Diffusion of innovation among Malaysian manufacturing SMEs

Abdullah Al Mamun
Universiti Malaysia Kelantan, Pengkalan Chepa, Malaysia

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Abstract

Purpose – The purpose of this paper is to examine the attributes of innovation adoption and its effects on the performance of Malaysian manufacturing SMEs.

Design/methodology/approach – Quantitative data were collected from 360 randomly selected manufacturing SMEs through structured interviews.

Findings – The findings of the study confirmed that, in Malaysian manufacturing SMEs, the degree of persuasion (i.e. relative advantages, compatibility, complexity, trialability and observability), strategic orientation (i.e. consumer, market and entrepreneurship) and firm antecedents (i.e. prior condition, knowledge and risk orientation) have significant effects on the innovation (i.e. product, process and service) adoption and performance of SMEs.

Practical implications – For policymakers, this study emphasizes the areas to focus on the development of an effective innovation ecosystem for an innovation-led economy. Because SMEs operate with limited resources and capacity, the programs and policies for innovation support systems must focus on providing new innovation information, cost-benefit analyses for new innovation adoption, innovation adoption processes and how new innovations affect performance.

Originality/value – The paper examines an important, but under-researched issue – designed and tested a model under the premises of the DOI and organizational diffusion of innovation theories which improve the knowledge and understanding about the innovation adoption by manufacturing SMEs.

Keywords Performance, Innovation, Strategic management, Manufacturing industries

Paper type Research paper

1. Introduction

SMEs are the first step for entrepreneurs, providing employment opportunities for many unskilled employees and a platform for deploying new concepts and ideas. To emphasize the role of SMEs in employment generation, the World Bank (2015) reported that 600 million jobs are needed in the next 15 years, and most formal jobs in emerging markets come from SMEs. Among the 18 OECD countries, SMEs contribute 63 percent of total employment, with large enterprises accounting for the remaining 37 percent (International Labour Office, 2015). SMEs are also considered to be one of the key mechanisms for addressing the devastating consequences of inequality. The World Bank, local governments and other international aid agencies, therefore, have focused on providing targeted assistance for the development and growth of SMEs worldwide.

SMEs can obtain competitive advantages and superior performance by investing in infrastructure and human capital; however, these factors eventually reach diminishing returns. For SMEs, the main sources of sustainability, competitive advantages and performance emerge from new technological and non-technological innovation adoption (Price *et al.*, 2013). Fagerberg *et al.* (2004) also reported that countries with higher rates of innovation have relatively higher rates of productivity and income than less-innovative countries. Therefore, studies of innovation, particularly in context of SMEs, are crucial because of the unique sets of processes and resources possessed by enterprises, and their roles in innovation adoption which result in the sustainability and performance of enterprises, as well as national development (Anderson and Eshima, 2011). Moreover, another significance of this study is that it provides empirical support for the much attacked path-dependence models that have received mass criticism for their lack of empirical evidence (Loch and Huberman, 1999).

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This study conceived Malaysian SMEs as an interesting laboratory for studying the diffusion of innovation as literature revealed that despite progress in terms of innovative activities, Malaysia is ranked low (51st of 144 countries in 2012-2013) in terms of technological readiness, which could significantly undermine Malaysia's efforts to become a knowledge-based economy by 2020 (World Economic Forum, 2015). Moreover, SMEs in Malaysia are under constant pressure to seize competitive advantages and sustainability to address the challenges arising from increasing costs of production, changes in input prices, globalization and changes in customer preferences (Anuar and Yusuff, 2011). In addition, beyond the significance of innovation emphasized in studies conducted in Malaysia and the government's efforts to provide an innovation ecosystem, there remain ample opportunities for manufacturing SMEs to improve their practices (Anuar and Yusuff, 2011). The study conducted by Anuar and Yusuff (2011) examined 270 manufacturing SMEs, reporting that "technology and product innovation" scored the lowest among eight indicators used to measure manufacturing practices. Hashim (2000) emphasized the limitations of Malaysian SMEs because they lacked managerial and technical expertise and undertook limited technological adoption. The findings of Zulkifli and Jamaluddin (2000) reported that Malaysian manufacturing SMEs possess limited skills and knowledge in manufacturing and strategy development. Moreover, Hosseini (2014) reported that very little knowledge existed about the nature of the innovation of Malaysian SMEs. It is therefore crucial to identify the factors that affect innovation adoption and the performance of Malaysian manufacturing SMEs, examining these aspects would, in turn, lead to an increase in competitive advantages and superior performance among Malaysian SMEs.

2. Literature review

2.1 Manufacturing SMEs in Malaysia

In 2013, National SME Development Council endorsed a new definition of SMEs in Malaysia. For manufacturing SMEs, the definition is divided into three categories, i.e., micro-enterprises (sales turnover of less than RM300,000 or fewer than five full-time employees), small enterprise (sales turnover from RM300,000 to less than RM15 million or from five to fewer than 75 full-time employees) and medium (sales turnover from RM15 million to not more than RM50 million or from 75 to not more than 200 full-time employees) (Bank Negara Malaysia, 2013). The Malaysian master plan for SMEs has focused on providing a supportive ecosystem for enterprises to innovate, increase business formation and enhance productivity, and this plan is expected to increase SMEs' contribution to gross domestic product (GDP) by 41 percent, to employment by 62 percent and to exports by 25 percent by 2020 (SME Corp. Malaysia, 2013, p. 33). To achieve these goals, the Malaysian Government implemented 139 SME development programs in 2015, including 36 programs for human capital development, 36 programs focused on market access, 29 programs focused on access to finance, 23 programs focused on innovation and technology adoption and 15 programs focused on infrastructure development. These SME development programs received a total of RM4.84 billion, which was expected to benefit SMEs in Malaysia (SME Annual Report, 2014/2015, p. 69). The supportive programs and policies led to SMEs contributing 35.8 percent of the total Malaysian GDP in 2014 (SME Annual Report, 2014/2015, p. 28).

2.2 Innovation persuasion

Diffusion is defined as the process by which innovation is communicated through certain channels over time, whereas innovation defined as products or services that are perceived by potential consumers as new (Rogers (2003). Rogers (2003) further defined "new" as absolutely new to the market, the producer, the seller or a combination of these. The DOI theory explains how innovation adoption is shaped by the characteristics of individual

decision-making processes, the communication channel involved, the potential consequences and the characteristics of the innovation being considered (Rogers, 2003; Song, 2014). As DOI theory explains, in the process by which an innovation is communicated to the members of a social system, an upgrade is required to explain the process for organizational settings. The organizational diffusion of innovation (ODI) theory is grounded on the concept that individuals behave very differently when faced with an adoption decision in the organizational context. Enterprise offers a stable system, in which individuals work together to achieve common goals through a hierarchy of ranks and position, which controls their communication patterns and adaptation behaviors. Rogers (2003) emphasized that these organizational factors act on innovation behavior above and beyond the aggregate of individual members, making it difficult to isolate the factors affecting innovation behavior at the enterprise level. Because this study focused on SMEs, which are commonly manage by the owners, this study argued that innovation behavior at the SME level largely could be categorized as authoritarian innovation behavior, in which innovation decisions are controlled by a few individuals in a system who possess power, status or technical expertise. This study therefore argued that the persuasion stage in the DOI model, as presented by Rogers (2003), which includes the perceived characteristics of innovation (i.e. relative advantage, compatibility, complexity, trialability and observability) could be the key contributing factor, affecting the intention and implementation stages of the ODI model (Rogers, 2003). Moreover the concept of path dependencies argues that existing technological advantages and knowledge base is the foundation for succeeding rounds of future technological development through innovation (Schienstock, 2011). This study therefore argued that SMEs' abilities to uncover the relative advantages of innovation, together with their compatibility, complexity, trialability and observability, could influence SMEs' intentions and therefore could contribute significantly to innovation adoption.

Relative advantage refers to the degree to which an innovation is perceived as being better than the idea it supersedes (Rogers, 2003). As this study focused on product, process and service innovation among manufacturing SMEs in Malaysia, relative advantages were therefore conceptualized as the SMEs perceiving the economic benefit associated with innovation, which is expected to affect innovation adoption decisions. The concept of increasing return (Arthur, 1996) illustrates that something which is already ahead will get further ahead; therefore, SMEs with a higher degree of compatibility are expected to adopt innovations to a greater extent than those that start with a lower degree of compatibility. Studies have adopted relative advantage as a perceived attribute of innovations, reporting relative advantage as one of the leading predictors of innovation adoption (i.e. Beatty *et al.*, 2001; Ko and Lu, 2010; Duckworth, 2014). Compatibility is the degree to which an innovation is perceived as being consistent with previously adopted innovations and the existing norms or values of the entrepreneur (Rogers, 2003). SMEs have therefore focused on the alignment between innovation and existing work practices (Duckworth, 2014). Empirical studies focusing on compatibility and innovation adoption have reported compatibility as one the key constructs of innovation adoption (i.e. Beatty *et al.*, 2001; Chau and Hu, 2002; Cosgun and Dogerlioglu, 2012). Complexity, as emphasized by Rogers (2003), is the degree to which an innovation is perceived as relatively difficult to understand and use and therefore is expected to have negative effects on innovation adoption. SMEs are more likely to adopt an innovation if it aligns with their absorptive capacity, which represents the employee skills and knowledge essential for successful adoption (Tan *et al.*, 2009). Trialability refers to the degree to which an innovation can be experimented with on a limited basis (Rogers, 2003). When an innovation is trialable, it provides opportunities for the adopters to redesign the innovation based on initial feedback, ultimately reducing the level of uncertainty for adopting enterprises (Ramiah, 2009). Studies examining the effect of trialability on

innovation adoption have reported that trialability has a positive effect on innovation adoption (Tan *et al.*, 2009; Duckworth, 2014). Observability is the degree to which the results of innovation are visible to others (Rogers, 2003). It represents the opportunities for SMEs to observe the outcomes of potential adoption, which is expected to have a positive effect on innovation adoption (Duckworth, 2014). Earlier studies have reported that SMEs are more likely to adopt when they can visualize the potential risks and benefits and can measure the value of these benefits (Ramiah, 2009; Tan *et al.*, 2009; Duckworth, 2014).

Furthermore, earlier studies provided empirical evidence of the effect of persuasion on innovation over a broad range of innovation adoption studies (i.e. Beatty *et al.*, 2001; Ko and Lu, 2010; Lee *et al.*, 2011; Cosgun and Dogerlioglu, 2012; Duckworth, 2014). The DOI and ODI theories, together with earlier empirical studies, have emphasized on the prospect of comprehending the economic benefit, together with the ability to observe these benefits, the ability to try and the capacity to adopt new concepts and/or process the effects on potential adopters. Based on the premises of the DOI and ODI theories, together with the empirical findings, the first hypothesis made the following prediction:

H1. In the context of Malaysian manufacturing SMEs, persuasion of innovation positively influences innovation adoption.

