Interdisciplinary Journal of Information, Knowledge, and Management

An Official Publication of the Informing Science Institute InformingScience.org

IJIKM.org

Volume 16, 2021

THE IMPACT OF KNOWLEDGE MANAGEMENT ON FIRM INNOVATIVENESS VIA MEDIATING ROLE OF INNOVATIVE CULTURE – THE CASE OF MNES IN MALAYSIA

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ABSTRACT

Aim/Purpose	This paper aimed to examine the impact of knowledge management on firm innovativeness of multinational enterprises (MNEs) via the mediating role of innovative culture in Malaysia.
Background	Inadequate management practices and growing competition among MNEs operating in developing nations, notably in Malaysia, have hindered their organizational success. Although several studies have shown that knowledge management has a substantial impact on MNEs' success, it is not apparent if innovation at the company level has a direct impact on their performance. Thus, there is no definitive evidence between knowledge management with business innovativeness and organizational success.
Methodology	This study adopted a quantitative approach based on a cross-sectional survey and descriptive design to gather the data in a specific period. A convenient sampling approach was used to select 296 respondents from Malaysia-dependent MNEs of different industries. One of the advantages of this study methodology is that the sample targeted many fields. Afterward, SPSS AMOS 24.0 software package analysis was performed to test the hypotheses.
Contribution	The study contributes to knowledge management and firm innovativeness literature through advancing innovative culture as a mediating factor that accounts for the link between these two constructs, especially from an emerging economy

Accepting Editor Christine Nya-Ling TAN | Received: August 24, 2021 | Revised: October 5, October 9, 2021 | Accepted: October 9, 2021.

Cite as: Arokiasamy, A. R. A., Nguyen, K-L, Nguyen, H. T. N. (2021). The impact of knowledge management on firm innovativeness via mediating role of innovative culture – The case of MNEs in Malaysia. *Interdisciplinary Journal of Information, Knowledge, and Management*, *16,* 435-457. https://doi.org/10.28945/4873

	perspective. The research findings also offer managerial implications for organizations in their quest to improve firm innovativeness.
Findings	The results support that innovative culture significantly affects MNEs' performance. Innovative culture enhances the capability of MNEs to be innovative that finally leads to the superior performance of firm innovativeness.
Recommendations for Practitioners	According to this research, companies that exhibit an innovative culture, the acquisition of new information, the conversion of tacit knowledge into explicit knowledge, the application of knowledge, and the safeguarding of knowledge, all have a positive effect on their innovativeness. This means that for organizations to run an innovative MNE in Malaysia, a creative culture must be fostered since the current study has shown how it is seen as a catalyst that facilitates learning, transformation, and implementation of relevant knowledge.
Recommendations for Researchers	Future studies should be carried out in other sectors aside from the manufacturing sector using the same scales used to measure knowledge management. Furthermore, a comparative analysis of knowledge management and firm innovativeness using innovative culture as a mediator should be researched in other developing economies.
Impact on Society	While the main aim of this study was to better understand how and why MNEs operate the way they do, it had an indirect impact on the business and political tactics taken by CEOs and managers working in MNEs in developing countries, as this research has shown.
Future Research	Future research should employ the methodology presented in this study and pursue this in other sectors, such as emerging and developed nations' major businesses, to validate the results and further generalize the conclusions. Other methods should also be incorporated to investigate the other dimensions of MNEs' performance, including market orientation, technology orientation, and entrepreneurial orientation.
Keywords	knowledge management, firm innovativeness, innovative culture, MNEs, Malaysia

INTRODUCTION

Firm innovation is essential for multinational enterprises (MNEs) to remain relevant and competitive and be dominant players. This particular organizational attribute has been extremely relevant as a means of strategic edge within a business (Broch et al., 2020; Rubera & Kirca, 2012; X. Sun et al., 2014; Yousaf et al., 2020). MNEs have a propensity to gain access to information and technologies from others to improve their international productivity (Dibrell et al., 2011; Menguc & Auh, 2006). In this sense, firms differ in their degree of innovativeness because of the tension between the need to be innovative and the costs involved in making innovations happen (Prasad & Junni, 2017). Some scholars have recently explored the reasons why some firms are more innovative than others and have found that firm innovativeness is linked to organizational and managerial determinants (e.g., Prasad & Martens, 2015). Because of business competitiveness problems, MNEs have begun to use a firm innovativeness paradigm as well as to lessen business dependence on limited, inward-looking inventions. Multiple MNEs are actively involved in knowledge management (KM) by applying its strategies to utilize information both within their borders and internationally. MNEs like Digital Media Solutions (DMS), Lucent, Procter & Gamble, Intel, IBM, and Millennium Pharmacy are leaders in the introduction of firm innovativeness (Tsai & Yang, 2013). In an information-based economy, MNEs experience not merely the pressure of providing creative goods and services through successful usage of existing knowledge resources accessible to everyone (Martín-de Castro, 2015), but often

the pressure of capturing and exploiting the relevant knowledge beyond their borders (Oboreh, 2021; Soto-Acosta, et al., 2017). The firm's information-based view considers knowledge to be a competitive advantage from which the MNE can build demand while discovering and leveraging it by sound management and achieving a sustainable market share (Hörisch et al., 2015; Kearns & Sabherwal, 2006; Martínez-Román & Romero, 2017).

