplete insight without involving firm performance as an outcome. The results of this study suggest that digital technology for innovation adoption significantly influence firm performance. It is an indication that Indonesian SMEs capacity in digital technology for innovative outcomes to introduce to customers or addressing new market together with adaption of new methods of production significantly enhances firm performance. Hence, the result corresponds to earlier studies with similar predictions and outcomes (i.e. Fagerberg et al., 2004; Damanpour & Aravind, 2011; Gunday et

al., 2011; Price et al., 2013; Azar & Drogendijk, 2014). The final prediction of the model is the ultimate hypothesis relevant: digital technology for innovation adoption mediates the relationship between organization readiness for digital technology, firm characteristics, strategic orientation and innovation persuasion with firm performance. The findings confirmed full mediation of digital technology innovation adoption on the relationship between the attributes of innovation of Indonesian SMEs. It suggests that digital technology innovation adoption embraces itself as a pull and a push mechanism that allows SMEs to achieve a certain threshold of their firm performance. The mediation model in this study confirms and extends previous study (Benner & Tushman, 2003; Al Mamun, 2017) by providing digital technology for innovation adoption, simultaneously responsible for the relationship between organization readiness for digital technology, firm characteristics, strategic orientation and innovation persuasion with firm performance of SMEs.

CONCLUSION

This study has provided an empirical investigation in determining the influence of organizational readiness for digital innovation, firm characteristic, strategic orientation, persuasion of innovation, digital technology for innovation adoption and firm performance of manufacturing SMEs in East Java, Indonesia. Organizational readiness, firm characteristic, strategic orientation, and persuasion of innovation are significant determinants of innovation adoption. Moreover, the findings also affirm the that Organizational Readiness for Digital Innovation, Firm Characteristic, Strategic Orientation, and Persuasion of Innovation partially have positive effects on the performance of SMEs. Finally, the mediating role of Digital Technology for Innovation Adoption had a positive and significant influence on the business performance of the manufacturing SMEs in Indonesia. Thus, this study affirms that all the innovation attributes of SMEs directly and indirectly through Digital Technology for Innovation Adoption influence the Performance of SMEs.

In addition, this study has contributed to the theory by offering a combine model supported by empirical findings, significantly differing from the relevant theories used by previous study. The findings improve the knowledge and understanding of the selected factors in explaining how these factors contributes to innovation adoption and performance by manufacturing SMEs. Furthermore, the result of this study also offers implications and tools for manufacturing SMEs and policymakers on sustainable economic development through providing a supportive ecosystem for innovation-led SMEs. Although SMEs are commonly competing based on quality and price, based on this study such approach might not be sufficient to gain competitive performance in the digitized and competitive business landscape. The findings of this study confirm the important role of the perceived attributes of innovation and digital readiness as important instruments for exploring new opportunities for novel products and services and also firm performance of SMEs in Indonesia.

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