2.3 Strategic orientation and innovation

The manner in which an enterprise responds to business challenges largely depends on its strategic orientation, which aligns internal capacity with external environmental factors. SMEs' innovation capacity to address different challenges fits the premise of Rogers's (2003) ODI theory. In the model, Rogers (2003) noted that "agenda setting" and "matching" stages represent organizational intentions regarding innovation adoption. The "agenda setting" stage explains that the perceived need for innovation can arise from the level of competitiveness in the industry and other environmental factors. Furthermore, the matching stage focuses on fitting a business problem through innovation. ODI theory emphasizes that innovation intention largely depends on an enterprise's need overcome internal and external business challenges. Strategic orientation aligns internal resources and external challenges to improve the performance of an enterprise; therefore, it falls directly under the premises of the "intention" stage of ODI theory. Aligned with internal resources and dynamic industry situations, strategic orientation builds the strategic adaptability of an enterprise, leading to greater innovative capacity and superior performance and sustainability (Baker and Sinkula, 2009; Kumar *et al.*, 2012).

Strategic orientation facilitates shared value and behavior throughout the enterprise, which become parts of the enterprise's culture. A large number of studies have focused on the factors affecting innovation, competitive advantages, sustainability and the performance of SMEs, thus examining the effects of strategic orientation (Grawe *et al.*, 2009; Slater *et al.*, 2006; Grinstein, 2008). The broad range of explanations of the ways to overcome business challenges arises from different sectors, resulting in several components of strategic orientation, including market orientation, entrepreneurial orientation, customer orientation, cost orientation, competitor orientation, learning orientation, employee orientation and interaction orientation (Grawe *et al.*, 2009). Based on this significance and on the findings of earlier studies, this study adopted three key components of strategic orientation, i.e., market orientation, consumer orientation and entrepreneurial orientation.

Market orientation refers to an enterprise's propensity to acquire, disseminate and respond to market information to increase the capacity to develop appropriate product and service strategies to meet customer needs and requirements (Baker and Sinkula, 2009). Market orientation is crucial to promoting a culture of openness, innovativeness and innovation adoption in enterprises. Findings of earlier empirical studies reported positive

effects of market orientation on enterprise innovation adoption and/or performance across enterprise sizes and industries (i.e. Baker and Sinkula, 2009; Suharyono *et al.*, 2014). A study conducted by Suharyono *et al.* (2014) reported that market orientation significantly affects innovation adoption among SMEs in Indonesia.

Customer orientation commonly refers to enterprise-wide generation of intelligence pertaining to current and future customer needs and responsiveness to them. It represents the enterprise culture that focuses on providing superior value for customers. Effective coordination among all departments in an enterprise to identify customer needs generates necessary market intelligence, which facilitates SMEs in identifying the suitable responses and designing products and services. Strong customer orientation is the most influential antecedent of business performance during economic growth (Deshpande *et al.*, 2012). Studies have emphasized the positive effect of consumer orientation on innovation and performance (i.e. Laforet, 2009; Grawe *et al.*, 2009).

Entrepreneurial orientation reflects the methods, practices and decision-making styles directed toward enterprises' propensity to exploit new opportunities (Baker and Sinkula, 2009). Entrepreneurial orientation reflects an enterprise's willingness to promote creativity in designing new products and services, its willingness to adopt new technology and its predisposition to undertake risky ventures (Baker and Sinkula, 2009). Despite the few exceptions (which found insignificant or negative effects, i.e. Swierczek and Ha, 2003) most of the empirical studies have reported a positive effect of entrepreneurial orientation on innovation (Nurlina, 2014) and enterprise performance (Rauch *et al.*, 2009; Nurlina, 2014).

Regarding the effects of strategic orientation, despite the positive effects reported in earlier studies of innovation and/or enterprise performance (Baker and Sinkula, 2009; Laforet, 2009; Kumar *et al.*, 2012; Deshpande *et al.*, 2012), there have also been a few studies reporting insignificant and/or negative effects of enterprises' orientations (i.e. Kumar *et al.*, 2011; Campbell, 2015). In light of the discussions presented above and the contradictory findings of the earlier studies, this study perceived that the relationship between strategic orientation and innovation adoption requires deeper exploration and therefore, the following prediction is hypothesized:

H2. In the context of Malaysian manufacturing SMEs, strategic orientation of the firm positively affects innovation adoption.

2.4 Firm characteristics and innovation

Firm characteristics refer to firm antecedents associated with innovation among SMEs. Rogers (2003) reported that most enterprises face many problems; therefore, they continuously scan for innovations that match their relevant problems. Small enterprises are innovative, and they are less bureaucratic and risk averse than their large counterparts; nevertheless, they lack critical resources and experience. Studies focusing on firm antecedents also referred to as internal drivers have reported positive effects on innovation adoption among SMEs (Leenders and Chandra, 2013; Walker, 2014). Based on the premises of the DOI and ODI theories and the findings of empirical studies, this study selected three antecedents expected to affect innovation adoption among Malaysian manufacturing SMEs.

Prior conditions refer to the degree to which SMEs comprehend the value of innovation and their employees' competency to adopt new innovations. Enterprises with a highly skilled workforce are more receptive, and they possess a greater capacity to develop innovations. Empirical studies have reported the positive effects of prior conditions on innovation adoption across industries (i.e. Prajogo and Sohal, 2006; Ko and Lu, 2010). This study therefore focused on examining the effects of prior conditions as a component of firm characteristics, with effects on innovation adoption among Malaysian manufacturing SMEs.

Knowledge in this study represents the innovation-related knowledge possessed by SMEs (Wang *et al.*, 2009). This context-specific definition was adopted to examine the effects

of knowledge on innovation among Malaysian manufacturing SMEs. When SMEs adopt new innovation, they enhance existing knowledge. Innovative SMEs therefore possess superior innovation knowledge, leading to further exploitation. Empirical studies have reported positive effects of knowledge-based resources on innovation (i.e. Zhou and Li, 2012; Price *et al.*, 2013; Urgal *et al.*, 2013) and performance (Lee and Sukoco, 2007). This study therefore examined the effects of innovation knowledge as a component of firm characteristics, which affect innovation adoption among Malaysian manufacturing SMEs.

Risk taking represents the risks associated with innovation adoption (Hunt, 2013) and for the present study this construct reflects the risk-taking propensity among Malaysian manufacturing SMEs. Earlier studies of risk-taking propensity mostly emphasized the areas of behavioral finance and entrepreneurship, among which Hoffmann *et al.* (2015) classified investors' risk-taking behavior into three dimensions, i.e. return expectation, risk tolerance and risk perceptions. When enterprises adopt innovation to improve products, processes or services, they can commit evaluation mistakes, which can generate negative outcomes (Carpenter and Petersen, 2002). Mavondo and Farrell (2003) suggested that managers who encourage risk taking are more responsive to market needs and are more likely to be effective in innovation adoption. The literature has therefore emphasized the effects of enterprises' risk-taking propensity on innovation adoption (i.e. Salavou *et al.*, 2004; Latham and Braun, 2009). In agreement with the earlier studies, this study examined the effects of risk-taking propensity as a component of firm characteristics on innovation adoption. Based on the findings of earlier studies, the third hypothesis, therefore, made the following prediction:

H3. In the context of Malaysian manufacturing SMEs, firm characteristics are positively associated with innovation adoption.

2.5 Innovation and performance

Innovations involve both improvements to existing components building on the current technological trajectory, along with shifts to a completely different technological trajectory (Gupta *et al.*, 2006). The literature on innovation adoption has emphasized SMEs' capacities, representing the unique ability of every SME to adopt and implement innovation. Recent research reveals that both incremental innovations and radical breakthroughs help small, entrepreneurial firms to acquire superior capacity (Hunt, 2013). Moreover, according to Loch and Huberman (1999) both new and old technologies improve performance incrementally over time. However, it is crucial for SMEs to pursue technological and non-technological innovations simultaneously, which raises the issue of "types of innovation." Types of innovation differentiate based on the object of innovation adoption, i.e., product, process, service, market and organizational innovations (Schumpeter, 1935). For competitive advantages and superior performance, SMEs must align their strategies with the level of innovation adoption capacity (Gunday *et al.*, 2011; Leenders and Chandra, 2013). To explore the nature of innovation adoption among Malaysian manufacturing SMEs, this study selected three types of innovation: product innovation, process innovation and service innovation.

Product innovation, as described by Schumpeter (1935), is the introduction of a completely new product, or a new quality of product, to customers who are not yet familiar with it. According to Banbury and Mitchell (1995), product innovation is a critically significant and competitive factor within established industries that positively influences the market share of a firm, thereby reducing the likelihood of business dissolution. Product innovation among SMEs mostly focuses on increasing efficiency or reducing costs to increase customers' willingness to pay for the product (Cheng, 2009). For SMEs, product innovations also improve their ability to withstand with shortened product life cycles, demand instability and rapid technological changes (Godener and Soderquist, 2004).

Process innovation refers to new methods of production and/or new means of managing commodities commercially (Schumpeter, 1935). Process innovation derives from internal production objectives, and it includes reducing production costs and increasing the quantity and quality of outputs. Relevant research reveals that process management activities are positively associated with organizational effectiveness in the presence of incremental innovations (Benner and Tushman, 2003). Therefore, efficiency-driven process innovation includes all of the changes in the manufacturing methods and equipment adopted, thus improving the quality of goods, allowing flexibility in production functions and increasing the productivity of the workforce, which generate competitive advantage, sustainability and performance for enterprises (Rowley *et al.*, 2011). Service innovation focuses on creating new value through service design and delivery methods (Toivonen and Tuominen, 2009); therefore, it commonly reflects enterprises' willingness and capacity to satisfy customers through dynamic combinations of service elements (Kunttu and Torkkeli, 2014). The service innovation capacity of an enterprise varies with its ability to understand customers' needs and technological options, to conceptualize (customers' reactions to service innovation), to bundle capability (new configurations of existing elements), to co-produce and orchestrate (service innovation across the boundaries), to scale and stretch and finally to learn and adapt (Hertog *et al.*, 2010). Service innovation allows enterprises to gain competitive advantages by offering products and services both alone and combined with customized solutions.

Despite the classifications noted above, in which innovations and the effects of innovations are categorized in particular terms, studies have also reported high levels of interdependence between types of innovation. Walker (2003), in a study of public organizations, reported that organizational, marketing and service innovations were interrelated, whereas Li *et al.* (2007) showed us that process and product innovations were significantly correlated with each other. Achieving superior performance therefore required the adoption of a portfolio of different types of innovations, enabling enterprises to address uncertainty and changes in the competitive global business environment (Damanpour and Aravind, 2011; Azar and Drogendijk, 2014). Earlier empirical studies reported positive effects of innovation on enterprise performance (Fagerberg *et al.*, 2004; Birkinshaw *et al.*, 2008; Damanpour and Aravind, 2011; Gunday *et al.*, 2011; Azar and Drogendijk, 2014). In agreement with the earlier studies, the fourth hypothesis, therefore, made the following prediction:

H4. In the context of Malaysian manufacturing SMEs, innovation adoption significantly and positively affects firm performance.