Firm innovativeness largely depends on how the firm owners react to an external or internal set of stimuli (Wong et al., 2016). There is little convergence on the factors that cause and affect innovativeness but, nevertheless, there is a common agreement that environmental and structural characteristics rather than individual characteristics play a significant role in determining firm innovativeness. Organizations are continuously pursuing opportunities to stay ahead of potential competitors, and one of the most sustainable strategies to remain successful is to arm oneself with knowledge. KM is known to be a systemic tool for the utilization of knowledge by a company (Esposito & Evangelista, 2016). Other academics regard KM as a coordinated mechanism for the processing of knowledge assets and strategies via the creation, distribution, and implementation of knowledge for the achievement of organizational objectives (Ali, 2021; Calabro et al., 2021; Nemati, 2002; Rahman et al., 2020). Knowledge is seen as a valuable asset that assists clients in acquiring unique resources and training for innovation. In addition to knowledge, technical competencies play an essential part in the organizations' quest for the creation of innovative goods or services that enable the organizations to achieve sustainable competitiveness (López-Torres et al., 2019).

As a consequence of the aggressive global competition, organizations have recognized the value of creativity in maintaining efficiency, sustainability, and results. It includes the successful use of innovative concepts and refers to the creation and application of knowledge (Jasimuddin & Zhang, 2014; Oboreh, 2021). The innovation phase relies primarily on knowledge, which characterizes an ecosystem that is much more concrete than details, records, and conventional reasoning (Y. Sun & Ding, Y., 2020). In addition, the previous report proposes the ability of KM to boost innovation and competition across numerous KM interventions (Byukusenge & Munene, 2017). Organizations that lack the right culture may find information exchange to be limited and challenging. This is because organizations are made up of workers and their requisite knowledge, and organizational culture is seen as an underlying influence that allows these workers to share the ideals, standards, and convictions of their beliefs and values. These standards would, in turn, shape the potential behaviors and attributes of workers. Moreover, it is highly probable for companies that rely on innovative culture to become strongly adaptable and efficient since they are required to effectively adopt revolutionary technologies, methods, or goods (Bendak et al., 2020; Leal-Rodríguez et al., 2013).

Despite the values of KM and the organizations' appreciation of such values, many of such KM programs have collapsed due to numerous reasons such as the insufficient implementation of the KM plan, over-reliance on digital technologies, and lack of knowledge of the consequences of KM. From the Malaysian point of view, researchers (Wong et al., 2016; Zailani et al., 2014) find that perhaps the idea of KM is still relatively nascent, with Malaysia's companies falling behind other nations in embracing KM because some organizations are unaware of its benefits. The firms have a challenge of developing the innovation competence for defining their competitive landscape. The challenge is more for the firms in developing countries where the scope for incubating the innovations by the firms is under the intense pressure of competitive performance. The consequences of non-innovativeness will hinder companies' capacity to adjust and adapt successfully to the shifting and complex dynamics of the business world, and thus minimize the organizations' ability to attain outstanding success (Delshab et al., 2020). These companies would find it difficult to produce their goods efficiently, culminating in low results, hence struggling to attain outstanding efficiency and retain a competitive edge (Arokiasamy, 2012; Donate & Guadamillas, 2015; Rahman et al., 2020).

Malaysia has a population of 32.8 million people, and there is a need to concentrate on MNEs in Malaysia since these businesses are generally considered important contributors to creating employment and economic growth (World Bank, 2015). There is a lack of studies that have been undertaken in

developing nations, particularly in terms of MNEs. MNEs are required to develop and implement business orientation concepts into their firms to deal with the problems of changing business environment. In the existing literature, the importance of knowledge management has been recognized in forecasting firm innovativeness. However, a review of previous research reveals that the concepts of knowledge management, innovative culture, and firm innovation are often studied separately or in pairs instead of all together in one framework. This research, therefore, aims to explore the influence of KM, in terms of "knowledge acquisition, knowledge conversion, knowledge application, and knowledge protection," on the enhancement of firm innovation, while being among the first to investigate if such relationship is moderated by an innovative culture. Thus, the current research sought to bridge the literature gaps by gaining a detailed understanding of the role of innovative culture in the relationships between firm innovativeness and knowledge management.

In the next sections, we will review the literature and hypotheses development before laying out the research methodology. Afterward, we will report the results and, finally, the paper ends with a discussion of findings, conclusion and managerial implications, limitations, and directions for future research.

LITERATURE REVIEW

FIRM INNOVATIVENESS

Firm innovation is seen as an organization's potential in engaging in creative practices, often as the implementation of improved goods or facilities, new processes, or new approaches (Ratchukool & Igel, 2018). In doing so, such creative businesses frequently incorporate product development and participate in innovative practices that enhance the efficiency of new goods, technology, and procedures. Innovation is assumed to be the engine that pushes companies into global superiority (Yuan et al., 2014), and the willingness of the corporation to evolve helps it to continually reshape and change in a dynamic market setting. In addition, it has also been repeatedly demonstrated that firm innovation is a major source of improved results for companies (Kalyar & Rafi, 2013; Sankowska & Paliszkiewicz, 2016).