2.6 The mediating role of innovation

The mediation model for this study was developed in accordance with an earlier study (Benner and Tushman, 2003). The effect of innovation persuasion on innovation adoption has been clearly demonstrated in earlier empirical studies (noted in Section 2.1). Studies have also emphasized the effect of innovation on enterprise performance (noted above). Similarly, studies have found mediating effects of innovation adoption between strategic orientation and enterprise performance (i.e. Suharyono *et al.*, 2014; Nurlina, 2014). Finally, empirical studies have reported the positive effects of prior conditions, knowledge and risk taking (noted in Section 2.3) on innovation adoption among enterprises across the industry. Furthermore, earlier studies have also reported the positive effect of innovation on enterprise performance (noted above). In light of these findings of earlier studies, the fifth hypothesis made the following prediction:

H5. Innovation adoption positively mediates the relationship of innovation persuasion, strategic orientation and firm characteristics with performance of Malaysian manufacturing SMEs.

3. Research methodology

This study used a cross-sectional design and collected quantitative data through a structured interview of registered SMEs in Peninsular Malaysia. The sampling frame for this study consisted of the Malaysian SMEs listed on the public website of the Malaysian SME Business Directory SME Corp. This list of registered SMEs includes all types of business sectors, including manufacturing, manufacturing-related services, mining and quarrying, service (including ICT), construction, primary agriculture and others. The population sample selected for this study was SME owners and higher-level managers in the manufacturing industry who are registered with the SME Malaysian Business Directory.

The sample size for this study was calculated using G-Power version 3.1. Based on the power of 0.95 (which is more than 0.80, as required in social and behavioral science research) with an effect size of 0.15, this study needed a sample size of 226 to test the model with 21 predictors. Moreover, Chin (2010) claims that the minimum sample size should be ten times that of the largest number of paths in the structural or measurement models; the sample size for this study should thus be 210. However, to avoid any possible complications arising from a small sample size, this study intended to collect data from more than 350 manufacturing SMEs in Peninsular Malaysia.

According to the list of registered "SME Malaysian Business Directory," there are 37,861 manufacturing firms in SME category, and 400 SME firms were selected by adopting a random sampling method to identify potential respondents using a table of random numbers. This study selected 400 SMEs, with an expectation that more than 300 SMEs would agree to allow one of their senior managers to be interviewed. Complete data from more than 300 SMEs were expected to be sufficient to test the model because Wolf *et al.* (2013) recommended that the range of the sample requirement for a structural equation model should be 30-460 units. The respondents were chosen from Selangor, Johor, Penang, Perak, Kelantan and Terengganu because they have the majority (79 percent) of manufacturing firms in the country. From the selected 400 sample SMEs, complete data were collected from 360 manufacturing SMEs from the selected states through structured interviews.

3.1 Research instruments

The questionnaire was designed using simple and unbiased wording, whereby respondents could easily understand the questions and could provide answers based on their perceptions. The questions were adopted from earlier studies with minor modifications where needed. The details of each section, what it measured and from whom the study adopted the questions are presented below. A seven-point Likert scale (strongly disagree, disagree, somewhat disagree, neutral, somewhat agree, agree and strongly agree) was used for the independent, mediating and dependent variables.

The first component of persuasion, which referred to perceived attributions of innovation, is relative advantage. Relative advantage is defined as the degree to which an innovation is perceived as being better than its precursor (Moore and Benbasat, 1991). Nine items were adopted from Moore and Benbasat (1991), with minor modifications. Compatibility refers to the degree to which an innovation is perceived as being consistent with the existing values, needs and past experiences of potential adopters (Moore and Benbasat, 1991). Six items were adopted from Moore and Benbasat (1991), with minor modifications. Complexity refers to the perceived difficulty of learning to use and understand an innovation. Six items were adopted from Ntemana and Olatokun (2012), with minor modifications. Trialability refers to the ease of experimenting with an innovation. Four items were adopted from Ntemana and Olatokun (2012), with minor modifications. Observability is characterized by how available and visible an innovation is to an individual. Five items were adopted from Ntemana and Olatokun (2012), with minor modifications.

Market orientation refers to SMEs' propensity to acquire, disseminate and respond to market information (Baker and Sinkula, 2009). A total of ten items were adopted from the study conducted by Deshpande and Farley (1998), with minor modifications. Customer orientation refers to the SMEs' orientation toward providing superior value for customers. In total, 12 items were adopted from the study conducted by Ramani and Kumar (2008), with minor modifications. Entrepreneurial orientation reflects the methods, practices and decision-making styles directed toward enterprises' propensity to exploit new opportunities (Baker and Sinkula, 2009). Six items were adopted from the study conducted by Gonzalez-Benito *et al.* (2009), with minor modifications.

Regarding firm antecedents, prior condition refers to SMEs' capacity to accept new changes or new innovation (Rabie, 2013). Six items were adopted from the study conducted by Rabie (2013), with minor modifications based on the scope of this study. Knowledge refers to the innovation-related knowledge possessed by SMEs (Wang *et al.*, 2009). Five items were adopted from the study conducted by Harvey (2012), with minor modifications based on the scope of this study. Finally, risk taking represents the risk-taking propensity associated with innovation adoption among Malaysian manufacturing SMEs (Isaga, 2012). Five items were adopted from the study conducted by Isaga (2012), with minor modifications based on the scope of this study. Product innovation refers to the introduction of completely new products or a new quality of product to customers who are not yet familiar with it (Schumpeter, 1935). Seven items were adopted from the study conducted by Suriati (2014), with minor modifications based on the scope of this study. Process innovation refers to the new methods of production and/or new means of managing commodities commercially (Schumpeter, 1935). Eight items were adopted from Suriati (2014), with minor modifications based on the scope of this study. Finally, service innovation refers to the creation of new value through service design and delivery methods (Toivonen and Tuominen, 2009). Seven items were adopted from Janssen *et al.* (2012), with minor modifications based on the scope of this study. Firm performance is a multidimensional concept, which can be measured with objective or subjective indicators (Harris, 2001). This study focused on SMEs across the industry; therefore, it adopted subjective measures of performance adapted from Turner (2011). The performance indicators measured perceived performance relative to that of relevant competitors. Seven items were adopted from Turner (2011), with minor modifications based on the scope of this study.

3.2 Common method variance (CMV)

CMV is a systematic measurement error in which the features that are intended to represent the construct of interest and the characteristics of the specific method being employed are shared by the measures of other constructs (MacKenzie and Podsakoff, 2012). As a procedural remedy to minimize the effect of common method bias, besides carefully constructing the items, this study also "informed the respondent that the responses will be evaluate anonymously and there are no right or wrong answers" while collecting the data (Podsakoff *et al.*, 2003). As a statistical remedy, this study adopted Harman's (1976) one-factor test as recommended by Podsakoff *et al.* (2003), in which one fixed factor extracted from all principal constructs is expected to explain less than 50 percent of the variance. The findings showed that one component explained 42.52 percent of the variance, which is less than the maximum threshold of 50 percent, indicating a lack of common method bias in the collected data.

3.3 Multivariate normality

Although the partial least squares (PLS) method does not require a multivariate normal data distribution, Peng and Lai (2012) recommend not making generalized statements regarding the ability of PLS to estimate a model, which may violate the multivariate normality assumption.

This study tested multivariate normality using the Web Power online tool. Web Power calculated Mardia's multivariate skewness and kurtosis coefficients and *p*-values, showing that the *p*-value of Mardia's multivariate skewness and kurtosis coefficients were less than 0.05, confirming non-normality.

3.4 Data analysis method

Partial least squares-structural equation modeling (PLS-SEM) is a causal modeling approach aimed at maximizing the explained variance of the dependent latent constructs. Due to the exploratory nature of this study and the non-normality issue, this study used variance-based-PLS-SEM estimation with the primary objective of maximizing the explanation of variance in the structural equation model's dependent constructs. The findings of this analysis are reported as recommended by Hair *et al.* (2014) for PLS modeling. These include indicator reliability (e.g. standardized indicator loadings 0.70; loadings of 0.40 are acceptable in exploratory studies); internal consistency reliability (Cronbach's α and composite reliability); average variance extracted (AVE); r^2 (the acceptable level depends on the research context); effect size; path coefficient estimates; and predictive relevance Q^2 and q^2.

4. Data analysis

4.1 Descriptive statistics

Among the 360 manufacturing SMEs, most of them were established between 1988 and 2010. The mean number of years of establishment was 19.49 years, with a standard deviation of 11.319. Of 360 manufacturing SMEs, a total of 112 SMEs refused to provide any information about sales turnover. For the remaining 248 SMEs, the mean sales turnover was RM20,143,816 with a standard deviation of RM14,614,059. Per the total number of employees, the mean number of full-time employees, as presented in Table I, was 85.26 with a standard deviation of 3.04 employees. The largest number of sampled SMEs involved were in basic metal works ($n = 41$, 13.6 percent), followed in order by food, beverage and tobacco ($n = 45$, 12.5 percent) and electrical and electronics ($n = 41$, 11.4 percent).

Most of the interviewees of the selected manufacturing SMEs, who represented their enterprises held "mid-level management" positions ($n = 194$, 53.9 percent), followed in order

No. of years: firm established		*Total number of employees*	
Mean	19.490	Mean	85.260
SD	11.319	SD	3.0390
Years of experience		*Interviewee's position*	
Mean	9.790	Owner/CEO	23
SD	0.383	Top management	129
		Mid-level management	194
		Other	14
Types of manufacturing SMEs	*n*		
Food, beverage and tobacco	45	Transport	3
Medical, precision and optical instruments	8	Plastics	28
Paper, printing and publishing	20	Fabricated metals	22
Textiles, apparel and leather	6	Machinery	21
Wood and wood products	14	Recycling	18
Chemicals, including petroleum	31	Rubber	9
Electrical and electronics	41	Furniture	20
Non-metallic minerals	7	Other	18
Basic metals	49	Total	360

Table I.
Descriptive statistics

by "top management" ($n = 129$, 35.8), and "owner/CEO" ($n = 23$, 6.4 percent). Per the total number of years of experience of the interviewees in the selected SMEs, only 81 or 22.5 percent were working and reported that they were working in their current enterprises for less than five years, which also indicated that approximately 78 percent of the representatives were working in their current enterprises for more than five years. The mean number of years of experience of the interviewees was 9.79 years, with a standard deviation of 0.383 years.

4.2 Validity and reliability

As recommended by Hair *et al.* (2014), composite reliability should be greater than 0.70. As noted in Table II, composite reliability for all of the items was more than 0.9 and was therefore considered reliable. Cronbach's α provides an estimate of reliability based on the indicators' intercorrelations. The Cronbach's αs, as presented in Table II, for all of the indicators were greater than 0.9; therefore, they are considered as reliable. Convergent validity indicates that a set of indicators represents the same underlying construct, which can be demonstrated through their unidimensionality. The AVE value for all of the items was greater than 0.5, indicating sufficient convergent validity. Indicators are assumed to be reliable if the absolute standardized outer (component) loadings are greater than 0.7. A component loading value of 0.5 is also considered acceptable if the AVE value is greater than 0.5. As noted in Table II, the AVE values for all of the items were greater than 0.5; therefore, all of the items were assumed to be reliable. Cross-loading checks were performed for discriminant validity. If an indicator has a stronger correlation with another latent variable compared to its respective latent variable, the appropriateness of the model should be reconsidered. As shown in Tables AII-AIV, the loading and cross-loading values showed that all of the items had maximum loading with their respective variables, thus satisfying the requirements. For discriminant validity based on the Fornell-Larcker criterion, the AVE for each indicator should be greater than the construct's highest squared correlation with another construct. As noted in Tables AII-AIV, all of the constructs managed to meet the set criteria. Furthermore, the heterotrait-monotrait ratio is an estimate

Variables	Number of items	Mean	SD	Cronbach's α	Composite reliability	Average variance extracted
Market orientation	10	5.473	0.919	0.959	0.964	0.729
Consumer orientation	12	5.438	0.863	0.948	0.955	0.641
Entrepreneurial orientation	6	5.215	1.092	0.941	0.953	0.772
Strategic orientation	28	5.375	0.810	0.966	0.969	0.526
Prior condition	6	5.362	1.1454	0.957	0.966	0.824
Risk taking	5	5.157	0.98093	0.909	0.932	0.735
Knowledge	5	5.223	0.99789	0.962	0.971	0.869
Firm characteristics	16	5.247	0.83114	0.937	0.944	0.517
Relative advantage	9	5.559	0.974	0.957	0.964	0.747
Compatibility	6	5.368	1.092	0.967	0.974	0.861
Complexity	7	5.350	1.095	0.956	0.964	0.793
Trialability	4	5.438	1.143	0.962	0.972	0.898
Observability	5	5.237	0.978	0.953	0.964	0.842
Persuasion	31	5.407	0.874	0.974	0.976	0.568
Product innovation	7	5.488	1.003	0.960	0.967	0.807
Service innovation	8	5.438	1.099	0.971	0.975	0.831
Process innovation	7	5.391	1.096	0.957	0.965	0.795
Innovation	22	5.439	0.907	0.966	0.969	0.588
Enterprise performance	7	4.989	0.973	0.961	0.968	0.813

Table II. Reliability analysis

of the correlation between constructs, paralleling the disattenuated construct score creation. Using a value of 0.9 as the threshold, this study concluded that there was no evidence of a lack of discriminant validity.

4.3 Hierarchical models

Hierarchical component models (reflective-formative), using the repeated indicators approach, were used to estimate the higher order constructs. This study hypothesized (H_H) that each first-order construct had a positive effect on the respective second-order construct. The findings, as presented in Table III, indicate that market orientation, consumer orientation and entrepreneurial orientation had significant (p-values < 0.05), positive effects on strategic orientation among Malaysian manufacturing SMEs. Among these factors, consumer orientation had a relatively higher effect ($\beta = 0.472$) on strategic orientation, followed in order by market orientation ($\beta = 0.429$) and entrepreneurial orientation ($\beta = 0.252$). Regarding the firm characteristics, prior conditions, risk taking and knowledge had significant (p-values < 0.05), positive effects among Malaysian manufacturing SMEs. Among these factors, prior conditions had a relatively higher effect ($\beta = 0.499$) on strategic orientation, followed in order by knowledge ($\beta = 0.391$) and risk taking ($\beta = 0.361$). Table III indicates that relative advantage, compatibility, complexity, trialability and observability had significant (p-values < 0.05), positive effects on innovation persuasion among Malaysian manufacturing SMEs. Among these factors, relative advantage had a relatively higher effect ($\beta = 0.329$) on persuasion, followed in order by complexity ($\beta = 0.281$), compatibility ($\beta = 0.225$), observability ($\beta = 0.176$) and entrepreneurial orientation ($\beta = 0.152$). The findings also emphasized the positive, significant effects of process innovation, service innovation and product innovation on enterprise innovation among Malaysian manufacturing SMEs.

Hypothesis		Coefficient	t-value	Sig.	Decision
Persuasion					
H1a	RelA → PerS	0.329	29.316	0.000	Supported
H1b	ComP → PerS	0.225	28.678	0.000	Supported
H1c	ComX → PerS	0.281	30.105	0.000	Supported
H1d	TraI → PerS	0.152	18.050	0.000	Supported
H1e	ObsE → PerS	0.176	25.553	0.000	Supported
Strategic Orientation					
H2a	MarO → StrO	0.429	27.577	0.000	Supported
H2b	ConO → StrO	0.472	40.723	0.000	Supported
H2c	EntO → StrO	0.252	22.259	0.000	Supported
Firm Characteristics					
H3a	PriC → FirC	0.499	24.407	0.000	Supported
H3b	RisP → FirC	0.361	21.146	0.000	Supported
H3c	Know → FirC	0.391	18.561	0.000	Supported
Innovation					
H4a	ProI → InnO	0.340	25.970	0.000	Supported
H4b	SerI → InnO	0.444	33.790	0.000	Supported
H4c	PssI → InnO	0.389	22.875	0.000	Supported

Notes: MarO: Market Orientation; ConO: Consumer Orientation; EntO: Entrepreneurial Orientation; StrO: Strategic Orientation; PriC: Prior Condition; KnoW: Knowledge; RisP: Risk Taking; FirC: Firm Characteristics; RelA: Relative Advantage; ComP: Compatibility; ComX: Complexity; TraI: Trialability; ObsE: Observability; PerS: Persuasion; ProI: Product Innovation; SerI: Service Innovation; PssI: Process Innovation; InnO: Innovation

Table III.
Hierarchical model (reflective-formative)

4.4 Path analysis

After exploring the findings through descriptive analysis and testing the validity, reliability and effects of first-order constructs on hierarchical component models (reflective-formative) using the repeated indicators approach, this study examined the effects of persuasion, strategic orientation and firm characteristics on innovation and enterprise performance. The r^2 value of 0.662 indicates that 66.2 percent of the variation in innovation among Malaysian manufacturing SMEs can be explained through persuasion, strategic orientation and firm characteristics. Regarding predictive relevance, the Q^2 values of 0.02, 0.15 and 0.35 indicate that an exogenous construct has a small, medium or large predictive relevance, respectively, for a certain endogenous construct (Hair *et al.*, 2014). The Q^2 value of 0.385 indicates a large predictive relevance of persuasion, strategic orientation and firm characteristics on innovation among Malaysian manufacturing SMEs.

As presented in Table IV, persuasion has a positive effect on innovation among Malaysian manufacturing SMEs, indicating that the manufacturing SME has greater ability to measure the relative advantage of adopting new concepts, a higher level of compatibility of new concepts with existing ones, a lower level of complexity in managing new concepts, the ability to try before complete adoption of any new concepts and finally the ability to observe the benefits of new concepts, all of which have positive effects on innovation. Moreover, the path coefficient of the structural model shows that the coefficient value for persuasion on innovation is 0.220, with a *p*-value of 0.000, indicating that the effect of persuasion on innovation is statistically significant (at a 5 percent level of significance). To measure the magnitude of the effect size, we used Cohen's (1988) guideline, which uses 0.02, 0.15 and 0.35 to represent small, medium and large effects, respectively. As noted in Table IV, the f^2 value for of 0.045 indicates a small effect of persuasion on innovation among Malaysian manufacturing SMEs. Finally, this study measured predictive relevance using a blindfolding procedure. The q^2 value of 0.015, which is more than 0, indicates sufficient predictive relevance of persuasion on innovation among Malaysian manufacturing SMEs.

Strategic orientation has a positive effect on innovation among Malaysian manufacturing SMEs, indicating that higher levels of market orientation, consumer orientation and entrepreneurial orientation have a positive effect on innovation. Moreover, the path coefficient of the structural model shows that the coefficient value for strategic orientation on innovation is 0.485 with a *p*-value of 0.000, indicating that the effect of strategic orientation on innovation is statistically significant (at a 5 percent level of significance). The f^2 value for of 0.258 indicates a large effect of strategic orientation on innovation among Malaysian manufacturing SMEs. Finally, this study measured predictive relevance using a blindfolding procedure. The q^2 value of 0.083, which is more than 0, indicates sufficient predictive relevance of strategic orientation on innovation among Malaysian manufacturing SMEs.

The firm characteristics have positive effects on innovation among Malaysian manufacturing SMEs, indicating that prior conditions, the degree of risk-taking propensity and the level of knowledge among employees have positive effects on innovation.

Hypothesis	Relationships	β	t	Sig.	Decision	r^2	f^2	Q^2	q^2
H1	PerS → InnO	0.220	2.925	0.000	Supported	0.662	0.046	0.385	0.015
H2	StrO → InnO	0.485	9.061	0.000	Supported		0.258		0.083
H3	FirC → InnO	0.182	2.898	0.004	Supported		0.041		0.011
H4	InnO → MEP	0.501	13.956	0.000	Supported	0.251	0.336	0.201	

Notes: StrO, strategic orientation; FirC, firm characteristics; PerS, persuasion; InnO, innovation; MEP, enterprise performance. Formula used to calculate $q^2 = (Q^2_{\text{Included}} - Q^2_{\text{Excluded}})/(1 - Q^2_{\text{Included}})$

Table IV. Hypothesis testing

Moreover, the path coefficient of the structural model shows that the coefficient value for firm characteristics on innovation is 0.102 with a p-value of 0.004, indicating that the effect of firm characteristics on innovation is statistically significant (at a 5 percent level of significance). The f^2 value for of 0.041 indicates a small effect of firm characteristics on innovation among Malaysian manufacturing SMEs. Finally, this study measured predictive relevance using a blindfolding procedure. The q^2 value of 0.011, which is more than 0, indicates sufficient predictive relevance of the firm characteristics to innovation among Malaysian manufacturing SMEs.

Finally, as presented in Table IV, innovation has a positive effect on the performance of Malaysian manufacturing SMEs, indicating that the more innovative Malaysian manufacturing SMEs are, the better they perform. The path coefficient of the structural model shows that the coefficient value for innovation on performance is 0.501 with a p-value of 0.000, indicating that the effects of innovation on the performance of Malaysian manufacturing SMEs are statistically significant (at a 5 percent level of significance). The r^2 value of 0.251 indicates that 25.1 percent of the variation in the performance of Malaysian manufacturing SMEs can be explained by innovation. The f^2 value for of 0.336 indicates nearly as large an effect of innovation on the performance of Malaysian manufacturing SMEs. Finally, this study measured predictive relevance using a blindfolding procedure. The Q^2 value of 0.201 indicates a medium predictive relevance of innovation to the performance of Malaysian manufacturing SMEs.

4.5 Mediating effects

Regarding the mediating effects of innovation between persuasion, strategic orientation and firm characteristics and the performance of selected manufacturing SMEs in Peninsular Malaysia, the study presents the indirect effect coefficients, confidence intervals and p-values in Table V. Findings reveal that innovation persuasion has a significant (p-values < 0.05) positive indirect effect on the performance of Malaysian manufacturing SMEs, which also confirms the mediating effect of innovation. The statistically significant (p-value < 0.05) positive indirect effects of strategic orientation on the performance of Malaysian manufacturing SMEs, also confirm the mediating effect of innovation. Finally, findings of this study reveal that firm characteristics has a significant (p-values < 0.05) positive indirect effect on the performance of Malaysian manufacturing SMEs, which also confirms the mediating effect of innovation.