KNOWLEDGE MANAGEMENT

Knowledge management relates to the recognition, introduction, dissemination, and development of knowledge within the enterprise (Ammirato et al., 2020). It entails the methods of understanding, collecting, and synthesizing essential evidence, facts and expertise from structured and unstructured data to allow organizations to make responsible choices. KM is a comprehensive mechanism that allows workers to receive and review information seamlessly, which will contribute to the increased efficiency of those workers through freshly gained skills and knowledge (Alolayyan et al., 2020; Bouncken & Pyo, 2002; Chong & Chong, 2009; Ode & Ayavoo, 2020). To be more specific, KM can play an essential role in supporting and nurturing innovation. Thus, it can be said that efficient KM can contribute to the enhancement of a business's competitive advantages, customer focus, employee relations and development, innovation, and reducing costs. By designing and implementing a system of knowledge sharing, firms are forced to make changes in the traditional operation mindset concerning managing intellectual property and employee working styles by adopting new processes, disciplines, and cultures as a result of constituting organizational innovation. In this vein, the knowledge management method is split into four components, which are "knowledge acquisition, knowledge conversion, knowledge application, and knowledge protection" (Antunes & Pinheiro, 2020; Kmieciak & Michna, 2018). The present study adopted this framework to investigate KM through these four key components.

Innovative Culture

An innovative culture is defined as a set of ideals and beliefs that motivate organizations to be groundbreaking, which also generate a tradition of creativity, receptivity to suggestions, and openness in decision-making (Toaldo et al., 2013). The correlation between innovative culture and innovation has been found in earlier research (Gabaldón-Estevan & Ybarra, 2017; Khan et al., 2019; Park et al., 2016). While organizations that encourage innovative practices will contribute to creativity that goes beyond traditional or repetitive standards, innovative culture can be seen as a leading indicator that promotes such an organization's willingness to be inventive. In order to maintain a creative culture, companies are expected to establish a basis for creativity, which stems from the need for constant improvements in the organization's operations. Such foundations would help to promote an accepting culture and guide organizations in cycles of periodic transition (Choi & Choi, 2014; Seddighi & Mathew, 2020). An innovative culture that harmonizes innovation may encourage workers to set a high level of standards that enhances the development of innovative goods and processes. In addition, a creative community amplifies the scale of inspiring workers and motivates everyone to be inventive and to improve their capacity to produce new goods and resources (Madrid-Guijarro et al., 2009).

Hypotheses Development and Conceptual Framework

This paper explores the idea of how efficient knowledge management helps an enterprise to turn knowledge resources into functionality – firm innovativeness in this case. Burkhard et al. (2011) posit that KM demonstrates the recognition and usage of expertise in an organization that helps the organization to enhance productivity. Their research emphasized the significance of KM in the operations of organizations and pointed to the reality that learning and growth practices improve efficiency.

Research by Jasimuddin and Zhang (2014) recommends that perhaps the emergence of fresh concepts, including the use of knowledge in organizations, makes it possible for companies to be more creative, productive, and profitable across the advancement of internal knowledge structures. Therefore, a thorough examination of the principles of KM and creativity could bring to light how these concepts are necessary to assist companies in improving their business performance. In addition, it is suggested that KM will facilitate organizations in making crucial choices efficiently by timely supplying workers with the relevant details (Mingers, 2008). Recent studies (Bibi et al., 2021; Kanter, 1999) found that KM contributes to increased innovative technology efficiency and performs a significant part in improving innovation in software companies. Through introducing KM, innovation in companies will be extended, and the utilization of KM could allow organizations to gain strategic advantages (Baskerville & Dulipovici, 2006). This means that the organizations' ability to gain and retain competitive advantages depends on how they use and handle the information in their hands. In addition, this underlines that KM has a significant effect on creativity, which suggests that companies can make attempts to build information channels and increase knowledge sharing amongst workers to allow the gained expertise to be utilized by workers to improve creative processes in organizations (Harrington et al., 2019).

This paper hypothesizes that KM would have a significant effect on firm innovativeness. For organizations to be creative, management will have to gain expertise, regardless of whether externally or internally. Therefore, the more expertise is gained, the more poised the organizations would be to be inventive. The gained expertise will then have to be translated and extended throughout the organization. In addition, information inside the organization must be well preserved as it is perceived to be a valuable resource (Okunoye & Karsten, 2002). Through safeguarding knowledge, companies may make use of it to get ahead in the business competition. The assumption of this theory would therefore be: Knowledge management has a positive impact on innovative culture and firm innovativeness. Centered on the theories formulated, this research will examine knowledge management through four different perspectives, i.e., knowledge acquisition (H1), knowledge conversion (H2), knowledge

application (H3), and knowledge protection (H4), in their relationships with an innovative culture. Consistent with extant literature, it is expected that innovative culture will be positively associated with firm innovativeness (H5).

H_1: Knowledge acquisition has a meaningful positive effect on innovative culture.

H_2: Knowledge conversion has a meaningful positive effect on innovative culture.

H_3: Knowledge application has a meaningful positive effect on innovative culture.

H_4: Knowledge protection has a meaningful positive effect on innovative culture.

H_5: Innovative culture has a meaningful positive effect on firm innovativeness.

The Mediating Effects Of Innovative Culture

An innovative culture is dedicated to promoting the development of new or improved goods and services by supporting innovation while encouraging members of organizations to make use of their imagination in seeking out new things and pursuing fresh ideas (Gabaldón-Estevan & Ybarra, 2017; Tomasova, 2020). This form of culture is encouraging, output-oriented, optimistic, and risk-taking while serving as a central connection between knowledge-based assets and creativity. According to Park et al. (2016), innovative culture is a complicated collection of corporate ideals, standards, obligations, and traditions that would have an effect on the firm's innovation if it is properly implemented. As such, an innovative culture can affect workers who are constructive in the use of complex technologies for the production of new products. Rooted culture and values inside the company could further steer employee actions towards novelty (Choi & Choi, 2014).

In addition, information can easily be exchanged by workers across an innovative culture, and such exchange could eventually encourage the development of new innovations that will contribute to improved results (Toaldo et al., 2013). In that similar vein, innovative culture can be critical to connecting technical knowledge-based resources and creativity, as the attitude towards technology use is vital to the effective utilization of the organization's resources and skills (Khan et al., 2019; Park et al., 2016). Improved performance and productivity can be achieved through the application of ideas, new discoveries to the development of products or new services, managerial strategies, procedures, work methods, and technology (Chahal & Bakshi, 2015). Therefore, innovation is an essential instrument for adapting to a rapidly changing business environment (Aboramadan et al., 2019) because it is capable of playing an important role in improving organizational performance and maintaining its competitive advantage (Bari & Fanchen, 2017). The theory is then proposed that the beneficial connection regarding knowledge management and firm innovation can be strengthened when the culture of innovation is vital. With implicit assumptions established, this analysis would examine the mediator function of creative culture in the relationship between information management and firm innovation from four KM viewpoints, i.e., knowledge acquisition (H6), knowledge conversion (H7), knowledge application (H8), and knowledge protection (H9).

H_6: Innovative culture has a meaningful mediating effect between knowledge acquisition and firm innovativeness.

H_7: Innovative culture has a meaningful mediating effect between knowledge conversion and firm innovativeness.

H_8: Innovative culture has a meaningful mediating effect between knowledge application and firm innovativeness.

H_9: Innovative culture has a meaningful mediating effect between knowledge protection and firm innovativeness.

Figure 1 shows the theoretical model of the current study.

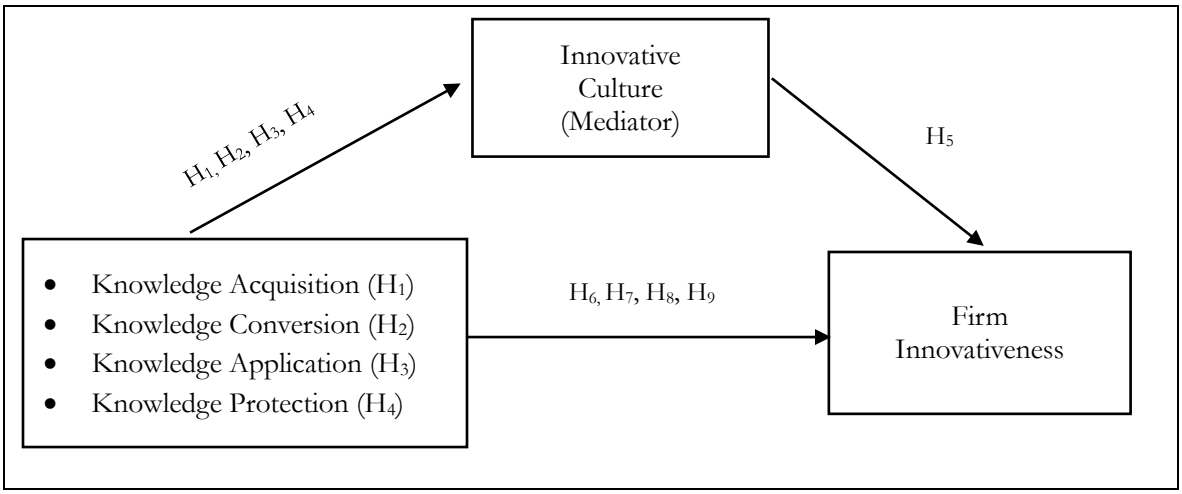

Figure 1. The conceptual framework

METHODOLOGY

MEASURING INSTRUMENTS

In this study, we adopted the use of the 44-item scale by Gold et al. (2001) to quantify KM, which is divided into four components, i.e., knowledge acquisition, knowledge conversion, knowledge application, and knowledge protection. Each component includes 10-12 items, such as "My organization generates new knowledge from existing knowledge" (knowledge acquisition), "My organization converts competitive intelligence into plans of action" (knowledge conversion), "My organization applies knowledge learned from experiences" (knowledge application), and "My organization protects knowledge from inappropriate use outside the organization" (knowledge protection). Respondents were asked to assess their level of agreement with such statements on a 7-point Likert scale (1 = strongly disagree to 7 = strongly agree). The Cronbach's alpha for this scale is 0.87, suggesting high internal consistency. To measure innovative culture, this study applied a 5-item scale by Ungan (2007), with items such as "The people in my organization are encouraged to try new and better ways of doing their jobs" and "Innovation is highly rewarded in our organization." This scale was also rated on a 7-point Likert scale of agreement (1 = strongly disagree, 7 = strongly agree). The internal consistency reliability (Cronbach's alpha) for this scale is 0.83.