5. Discussion

As many SMEs produce almost identical goods and services, the level of competitiveness is therefore considered a driver of economy-wide efficiency. The present study argues that such competitiveness could be achieved by innovation and aggregate productivity and therefore this study designed and tested five hypotheses to determine the effects of innovation persuasion, strategic orientation and firm characteristics on innovation and performance among SMEs in Malaysia. Studies of economic development, employment and inequalities have emphasized the significant roles of SMEs in socio-economic development worldwide.

Mediating effect of InnO		β	CI-min	CI-max	Sig.	Decision
H5	PerS → InnO → MEP	0.110	0.043	0.176	0.002	Mediation
H6	StrO → InnO → MEP	0.243	0.191	0.299	0.000	Mediation
H7	FirC → InnO → MEP	0.091	0.039	0.145	0.002	Mediation

Table V.
Mediating effects

Notes: StrO: Strategic Orientation; FirC: Firm Characteristics; PerS: Persuasion; InnO: Innovation; MEP: Enterprise Performance

International and national development agencies and organizations have therefore focused on providing targeted assistance for the development and growth of SMEs internationally. Earlier studies focused on the competitive advantages, sustainability and performance of SMEs, reporting crucial roles in innovation adoption. Because of the significance of the performance of SMEs and innovation adoption, this study examined the attributes of innovation adoption, and the effects of innovation adoption on firm performance using 360 Malaysian manufacturing SMEs as a data source.

The first hypothesis was designed to test the effect of persuasion, which represents the perceived attributes of innovation, on innovation adoption. The findings supported the claim that persuasion has a significant, positive effect (coefficient 0.220, p-value 0.000, f^2 value 0.046 and q^2 value 0.015) on innovation adoption, particularly among Malaysian manufacturing SMEs. The findings confirmed that SMEs' capacity to perceive the economic profitability, initial cost, decrease in discomfort, savings in time and effort, immediacy of reward, social benefits and hazards removed, together with the alignment of the existing setup, norms and values, ability to manage complex innovation, capacity to adopt innovation on a trial basis and the ability to observe the outcomes of similar innovation adoption, play significant roles in innovation adoption. This finding is in line with the earlier studies that measured the effect of innovation persuasion on innovation adoption (see Beatty *et al.*, 2001; Lee *et al.*, 2011).

The second hypothesis was designed to test the effect of strategic orientation, which represents market orientation, customer orientation and entrepreneurial orientation, on innovation adoption across the study's sample. The findings supported the claim that strategic orientation has a significant, positive effect (coefficient 0.485, p-value 0.000, f^2 value 0.258 and q^2 value 0.083) on innovation adoption, particularly among Malaysian manufacturing SMEs. The standardized coefficient and the f^2 values indicate that the strategic orientation of Malaysian manufacturing SMEs has a much greater effect on innovation adoption than persuasion and firm characteristics. The findings confirmed the significant role of strategic orientation, which represents SMEs' directions and adoptions of competitive challenges by acquiring, disseminating and responding to market information, together with their abilities to provide superior value to customers and the methods, practices and decision-making styles directed toward the enterprises' propensity to exploit new opportunities, in innovation adoption. This finding is in agreement with the earlier studies that measured the effect of strategic orientation on innovation adoption (i.e. Baker and Sinkula, 2009; Laforet, 2009; Kumar *et al.*, 2012; Deshpande *et al.*, 2012).

The third hypothesis was designed to test the effects of firm characteristics, which represent prior conditions, knowledge and risk orientation, on innovation adoption. The findings supported the claim that firm characteristics have a significant, positive effect (coefficient 0.182, p-value 0.004, f^2 value 0.041 and q^2 value 0.011) on innovation adoption, particularly across the sample of the study. The findings confirmed that SMEs' capacity to accept new changes or new innovation, together with their innovation-related knowledge and risk-taking propensity, has a significant, positive effect on innovation adoption. This finding is in line with earlier studies that measured the effects of prior conditions, knowledge and risk-taking propensity on innovation adoption (see Prajogo and Sohal, 2006; Ko and Lu, 2010; Zhou and Li, 2012; Price *et al.*, 2013; Urgal *et al.*, 2013; Salavou *et al.*, 2004; Latham and Braun, 2009).

Furthermore, this study hypothesized that innovation adoption has a positive effect on the performance of SMEs. The findings supported the claim that innovation adoption has a significant, positive effect (coefficient 0.501, p-value 0.000, r^2 value 0.251, f^2 value 0.336 and Q^2 value 0.201) on innovation adoption among Malaysian manufacturing SMEs. The f^2 value indicates a large effect of innovation adoption on Malaysian manufacturing SMEs. The Q^2 value indicates medium predictive relevance of innovation to the performance of

Malaysian manufacturing SMEs. The findings of this study confirmed that Malaysian manufacturing SMEs' capacity to introduce completely new products or new quality of products to customers who are not yet familiar with them, together with adaptation of new methods of production and/or new means of managing commodities commercially and the ability to create new value through service design and delivery methods, has significant effects on innovation adoption. This finding is in agreement with earlier studies that measured the effects of products, processes and service innovation on performance (i.e. Fagerberg *et al.*, 2004; Damanpour and Aravind, 2011; Gunday *et al.*, 2011; Price *et al.*, 2013; Azar and Drogendijk, 2014).

The prediction of the fifth hypothesis was that innovation adoption mediates the relationship of innovation persuasion, strategic orientation and firm characteristics with performance of Malaysian manufacturing SMEs. The findings confirmed full mediation of innovation adoption on the relationship between persuasion of innovation and performance of Malaysian manufacturing SMEs. Findings further confirmed full mediation of innovation adoption on the association of strategic orientation and performance of Malaysian manufacturing SMEs. Finally, findings also confirmed partial mediation of innovation adoption on the linkage of firm characteristics and performance of Malaysian manufacturing SMEs. The mediation model for this study was compelling, in accordance with an earlier study (Benner and Tushman, 2003), and in this regard the findings confirm and extend the study of Benner and Tushman (2003), thereby proving that not only process innovation, but rather product, process and service innovation are jointly responsible for the relationships of innovation persuasion, strategic orientation and firm characteristics with firm performance.

6. Conclusion

This study answered the call of Hunt and Ortiz-Hunt (2017) to build and test theories connecting concepts of strategic management, innovation and entrepreneurship to specific forms of innovation (product, process and service). The findings of this study substantiated the conceptual path-dependence model adopted in this study. The conceptual model was designed according to the premises of the DOI and ODI theories of Rogers (2003). The DOI theory conceptualizes innovation adoption decision process from the entrepreneur's perspective, whereas the ODI theory focuses on enterprise perspectives. However, this study argued that a combination of the DOI or ODI theory would be more appropriate to explain the innovation attributes among SMEs because SMEs are commonly owned and controlled by entrepreneurs or small groups of entrepreneurs. This study adopted the persuasion characteristics from DOI theory and the strategic orientation and firm characteristics expected to represent the innovation intention stage from ODI theory. The findings of this study confirm the effectiveness of the combined theories for the innovation adoption of Malaysian SMEs. This study contributes to the theory by offering a combined model supported by empirical findings, significantly differing from the DOI and ODI theories and improving the knowledge and understanding of the nature of the selected factors and how they contribute to innovation adoption by manufacturing SMEs.

In addition to providing the much required and much criticized path-dependency models (Loch and Huberman, 1999) and contributing to the relevant theories thereby, the findings of this study also offer implications and tools for manufacturing SMEs and policymakers who focus on sustainable economic development through providing a supportive system for innovation-led SMEs. SMEs commonly compete based on price and quality; however, such an approach might not be sufficient to gain competitive advantages, sustainability and superior performance in today's competitive global business environment. The findings of this study confirm the crucial role of SMEs' capacity to attend to the perceived attributes of innovation (i.e. measure economic profitability, initial costs, decreases in discomfort,

savings in time and effort, immediacy of rewards, social benefits and hazards removed, together with the alignment of the existing setup, norms and values, the ability to address complex innovation, the capacity to adopt innovation on a trial basis and the ability to observe the outcomes of similar innovations adoption) because they are important instruments for innovation adoption and the performance of manufacturing SMEs in Malaysia. It is also crucial that SMEs align their strategies by acquiring, disseminating and responding to market information, building customer intelligence by examining customers' needs and preference and exploiting new opportunities. The findings also emphasize the positive roles of prior condition, knowledge and risk orientation, indicating that it is crucial for Malaysian manufacturing SMEs to accept new changes or new innovations, to gather innovation-related knowledge and to build their risk-taking capabilities to accommodate innovation adoption. For policymakers, this study emphasized the areas (i.e. all indicators of persuasion, strategic orientation and firm antecedents) to focus on the development of an effective innovation ecosystem for an innovation-led economy. Because SMEs operate with limited resources and capacity, the programs and policies for innovation support systems must focus on providing innovation-related information (i.e. markets, consumers, new technology, etc.), cost-benefit analyses for innovation adoption, and spreading information about innovation adoption and its effect on performance, which all together improve SMEs' perceived innovation attributes and their innovation-related knowledge.

In terms of limitations, it is acknowledged that this study could not accommodate all dimensions of the innovation paradigm, such as temporal effects, into its model. As potential for more solid hypothesis and greater contributions exist by taking into account the role of time, it is recommended that future researchers could extend the present model by integrating such relevant constructs. Furthermore, future ventures could also replicate the present study in different business environments (turbulent or non-turbulent environments) which would further enrich the understanding of the role of path dependencies in the diffusion phenomena.