Lastly, firm innovation was measured using a 5-items scale developed by Calantone et al., (2002). The scale included statements such as "Our organization frequently tries out new ideas" and "Our organization seeks out new ways to do things," which were measured on a 7-point Likert scale (1 = strongly disagree, 7 = strongly agree) and had a Cronbach's alpha of 0.79.

RESEARCH SETTING

The purpose of the paper is to explore how global corporations handle their knowledge management, innovative culture, and firm innovativeness. A cross-sectional design was introduced, in which data was obtained from a sample of subsidiaries of corporations headquartered in Malaysia using a structured survey. There are three explanations for conducting research in this sense. Firstly, innovative culture is relatively new to Malaysia's innovation research environment, so the analysis of firm innovativeness and innovation culture in Malaysia is still in the infancy stage. Furthermore, the Malaysian Government is promoting better communication of data and technology from public science to corporate companies. Finally, Malaysia's goal in the 21st century was to open creativity to foreign cooperation in order to improve economic growth and prosperity (Bamgbade et al., 2019; Diez & Kiese, 2006).

Sample and Data Collection

The OECD classifies businesses into two categories. The first category consists of high-tech industrial and manufacturing businesses, including the electronics, aviation, and biotechnology sectors, and the second category consists of knowledge-intensive and financial institutions, including the educational, telecom, banking, and information services businesses. The businesses studied in this analysis are from the first group, i.e., high-tech firms in the industrial industry, as per OECD classifications (Diez & Kiese, 2006). A convenient sampling approach is used to collect data from 296 respondents from Malaysia-dependent MNEs of different industries. One of the advantages of this study methodology is that the sample could target many fields. Consequently, future generic source problems have been minimized. The multi-industry sampling architecture, which included automotive components, bioengineering, drug companies, chemical diagnostic supplies, machines, processed oil and gas, timber steel plant, and electrical industries, has also helped to extend the generalizability of results (Xu et al., 2019).

The data was collected from October 2019 to December 2019. There were deliveries of 600 questionnaires, and 490 were returned. Of the 490 survey questionnaires received, a total of 180 questionnaires were discarded because the respondents only mailed the postal packet in late February 2020. Around 14 responses had missing information, either because they were not interested or serious in the survey and had to be removed from the total tally. Given the timeline of data collection from October to December 2019, there were 296 valid answers selected with a 60.4 percent successful response rate. To avoid any biases, we decided not to include the late responses received from the survey. This research aimed to study participants that have adequate awareness of KM acquisition, knowledge conversion, knowledge application, and knowledge protection in their organization. The survey questions were sent to participants with a covering letter outlining the purpose of this study. The kit contained an automatically addressed postal packet. In the event that a participant decided to participate in the questionnaires online, a website address of the online questionnaire version was also included in the letter (Marinagi et al., 2015).

Table 1. Sample demographic variables

Variables	Values	Frequency	Percentage
Gender	Male	198	67
	Female	98	33
Age	19-23	1	0.3
	24-29	65	22.1
	30-39	100	33.6
	40-49	86	29.2
	≥50 years	44	14.9
Education	Higher Diploma	162	54.6
	Undergraduate degree	100	33.8
	Postgraduate degree	33	11.2
	PhD degree	1	0.4
Shift Work	12-hours rotating shift work	152	51.3
	8-hours shift (9am-5pm)	144	48.7
Working Experience	≥1 but less than 3 years	56	18.8
	≥3 but less than 5 years	97	32.7
	≥5 but less than 10 years	81	27.4
	≥10 years	62	21.1
Position	Clerical/Administrative	48	16.3
	Junior Manager	58	19.7
	Middle Manager	65	21.8
	Senior Manager	70	23.6
	Specialists	34	11.7
	Others	20	6.9

Variables	Values	Frequency	Percentage
Firm Age	0-10 years	39	13.2
	11-20 years	87	29.4
	21-30 years	93	31.3
	31-40 years	49	16.4
	Above 40 years	29	9.7
Market Orientation	Local/National	85	28.6
	Regional	145	49.1
	Global	66	22.3
Firm Ownership	100% foreign owned subsidiaries	157	52.9
	Mixed ownership (joint venture)	139	47.1
Industry	Aircraft and spacecraft	12	4.2
	Pharmaceuticals	28	9.3
	Office, accounting, computing	27	9.1
	Communications equipment	43	14.4
	Biotechnology	25	8.6
	Electrical machinery and apparatus	68	22.9
	Motor vehicles	41	13.7
	Transport and railroad equipment	18	6.2
	Others	34	11.6

Table 1 indicates that the respondents came from different sectors with the highest responses from the electric manufacturing equipment (22.9%) and telecommunications equipment (14.4%) sectors. The responses of top executives and business managers were 23.6% and 21.8%, respectively. Most respondents had worked at their "current" organizations for a duration of 3-5 years (32.7%). At the organizational level, most of the sampled organizations have operated for 21-30 years (31.3%). Many of these companies have a regional business focus (49.1%) and were wholly foreign-owned branches (52.9%).