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Appendix 1

Code	Items
RelA-1	Innovation will reduce the company's overall operating cost
RelA-2	Innovation will help your company to expand market share
RelA-3	Innovation will help your company to increase the customer base
RelA-4	Innovation will increase your company's sales and revenues
RelA-5	Innovation will reduce the operating procedure (e.g. reduce the time to communicate)
RelA-6	Innovation will create a new channel for advertising and public relations to improve the company's image
RelA-7	Innovation will increase the competitive advantage for your company
RelA-8	Innovation provides easy access to competitors
RelA-9	Innovation provides easy access to product information
ComP-1	Innovation is compatible with the company's traditional operating procedures
ComP-2	Innovation is compatible with the company's current operations/procedures
ComP-3	Innovation is compatible with existing values of the people in the company
ComP-4	Innovation is compatible with the mentality of the people in the company
ComP-5	Innovation is compatible with suppliers' and customers' ways of doing business
ComP-6	Innovation is compatible with the culture of people in Malaysia
ComX-1	It is not difficult to access the internet to use a new system
ComX-2	The company has adequate computer systems to support Innovation activities
ComX-3	People in your company have innovation necessary knowledge and understanding of innovation
ComX-4	People in your company does not require a lot of training to start innovation
ComX-5	Innovation are easy to understand
ComX-6	Innovation are easy to implement
ComX-7	The company has the technical knowledge to practice innovation
TraI-1	It is easy to recover from mistakes when using the technology
TraI-2	Exploration of features are safe when using the technology
TraI-3	Correcting your mistakes is easy when using the technology
TraI-4	Ability to undo operations are adequate when using the technology
ObsE-1	There are sufficient support and systems that people in the company can access to implement innovation
ObsE-2	Implementing innovation helps our company to perform better than domestic competitors
ObsE-3	Implementing innovation helps our company to perform better than international competitors
ObsE-4	Looking at the performance of implement innovation will help us to decide if we should go into it as well
ObsE-5	My company is certain that that being innovative will generate a good image of the company
MarO-1	Your firm continually monitors customers and competitors to find new ways to improve customer satisfaction
MarO-2	Your firm freely communicate information about your successful and unsuccessful customer experiences with your staffs
MarO-3	Your firm strategy for competitive advantage is based on your understanding of customer's need
MarO-4	Your firm is more customer focused than your competitors
MarO-5	Your firm survey end users at least once a year to assess the quality of products and services
MarO-6	Your firm's objectives are driven primarily by customer satisfaction
MarO-7	Your firm measure customer satisfaction systematically and frequently
MarO-8	Your firm has routine or regular measures of customer service
MarO-9	Your firm believe this business exists primarily to serve customers
MarO-10	Data on customer satisfaction are disseminated on a regular basis
ConO-1	Your firm believes that each customer cannot be satisfied with the same set of products and services
ConO-2	Your firm consciously seeks to identify and acquire new customers individually
ConO-3	Your firm believes that customers reactions to marketing action should be observed at the individual level

Table AI.
(*continued*) Research instruments

Code	Items
ConO-4	Your firm analyzes past customer transactions at the individual level to predict future transaction from that customer
ConO-5	Your firm has systems in place that record each customer's transaction
ConO-6	In your firm, all staff who deal with customers have access to information about the transaction of individual customers
ConO-7	Your firm encourage customers to share opinions of its product or services within the firm
ConO-8	Your firm encourages customers to share opinions of its product or services with other customers
ConO-9	Your firm encourages customers to participate interactively in designing products and services
ConO-10	Your firm has an excellent idea of what each individual customer has been contributing to its profits
ConO-11	Your firm predicts what each individual customer will contribute to its profit in the future
ConO-12	Your firm computes the revenue generated as a result of every marketing action directed at an individual customer
EntO-1	Your firm has launched many new products/services on the market during the last five years
EntO-2	Changes introduced by your firm's product/services are usually important
EntO-3	Your firm usually beats your competitors in developing innovative actions
EntO-4	Your firm usually adopts an aggressive attitude toward your competitors
EntO-5	Your firm is tend to carry out risky projects when involve profitable opportunities
EntO-6	When uncertainty is high, your firm adopt a brave and aggressive attitude to exploit possible opportunities
PriC-1	Innovation is beneficial to your firm
PriC-2	Your firm is well informed with the recent innovation taking place in the industry
PriC-3	Your firm possesses the necessary skills to take part in the innovation adoption
PriC-4	Your firm believes in new changes/technology
PriC-5	It is not costly to implement changes/technology in your firm
PriC-6	You firm has the time to implement changes/technology
KnoW-1	Your firm is aware if there is a new innovation in the industry
KnoW-2	Your firm is aware if there is a new innovation visible to your organization
KnoW-3	Your firm has the knowledge on how a new innovation works
KnoW-4	Your firm has the knowledge on how to implement a new innovation
KnoW-5	Your firm has knowledge to understand the processes of an innovation
RisP-1	Your firm prefers certainty in its business relationships, even if this could involve a lower level of business performance
RisP-2	Research is important to your firm before making a risky decision
RisP-3	Your firm only takes risks in areas it knows well
RisP-4	Your firm approaches business transactions with a high degree of caution
RisP-5	Your firm's business strategy is characterized by a strong tendency to undertake high-risk projects
ProI-1	The products of your firm are produced to fulfill current needs
ProI-2	Your firm continually introduces innovative products into the market
ProI-3	The products of your firm focused on quality improvement
ProI-4	The products of your firm focused on product design improvement
ProI-5	The products of your firm differ significantly in terms of newness from existing product of competitors
ProI-6	The newly developed products of your company deliver high benefits to your customers
ProI-7	Your firm has introduced more new products during the last 3 years than your strongest competitors
SerI-1	Your firm systematically observes and evaluates the needs of your customers
SerI-2	Your firm analyzes the actual use of your services
SerI-3	In order to identify possibilities for new services, your firm use different information sources
SerI-4	Your firm is innovative in coming up with ideas for new service concepts
SerI-5	Your firm experiments with new service concepts
SerI-6	Your firm aligns new service offerings with your current business and processes
SerI-7	In the development of new services, your firm takes into account your branding strategy
SerI-8	Your firm is actively engaged in promoting new services
PssI-1	Your firm introduce new methods of manufacturing or producing goods or services
PssI-2	Your firm introduce new logistics, delivery or distribution methods

Table AI. (*continued*)

Code	Items
PssI-3	Your firm introduce new supporting activities for the processes, such as maintenance systems or operations
PssI-4	Your firm cooperates with other companies to develop innovative projects over the last three years
PssI-5	The rate of process innovation into the firm among innovation activities is the highest over the last three years
PssI-6	Your firm considers itself as a process innovation focused organization
PssI-7	Your firm's new processes are often perceived as very novel by customers
MEP-1	Your firm's profitability is high relative to the average in the industry
MEP-2	How is your firm's return on investment relative to the average in the industry?
MEP-3	How is your firm's return on total sales relative to the average in the industry?
MEP-4	How is your firm's return on asset relative to the average in the industry?
MEP-5	How your employment growth is for the last financial year compared to since the business started?
MEP-6	How would your firm describe the overall business performance?
MEP-7	How satisfied is your firm with the overall business performance?

Notes: MarO, market orientation; ConO, consumer orientation; EntO, entrepreneurial orientation; StrO, strategic orientation; PriC, prior condition; KnoW, knowledge; RisP. risk taking; FirC, firm characteristics; RelA, relative advantage; ComP, compatibility; ComX, complexity; TraI, trialability; ObsE, observability; PerS, persuasion; ProI, product innovation; SerI, service innovation; PssI, process innovation; InnO, innovation; MEP, enterprise performance

Table AI.

Appendix 2

Table AII.
Validity and reliability

	MarO	ConO	EntO	StrO	PriC	RisP	KnoW	FirC	RelA	ComP	ComX	TraI	ObsE	PerS	ProI	SerI	PssI	InnO	MEP
MarO-1	*0.795*	0.496	0.319	*0.656*	0.355	0.447	0.395	0.493	0.521	0.428	0.430	0.415	0.495	0.552	0.375	0.432	0.381	0.467	0.279
MarO-2	*0.828*	0.540	0.396	*0.711*	0.408	0.460	0.392	0.523	0.561	0.521	0.497	0.474	0.524	0.622	0.447	0.482	0.436	0.535	0.337
MarO-3	*0.856*	0.615	0.364	*0.749*	0.436	0.509	0.439	0.572	0.584	0.454	0.465	0.487	0.557	0.611	0.452	0.519	0.424	0.549	0.299
MarO-4	*0.839*	0.613	0.410	*0.753*	0.443	0.480	0.414	0.556	0.542	0.485	0.524	0.409	0.534	0.606	0.384	0.543	0.502	0.567	0.363
MarO-5	*0.862*	0.613	0.419	*0.765*	0.395	0.477	0.385	0.521	0.508	0.480	0.526	0.438	0.537	0.599	0.426	0.537	0.520	0.586	0.349
MarO-6	*0.863*	0.652	0.411	*0.782*	0.382	0.490	0.344	0.501	0.529	0.459	0.469	0.371	0.516	0.571	0.386	0.506	0.506	0.553	0.350
MarO-7	*0.893*	0.638	0.428	*0.792*	0.379	0.479	0.405	0.521	0.526	0.469	0.470	0.421	0.514	0.580	0.416	0.544	0.484	0.571	0.313
MarO-8	*0.880*	0.645	0.392	*0.781*	0.402	0.483	0.397	0.530	0.520	0.435	0.450	0.369	0.528	0.558	0.397	0.500	0.474	0.541	0.262
MarO-9	*0.864*	0.693	0.399	*0.797*	0.378	0.486	0.374	0.510	0.534	0.424	0.440	0.386	0.535	0.561	0.400	0.519	0.453	0.543	0.270
MarO-10	*0.857*	0.669	0.418	*0.789*	0.427	0.466	0.358	0.522	0.506	0.546	0.545	0.427	0.487	0.610	0.411	0.553	0.553	0.601	0.389
ConO-1	0.566	*0.759*	0.334	*0.683*	0.384	0.338	0.325	0.440	0.459	0.379	0.389	0.335	0.437	0.485	0.353	0.395	0.391	0.447	0.256
ConO-2	0.616	*0.841*	0.391	*0.757*	0.432	0.380	0.354	0.491	0.561	0.400	0.409	0.435	0.528	0.561	0.414	0.438	0.370	0.479	0.250
ConO-3	0.639	*0.839*	0.395	*0.767*	0.447	0.415	0.334	0.504	0.576	0.451	0.468	0.445	0.514	0.595	0.411	0.468	0.423	0.512	0.315
ConO-4	0.625	*0.862*	0.428	*0.781*	0.378	0.415	0.348	0.475	0.549	0.417	0.421	0.409	0.548	0.564	0.407	0.470	0.416	0.509	0.279
ConO-5	0.638	*0.845*	0.472	*0.790*	0.379	0.403	0.351	0.472	0.498	0.469	0.428	0.432	0.538	0.565	0.481	0.476	0.455	0.552	0.281
ConO-6	0.513	*0.767*	0.410	*0.686*	0.350	0.362	0.255	0.406	0.384	0.440	0.443	0.351	0.466	0.499	0.419	0.417	0.491	0.518	0.324
ConO-7	0.638	*0.866*	0.449	*0.794*	0.398	0.406	0.372	0.491	0.542	0.452	0.433	0.396	0.584	0.579	0.443	0.502	0.455	0.550	0.310
ConO-8	0.377	*0.631*	0.427	*0.571*	0.308	0.366	0.330	0.416	0.395	0.371	0.459	0.442	0.472	0.505	0.472	0.433	0.406	0.510	0.205
ConO-9	0.555	*0.797*	0.505	*0.745*	0.435	0.480	0.387	0.542	0.501	0.455	0.491	0.472	0.567	0.591	0.536	0.547	0.480	0.612	0.296
ConO-10	0.591	*0.799*	0.510	*0.762*	0.460	0.509	0.442	0.586	0.479	0.460	0.507	0.418	0.590	0.586	0.488	0.518	0.508	0.594	0.350
ConO-11	0.588	*0.782*	0.543	*0.761*	0.421	0.486	0.389	0.537	0.446	0.440	0.483	0.415	0.557	0.557	0.491	0.488	0.481	0.570	0.321
ConO-12	0.584	*0.796*	0.545	*0.766*	0.403	0.455	0.406	0.524	0.476	0.429	0.467	0.422	0.575	0.563	0.525	0.511	0.473	0.589	0.264
EntO-1	0.341	0.428	*0.807*	*0.554*	0.337	0.327	0.240	0.381	0.427	0.442	0.434	0.348	0.324	0.486	0.532	0.513	0.558	0.626	0.322
EntO-2	0.397	0.474	*0.879*	*0.616*	0.382	0.349	0.397	0.471	0.519	0.449	0.444	0.390	0.398	0.540	0.593	0.473	0.429	0.578	0.315
EntO-3	0.334	0.478	*0.879*	*0.592*	0.347	0.325	0.346	0.427	0.409	0.461	0.442	0.391	0.396	0.506	0.645	0.511	0.535	0.654	0.339
EntO-4	0.409	0.522	*0.920*	*0.654*	0.355	0.405	0.443	0.496	0.448	0.425	0.433	0.393	0.425	0.513	0.635	0.518	0.476	0.631	0.308
EntO-5	0.465	0.518	*0.870*	*0.664*	0.405	0.460	0.376	0.515	0.437	0.459	0.483	0.394	0.373	0.523	0.584	0.547	0.535	0.649	0.372
EntO-6	0.484	0.539	*0.914*	*0.693*	0.417	0.437	0.431	0.535	0.502	0.499	0.507	0.449	0.403	0.575	0.652	0.574	0.522	0.679	0.354
PriC-1	0.381	0.396	0.355	0.440	*0.910*	0.481	0.332	*0.756*	0.637	0.473	0.487	0.334	0.338	0.578	0.379	0.393	0.407	0.462	0.277
PriC-2	0.418	0.449	0.363	0.483	*0.927*	0.490	0.341	*0.771*	0.680	0.480	0.522	0.378	0.358	0.613	0.410	0.426	0.429	0.495	0.274
PriC-3	0.423	0.473	0.387	0.502	*0.944*	0.525	0.351	*0.797*	0.638	0.458	0.509	0.413	0.380	0.600	0.423	0.413	0.433	0.496	0.281
PriC-4	0.457	0.488	0.389	0.524	*0.925*	0.500	0.336	*0.773*	0.631	0.475	0.510	0.405	0.396	0.604	0.386	0.421	0.466	0.499	0.274
PriC-5	0.411	0.421	0.394	0.475	*0.815*	0.404	0.291	*0.669*	0.519	0.485	0.554	0.476	0.328	0.581	0.442	0.454	0.462	0.531	0.260
PriC-6	0.465	0.497	0.440	0.546	*0.920*	0.492	0.369	*0.782*	0.659	0.515	0.574	0.463	0.400	0.651	0.471	0.494	0.487	0.569	0.306
RisP-1	0.438	0.387	0.317	0.452	0.385	*0.759*	0.332	*0.596*	0.397	0.323	0.378	0.317	0.432	0.444	0.310	0.362	0.405	0.423	0.266