Data Analysis

This study uses SPSS AMOS 24.0 software package (Hair et al., 1998; Kock & Hadaya, 2018) to analyze data and test the model. Particularly, the structural equation modeling (SEM) is utilized in the whole study to evaluate the connections among the concepts (i.e., knowledge management, innovative culture, and firm innovativeness) as well as to evaluate the probabilistic strength of its framework. SEM can handle multiplicity, from which integrated measurements are based on the compositional set of connections. This methodology is used to evaluate the research framework and predictions. In addition, it incorporates a dual emphasis on the estimation of systemic interactions between constructs and the calculation of latent, observed indicators (Gunzler et al., 2013). The observation of the track coefficients (direct and indirect effects from latent variables), the lineup of the whole framework, and the bootstrapped ratings of Tubadji and Nijkamp (2015) will be provided through our functional model measurement.

RESULTS

Non-Response Bias and Common Method Variance

The *t*-test was used to assess the non-response bias in the results. Comparative analysis is provided regarding all factors around 40 fast and 40 delayed reactions. Zero substantial variations ($p > .05$) have been established, contributing to the inference that the results are clear from non-response bias. Likewise, we have taken steps from the implementation phase of the list of questions, namely psychological separators (Podsakoff et al., 2003), to mitigate any possible consequences of common method bias. All the calculation objects were subject to a CFA in which the numbers of variables were reduced to 1. The method allowed the researchers to incorporate all perceptually evaluated variables

into a variable study in order to identify a non-rotated factor approach and define the number of variables required to compensate for factor variance (Podsakoff et al., 2003). The analysis of variance approach being evaluated, and a specific item were produced, which described far less than 50 percent of the variation, indicating a lack of common method bias. To validate this result, we built a typical latent factor and loaded all the products onto this factor. The evaluation of this model showed a low fitness of the model: χ^2/df=3.12, CFI=0.703, and RMSEA=0.11 (Hair et al., 2013). Therefore, the data is deemed free from common method bias (Podsakoff et al., 2003).

Instrument Validation

CFA was applied to calculate the efficiency, discriminatory validity, and probabilistic accuracy of the method while evaluating the measurement model. This study adopted Hair et al. (2017) and MacKenzie et al.'s (2005) rule of thumb, which dictates that only items with loadings of 0.50 or above should be retained. Table 2 shows that the loadings of this study's items, which range from 0.557 to 0.888, are all above 0.50, and therefore every item was retained. Besides, the composite reliability scores, which range from 0.812 to 0.952, all well pass the Hair et al.'s (2017) threshold of 0.70. In addition, Table 2 also shows the AVE scores of 0.619 – 0.739, hence meeting Hair et al.'s (2017) threshold of 0.50 and above. Lastly, as mentioned in the "Measuring Instruments" section above, the Cronbach's alphas of this study's scales range from 0.79 to 0.87. Hence, in conclusion, the psychometric properties of the research model were ascertained by confirming the internal consistency reliability and convergent validity (Ab Hamid et al., 2017).

Table 2. Results of instrument validation

Construct	Measurement Items	Loadings	AVE	CR
Knowledge Acquisition	KQ1: My organization acquires knowledge about our customers	0.597	0.643	0.898
	KQ2: My organization generates new knowledge from existing knowledge	0.725		
	KQ3: My organization acquires knowledge about our suppliers	0.581		
	KQ4: My organization uses feedback from projects to improve subsequent projects	0.714		
	KQ5: My organization distributes knowledge throughout the organization	0.677		
	KQ6: My organization exchanges knowledge with our business partners	0.712		
	KQ7: My organization collaborates with other organizations	0.662		
	KQ8: My organization acquires knowledge about new products/ services within our industry	0.608		
	KQ9: My organization acquires knowledge about our competitors within our industry	0.713		
	KQ10: My organization has the ability to benchmark the organizational performance compared to the industry	0.655		
	KQ11: My organization identifies best practices for the company	0.761		
	KQ12: My organization exchanges knowledge between employees	0.666		
Knowledge Conversion	KC1: My organization converts knowledge into the design of new products/services	0.557	0.629	0.812
	KC2: My organization converts competitive intelligence into plans of action	0.713		
	KC3: My organization filters knowledge that is acquired	0.745		
	KC4: My organization transfers organizational knowledge to individuals	0.765		
	KC5: My organization absorbs knowledge from individuals into the organization	0.633		
	KC6: My organization absorbs knowledge from business partners into the organization	0.692		
	KC7: My organization distributes knowledge throughout the organization	0.778		
	KC8: My organization integrates different sources and types of knowledge	0.811		
	KC9: My organization organizes knowledge	0.713		
	KC10: My organization replaces outdated knowledge	0.699		

Construct	Measurement Items	Loadings	AVE	CR
Knowledge Application	KA1: My organization applies knowledge learned from mistakes	0.771	0.662	0.922
	KA2: My organization applies knowledge learned from experiences	0.786		
	KA3: My organization uses knowledge in the development of new products/services	0.589		
	KA4: My organization uses knowledge to solve new problems	0.713		
	KA5: My organization matches sources of knowledge to problems and challenges	0.605		
	KA6: My organization uses knowledge to improve efficiency	0.801		
	KA7: My organization uses knowledge to adjust strategic direction	0.706		
	KA8: My organization is able to locate and apply knowledge to changing competitive conditions	0.778		
	KA9: My organization makes knowledge accessible to those who need it	0.764		
	KA10: My organization takes advantage of new knowledge	0.649		
	KA11: My organization quickly applies knowledge to critical competitive needs	0.765		
	KA12: My organization quickly links sources of knowledge in solving problems	0.734		
Knowledge Protection	KP1: My organization protects knowledge from inappropriate uses inside the organization	0.762	0.639	0.952
	KP2: My organization protects knowledge from inappropriate use outside the organization	0.687		
	KP3: My organization protects knowledge from theft from within the organization	0.887		
	KP4: My organization protects knowledge from theft from outside the organization	0.817		
	KP5: My organization provides incentives to employees who protects knowledge	0.653		
	KP6: My organization has technology that restricts access to some sources of knowledge	0.742		
	KP7: My organization has extensive policies and procedures for protecting trade secrets	0.822		
	KP8: My organization values and protects knowledge embedded in individuals	0.863		
	KP9: My organization has restricted knowledge that is clearly identified	0.844		
	KP10: My organization clearly communicates the importance of protecting knowledge	0.811		
Innovative Culture	IC1: The people in my organization are encouraged to try new and better ways of doing their jobs	0.866	0.739	0.942
	IC2: Innovation is highly rewarded in our organization	0.787		
	IC3: Trying new ways of solving problems is encouraged in our organization	0.901		
	IC4: Our organization's culture allows people to be creative	0.827		
	IC5: In our organization, change is viewed as a positive factor which brings new opportunities	0.888		
Firm Innovative-ness	FI1: Our organization frequently tries out new ideas	0.876	0.619	0.87
	FI2: Our organization seeks out new ways to do things	0.687		
	FI3: Our organization is creative in its methods of operation	0.870		
	FI4: Our organization is often the first to market with new products and services	0.822		
	FI5: Our new product introduction has increased over the last 5years	0.788		

Notes: AVE = Average Variance Extracted, CR = Composite Reliability

Table 3 explains the unequal validity of the constructs. In deciphering the discriminatory validity, AVE was squared embedded in opposition to the inter-correlation of the prototype as a way of verifying the discriminatory viability of the model (Halpin et al., 2014). The findings indicate that the root of the AVE square exceeded the association with other parameters.

Table 3. Discriminant validity HTMT of measurement model

Constructs	KQ	KC	KA	KP	FI	IC
Knowledge Acquisition	-					
Knowledge Conversion	.764	-				
Knowledge Application	.759	.797	-			
Knowledge Protection	.562	.566	.632	-		
Firm Innovativeness	.489	.435	.443	.512	-	
Innovative Culture	.399	.467	.511	.538	.744	-

Note: KQ = Knowledge Acquisition, KC = Knowledge Conversion, KA = Knowledge Application, KP = Knowledge Protection, IC = Innovative Culture, FI = Firm Innovativeness.

Results of Model Assessment and Hypothesis Testing

In order to validate the conceptual model and to evaluate the suggested theories leveraging the AMOS application software 24.0, two parameters must be regarded and interpreted: the coefficients of determinations (R^2) to be calculated for the intrinsic structures, and the direction coefficients (Young, 2000). The path coefficients must be substantial, although the R^2 value can differ based on the study field. In the evaluation of R^2, the values of 0.19, 0.33, and 0.67 are rated as minor, reasonable, and major (Young, 2000). In this study, the R^2 of firm innovativeness is at the level of 0.353.

Table 4 displays the findings of hypotheses testing in terms of structural interactions between variables. For Hypothesis 1, the researchers looked at the connection between knowledge acquisition and innovative culture. As seen in Table 4, the influence of knowledge acquisition on innovative culture (β=0.189; p<0.05) is important, hence H_1 is supported.