(*continued*)

Table AII.

	MarO	ConO	EntO	StrO	PriC	RisP	KnoW	FirC	RelA	ComP	ComX	TraI	ObsE	PerS	ProI	SerI	PssI	InnO	MEP
RisP-2	0.480	0.440	0.362	0.505	0.463	*0.878*	0.441	*0.719*	0.463	0.388	0.393	0.357	0.488	0.502	0.378	0.428	0.368	0.462	0.261
RisP-3	0.505	0.429	0.370	0.513	0.472	*0.841*	0.329	*0.667*	0.436	0.379	0.390	0.338	0.441	0.479	0.355	0.366	0.356	0.421	0.209
RisP-4	0.488	0.473	0.412	0.537	0.484	*0.925*	0.469	*0.758*	0.451	0.441	0.447	0.374	0.508	0.533	0.396	0.455	0.453	0.513	0.291
RisP-5	0.488	0.505	0.417	0.555	0.472	*0.874*	0.415	*0.715*	0.424	0.487	0.487	0.374	0.451	0.537	0.418	0.489	0.496	0.552	0.334
Know-1	0.437	0.425	0.357	0.478	0.354	0.437	*0.899*	*0.685*	0.425	0.387	0.334	0.292	0.398	0.447	0.363	0.374	0.345	0.424	0.274
Know-2	0.430	0.436	0.392	0.490	0.365	0.432	*0.933*	*0.702*	0.438	0.439	0.347	0.337	0.444	0.483	0.377	0.411	0.403	0.467	0.326
Know-3	0.426	0.408	0.416	0.481	0.363	0.434	*0.956*	*0.711*	0.400	0.414	0.375	0.376	0.386	0.468	0.430	0.412	0.371	0.473	0.336
Know-4	0.429	0.417	0.409	0.485	0.323	0.451	*0.941*	*0.692*	0.404	0.385	0.377	0.348	0.399	0.461	0.424	0.430	0.364	0.476	0.313
Know-5	0.403	0.400	0.418	0.468	0.326	0.421	*0.930*	*0.678*	0.377	0.364	0.349	0.344	0.370	0.433	0.435	0.426	0.380	0.485	0.300
RelA-1	0.382	0.436	0.356	0.460	0.578	0.366	0.228	0.509	*0.703*	0.439	0.504	0.421	0.385	*0.617*	0.358	0.364	0.369	0.427	0.186
RelA-2	0.462	0.496	0.425	0.539	0.650	0.358	0.295	0.568	*0.795*	0.511	0.530	0.488	0.397	*0.685*	0.425	0.416	0.382	0.478	0.254
RelA-3	0.542	0.528	0.424	0.588	0.559	0.460	0.415	0.606	*0.888*	0.580	0.556	0.442	0.461	*0.745*	0.470	0.471	0.387	0.519	0.272
RelA-4	0.547	0.533	0.432	0.594	0.595	0.430	0.392	0.604	*0.913*	0.585	0.585	0.457	0.471	*0.767*	0.456	0.508	0.402	0.537	0.298
RelA-5	0.540	0.531	0.480	0.603	0.583	0.444	0.413	0.612	*0.906*	0.601	0.612	0.495	0.455	*0.779*	0.476	0.507	0.414	0.548	0.265
RelA-6	0.581	0.546	0.495	0.632	0.612	0.442	0.403	0.622	*0.905*	0.593	0.590	0.485	0.489	*0.775*	0.490	0.519	0.477	0.582	0.301
RelA-7	0.589	0.569	0.459	0.637	0.601	0.457	0.407	0.624	*0.902*	0.629	0.564	0.457	0.525	*0.779*	0.477	0.533	0.461	0.578	0.290
RelA-8	0.570	0.540	0.478	0.620	0.595	0.488	0.428	0.640	*0.861*	0.628	0.574	0.484	0.517	*0.771*	0.478	0.533	0.473	0.583	0.277
RelA-9	0.603	0.577	0.487	0.654	0.629	0.481	0.399	0.643	*0.883*	0.673	0.588	0.487	0.522	*0.794*	0.474	0.566	0.480	0.599	0.292
ComP-1	0.506	0.493	0.492	0.575	0.469	0.408	0.391	0.535	0.657	*0.899*	0.669	0.556	0.470	*0.801*	0.498	0.516	0.457	0.576	0.337
ComP-2	0.520	0.502	0.466	0.579	0.493	0.418	0.386	0.548	0.634	*0.933*	0.715	0.520	0.462	*0.808*	0.473	0.500	0.503	0.578	0.396
ComP-3	0.525	0.504	0.494	0.589	0.493	0.429	0.384	0.551	0.625	*0.947*	0.722	0.548	0.483	*0.819*	0.499	0.501	0.518	0.594	0.368
ComP-4	0.534	0.524	0.498	0.603	0.511	0.481	0.444	0.603	0.621	*0.954*	0.741	0.546	0.480	*0.824*	0.499	0.525	0.537	0.611	0.378
ComP-5	0.493	0.511	0.478	0.574	0.499	0.468	0.376	0.565	0.614	*0.928*	0.732	0.526	0.479	*0.809*	0.469	0.452	0.521	0.563	0.362
ComP-6	0.482	0.459	0.458	0.540	0.478	0.432	0.394	0.549	0.619	*0.904*	0.738	0.530	0.471	*0.805*	0.482	0.441	0.481	0.546	0.312
ComX-1	0.465	0.447	0.359	0.502	0.519	0.384	0.272	0.504	0.608	0.687	*0.831*	0.489	0.456	*0.763*	0.383	0.454	0.434	0.500	0.292
ComX-2	0.516	0.489	0.390	0.552	0.562	0.455	0.344	0.579	0.638	0.697	*0.866*	0.538	0.507	*0.802*	0.411	0.488	0.495	0.549	0.351
ComX-3	0.532	0.545	0.466	0.605	0.541	0.476	0.360	0.583	0.616	0.722	*0.919*	0.597	0.499	*0.824*	0.454	0.549	0.516	0.599	0.364
ComX-4	0.484	0.488	0.494	0.564	0.501	0.421	0.297	0.519	0.538	0.669	*0.910*	0.630	0.439	*0.778*	0.456	0.506	0.540	0.590	0.346
ComX-5	0.464	0.471	0.494	0.547	0.480	0.404	0.335	0.518	0.545	0.652	*0.884*	0.655	0.480	*0.779*	0.494	0.467	0.449	0.550	0.261
ComX-6	0.512	0.518	0.509	0.594	0.489	0.430	0.383	0.550	0.565	0.702	*0.891*	0.652	0.497	*0.803*	0.502	0.508	0.482	0.584	0.294
ComX-7	0.537	0.529	0.529	0.615	0.508	0.478	0.386	0.578	0.581	0.701	*0.928*	0.627	0.510	*0.817*	0.511	0.545	0.555	0.631	0.357
TraI-1	0.407	0.456	0.416	0.496	0.416	0.369	0.290	0.455	0.498	0.517	0.625	*0.934*	0.409	*0.686*	0.455	0.403	0.377	0.480	0.284
TraI-2	0.472	0.508	0.449	0.557	0.428	0.396	0.343	0.492	0.516	0.571	0.649	*0.945*	0.475	*0.726*	0.489	0.443	0.401	0.519	0.299
TraI-3	0.482	0.496	0.429	0.550	0.435	0.399	0.363	0.504	0.522	0.552	0.625	*0.963*	0.473	*0.719*	0.466	0.416	0.401	0.499	0.278
TraI-4	0.493	0.495	0.410	0.550	0.431	0.394	0.382	0.507	0.517	0.555	0.650	*0.949*	0.508	*0.729*	0.460	0.422	0.421	0.508	0.267

(*continued*)

Table AII.

	MarO	ConO	EntO	StrO	PriC	RisP	KnoW	FirC	RelA	ComP	ComX	TraI	ObsE	PerS	ProI	SerI	PssI	InnO	MEP
ObsE-1	0.549	0.603	0.397	0.622	0.402	0.497	0.343	0.514	0.447	0.467	0.536	0.454	*0.875*	*0.641*	0.432	0.430	0.520	0.540	0.331
ObsE-2	0.554	0.604	0.351	0.612	0.369	0.475	0.363	0.497	0.506	0.424	0.436	0.433	*0.923*	*0.626*	0.411	0.411	0.377	0.469	0.240
ObsE-3	0.585	0.612	0.445	0.653	0.367	0.503	0.428	0.532	0.518	0.496	0.521	0.477	*0.945*	*0.683*	0.429	0.465	0.457	0.530	0.266
ObsE-4	0.558	0.619	0.426	0.640	0.375	0.522	0.430	0.544	0.511	0.502	0.530	0.473	*0.932*	*0.681*	0.471	0.453	0.484	0.549	0.253
ObsE-5	0.559	0.614	0.398	0.631	0.345	0.488	0.398	0.503	0.518	0.453	0.470	0.422	*0.912*	*0.643*	0.429	0.410	0.430	0.495	0.249
ProI-1	0.481	0.524	0.603	0.606	0.476	0.392	0.401	0.536	0.533	0.415	0.449	0.413	0.449	0.549	*0.860*	0.487	0.403	*0.666*	0.319
ProI-2	0.389	0.477	0.631	0.553	0.439	0.366	0.348	0.488	0.451	0.461	0.466	0.427	0.395	0.532	*0.913*	0.491	0.468	*0.710*	0.317
ProI-3	0.484	0.553	0.588	0.617	0.445	0.399	0.407	0.525	0.537	0.434	0.441	0.442	0.447	0.557	*0.887*	0.489	0.383	*0.668*	0.311
ProI-4	0.388	0.481	0.590	0.544	0.375	0.368	0.375	0.468	0.430	0.473	0.460	0.434	0.396	0.528	*0.919*	0.492	0.512	*0.730*	0.324
ProI-5	0.412	0.504	0.625	0.574	0.411	0.397	0.395	0.504	0.458	0.499	0.472	0.469	0.420	0.557	*0.931*	0.494	0.512	*0.735*	0.332
ProI-6	0.469	0.544	0.652	0.624	0.406	0.453	0.450	0.542	0.519	0.486	0.475	0.465	0.463	0.581	*0.903*	0.538	0.505	*0.742*	0.312
ProI-7	0.398	0.474	0.653	0.561	0.351	0.360	0.362	0.448	0.411	0.521	0.477	0.450	0.410	0.544	*0.871*	0.520	0.570	*0.748*	0.337
SerI-1	0.505	0.515	0.446	0.573	0.415	0.387	0.352	0.485	0.517	0.382	0.436	0.346	0.443	0.521	0.457	*0.842*	0.433	*0.697*	0.295
SerI-2	0.530	0.535	0.479	0.602	0.429	0.404	0.363	0.502	0.539	0.421	0.459	0.368	0.441	0.548	0.476	*0.880*	0.473	*0.736*	0.298
SerI-3	0.571	0.539	0.543	0.637	0.484	0.455	0.440	0.578	0.564	0.474	0.507	0.437	0.443	0.594	0.489	*0.927*	0.579	*0.803*	0.368
SerI-4	0.530	0.509	0.563	0.611	0.444	0.448	0.432	0.554	0.522	0.503	0.532	0.426	0.411	0.587	0.517	*0.943*	0.629	*0.839*	0.350
SerI-5	0.553	0.539	0.569	0.637	0.443	0.496	0.383	0.551	0.463	0.510	0.562	0.410	0.427	0.579	0.525	*0.920*	0.659	*0.843*	0.391
SerI-6	0.594	0.569	0.588	0.673	0.428	0.480	0.463	0.569	0.549	0.502	0.517	0.425	0.463	0.601	0.534	*0.948*	0.603	*0.837*	0.352
SerI-7	0.580	0.569	0.585	0.666	0.423	0.459	0.411	0.538	0.548	0.510	0.540	0.425	0.440	0.605	0.555	*0.940*	0.648	*0.858*	0.355
SerI-8	0.526	0.526	0.550	0.614	0.412	0.449	0.362	0.511	0.472	0.523	0.551	0.396	0.390	0.573	0.513	*0.886*	0.707	*0.843*	0.418
PssI-1	0.535	0.537	0.485	0.606	0.487	0.473	0.407	0.573	0.536	0.483	0.524	0.409	0.491	0.596	0.405	0.608	*0.824*	*0.728*	0.427
PssI-2	0.459	0.463	0.481	0.538	0.441	0.386	0.341	0.494	0.411	0.479	0.483	0.363	0.382	0.516	0.464	0.603	*0.881*	*0.768*	0.467
PssI-3	0.560	0.524	0.508	0.616	0.511	0.483	0.385	0.580	0.508	0.477	0.528	0.380	0.484	0.581	0.479	0.601	*0.876*	*0.770*	0.500
PssI-4	0.408	0.434	0.480	0.503	0.370	0.378	0.260	0.424	0.359	0.438	0.463	0.334	0.387	0.479	0.461	0.541	*0.891*	*0.744*	0.479
PssI-5	0.491	0.489	0.543	0.580	0.412	0.426	0.344	0.495	0.418	0.494	0.484	0.362	0.432	0.531	0.473	0.569	*0.928*	*0.774*	0.493
PssI-6	0.481	0.488	0.544	0.576	0.398	0.423	0.359	0.493	0.406	0.500	0.485	0.375	0.436	0.532	0.529	0.588	*0.919*	*0.798*	0.463
PssI-7	0.537	0.536	0.561	0.627	0.454	0.461	0.399	0.550	0.463	0.513	0.516	0.415	0.479	0.576	0.527	0.576	*0.920*	*0.792*	0.485
PssI-6	0.481	0.488	0.544	0.576	0.398	0.423	0.359	0.493	0.406	0.500	0.485	0.375	0.436	0.532	0.529	0.588	*0.919*	*0.798*	0.463
PssI-7	0.537	0.536	0.561	0.627	0.454	0.461	0.399	0.550	0.463	0.513	0.516	0.415	0.479	0.576	0.527	0.576	*0.920*	*0.792*	0.485
MEP-1	0.332	0.322	0.319	0.376	0.254	0.291	0.325	0.360	0.251	0.320	0.312	0.280	0.283	0.345	0.333	0.346	0.455	0.444	*0.909*
MEP-2	0.350	0.342	0.350	0.401	0.276	0.268	0.299	0.352	0.265	0.371	0.346	0.287	0.282	0.373	0.338	0.350	0.476	0.455	*0.934*
MEP-3	0.377	0.331	0.348	0.406	0.300	0.293	0.291	0.370	0.318	0.375	0.350	0.286	0.250	0.387	0.334	0.372	0.493	0.471	*0.933*
MEP-4	0.348	0.343	0.356	0.401	0.278	0.286	0.281	0.352	0.291	0.394	0.367	0.312	0.306	0.401	0.342	0.362	0.517	0.478	*0.931*
MEP-5	0.316	0.294	0.331	0.358	0.293	0.259	0.274	0.347	0.316	0.318	0.307	0.228	0.236	0.348	0.274	0.337	0.436	0.412	*0.850*
MEP-6	0.342	0.343	0.370	0.402	0.280	0.323	0.328	0.385	0.295	0.360	0.341	0.247	0.259	0.368	0.333	0.357	0.512	0.471	*0.887*
MEP-7	0.304	0.295	0.331	0.354	0.257	0.286	0.301	0.349	0.251	0.294	0.268	0.232	0.222	0.308	0.301	0.331	0.457	0.427	*0.862*

	MarO	ConO	EntO	PriC	RisP	KnoW	RelA	ComP	ComX	TraI	ObsE	ProI	SerI	PssI	MEP
MarO	*0.854*														
ConO	0.726	*0.801*													
EntO	0.464	0.563	*0.879*												
PriC	0.469	0.500	0.427	*0.908*											
RisP	0.560	0.523	0.440	0.533	*0.857*										
KnoW	0.456	0.448	0.428	0.372	0.467	*0.932*									
RelA	0.623	0.613	0.521	0.693	0.507	0.439	*0.864*								
ComP	0.550	0.538	0.519	0.529	0.474	0.474	0.677	*0.928*							
ComX	0.564	0.560	0.521	0.578	0.490	0.382	0.657	0.776	*0.890*						
TraI	0.490	0.516	0.450	0.451	0.411	0.364	0.542	0.580	0.673	*0.948*					
ObsE	0.612	0.665	0.441	0.404	0.542	0.429	0.545	0.511	0.544	0.493	*0.918*				
ProI	0.479	0.565	0.691	0.460	0.435	0.435	0.529	0.525	0.516	0.494	0.474	*0.898*			
SerI	0.602	0.590	0.596	0.477	0.492	0.441	0.571	0.528	0.565	0.445	0.473	0.559	*0.911*		
PssI	0.556	0.556	0.578	0.492	0.485	0.400	0.496	0.542	0.558	0.423	0.495	0.536	0.654	*0.892*	
MEP	0.376	0.360	0.381	0.307	0.318	0.333	0.315	0.387	0.364	0.298	0.292	0.358	0.390	0.531	*0.902*

Table AIII.
Discriminant validity – Fornell-Larcker criterion

	MarO	ConO	EntO	PriC	RisP	KnoW	RelA	ComP	ComX	TraI	ObsE	ProI	SerI	PssI	MEP
MarO	–														
ConO	0.756	–													
EntO	0.484	0.595	–												
PriC	0.490	0.525	0.449	–											
RisP	0.601	0.563	0.472	0.570	–										
KnoW	0.476	0.469	0.445	0.387	0.497	–									
RelA	0.649	0.642	0.548	0.726	0.544	0.454	–								
ComP	0.572	0.562	0.544	0.551	0.503	0.442	0.702	–							
ComX	0.589	0.591	0.548	0.606	0.525	0.398	0.688	0.806	–						
TraI	0.511	0.543	0.472	0.473	0.440	0.378	0.566	0.601	0.701	–					
ObsE	0.641	0.700	0.464	0.423	0.583	0.447	0.570	0.532	0.569	0.514	–				
ProI	0.502	0.596	0.726	0.483	0.465	0.454	0.554	0.543	0.538	0.513	0.496	–			
SerI	0.623	0.616	0.620	0.497	0.521	0.455	0.592	0.542	0.584	0.459	0.493	0.578	–		
PssI	0.579	0.586	0.611	0.516	0.521	0.417	0.519	0.564	0.583	0.440	0.518	0.556	0.674	–	
MEP	0.391	0.377	0.401	0.321	0.340	0.346	0.327	0.400	0.378	0.309	0.304	0.372	0.402	0.553	–

Notes: MarO, market orientation; ConO, consumer orientation; EntO, entrepreneurial orientation; PriC, prior condition; KnoW, knowledge; RisP, risk taking; RelA, relative advantage; ComP, compatibility; ComX, complexity; TraI, trialability; ObsE, observability; ProI, product innovation; SerI, service innovation; PssI, process innovation; MEP, enterprise performance

Table AIV.
Discriminant validity – heterotrait-monotrait ratio (HTMT)

About the author
Dr Abdullah Al Mamun is a Senior Lecturer at the Faculty of Entrepreneurship and Business, University Malaysia Kelantan, Kota Bharu, Malaysia. Dr Abdullah Al Mamun is a Research Fellow at the GERIC, University Malaysia Kelantan. Dr Abdullah Al Mamun can be contacted at: abdullah.a@umk.edu.my