Table 4. Summary of path coefficient and hypotheses testing

Hypothesis	Relationship	β-value	Std. Error	t-Values	p-Value	95% LL	95% UL	*Effect Size (f^2)*	Decision
H1	KQ-IC	0.189	0.076	2.796*	0.002	0.064	0.318	0.096	Supported
H2	KC-IC	0.272	0.069	2.696*	0.001	0.057	0.127	0.078	Supported
H3	KA-IC	0.416	0.077	2.832*	0.000	0.113	0.326	0.066	Supported
H4	KP-IC	0.232	0.066	1.876**	0.006	0.163	0.429	0.074	Supported
H5	IC-FI	0.376	0.068	2.236*	0.003	0.069	0.338	0.091	Supported
H6	KQ-IC-FI	0.178	0.071	2.676*	0.002	0.157	0.409	0.093	Supported
H7	KC-IC-FI	0.234	0.072	1.098**	0.005	0.098	0.379	0.075	Supported
H8	KA-IC-FI	0.378	0.065	3.096*	0.001	0.055	0.355	0.088	Supported
H9	KP-IC-FI	0.204	0.075	2.116*	0.002	0.178	0.299	0.067	Supported

*Note: KQ = Knowledge Acquisition, KC = Knowledge Conversion, KA = Knowledge Application, KP = Knowledge Protection, IC = Innovative Culture, FI = Firm Innovativeness. * p<0.05, ** p<0.01*

The findings of Hypothesis 2 testing indicate that the association between knowledge conversion and innovative culture (β=0.272; p<0.05) is substantial; therefore, H_2 is also accepted. Similarly, Hypothesis 3 test results indicated that the application of knowledge promotes innovative culture (β=0.416; p<0.05), thereby endorsing H_3. Hypothesis 4 is also supported since results suggest that knowledge protection does have an important and optimistic association (β=0.232; p<0.01) with an innovative culture. Lastly, Hypothesis 5 test results also point out that the innovative culture (β=0.376; p<0.05) strengthens firm innovativeness and thereby supports H_5.

Mediating Effects

The structural model fitness was measured so that the hypotheses H_6, H_7, H_8, and H_9 were evaluated. Centered on Hair et al.'s (2013) recommendations, an appropriate model equation was collected: Chi-

square=833.27; df=516; ratio=1.67; CFI=0.921; RMSEA=0.070. Next, we checked the direct association between knowledge management parameters (KQ, KC, KA & KP) and firm innovativeness. Testing of hypotheses 6 (β=0.419; p<0.01), 7 (β=0.332; p<0.01), 8 (β=0.511; p<0.01), and 9 (β=0.228; p<0.01) all projected favorable interactions with firm innovativeness, hence these 4 hypotheses were assisted. These four models indicated a major mediating impact of the innovative culture on the partnership among knowledge management and firm innovativeness. In the interests of rigor, we adopted two methods of mediation research. First, the conventional method of Baron and Kenny (1986) was used. The findings are presented in Table 5, which show that the important indirect impacts of knowledge acquisition (β=0.312; p<0.01), knowledge conversion (β=0.136; p<0.01), knowledge application (β=0.378; p<0.01), and knowledge protection (β=0.192; p<0.01) on firm innovativeness are all substantially diminished when the innovative culture (mediator) is implemented throughout the framework. This large decline suggests complete mediation by Baron and Kenny (1986).

Table 5. Direct, indirect and total effects analysis

Path	Direct Effect	Indirect Effect	SE	LL95% CI	UL95%CI
KQ→IC→FI (H_6)	0.419**	0.312**	0.03	[0.11]	[0.28]
KC→IC→FI (H_7)	0.332**	0.136**	0.04	[0.18]	[0.34]
KA→IC→FI (H_8)	0.511**	0.378**	0.03	[0.13]	[0.31]
KP→IC→FI (H_9)	0.228**	0.192**	0.05	[0.09]	[0.18]

*Note: N=296, KQ = Knowledge Acquisition, KC = Knowledge Conversion, KA = Knowledge Application, KP = Knowledge Protection, **p < 0.01*

Second, we used another approach that Preacher and Hayes (2008) proposed after Baron and Kenny's (1986) method was lately questioned. In this approach, we employed the bootstrapping system with bias-corrected confidence estimates to determine the mediating function of innovative culture utilizing the process macro (Hayes, 2013). The lower and upper limit confidence intervals (LLCI & ULCI) were therefore established for the implicit impacts of knowledge acquisition, knowledge conversion, knowledge application, and knowledge protection on firm innovativeness. It was found that with 10,000 bootstraps resamples, the confidence interval for the indirect impact of knowledge acquisition [LLCI=0.11; ULCI=0.28], knowledge conversion [LLCI=0.18; ULCI=0.34], knowledge application [LLCI=0.13; ULCI=0.31], and knowledge protection [LLCI=0.09; ULCI=0.18] did not contain zero. The mediation in the bootstrapped confidence interval method includes omitting zero from the confidence interval for unstandardized indirect effect outcomes. Although in this situation, the upper and lower limit confidence ranges do not include zero among them, it is inferred that the indirect impact is substantially different from zero at p<0,01, which implies that the innovative culture mediates the relationship between knowledge acquisition, knowledge conversion, knowledge application, knowledge protection, and firm innovativeness (see Table 5). This shows the existence of complete mediation and supports the findings obtained earlier using Baron and Kenny's (1986) process. The results of this analysis confirm the assumptions that innovative culture strengthens the positive relationship among all four knowledge management variables (H_6, H_7, H_8 & H_9) and firm innovativeness (see Table 5).

FINDINGS AND DISCUSSION

The above results have underscored significant observations of the linkages proposed in the current study, as seen in Tables 4 and 5. This study's supported H_1 was corroborated by the previous research performed by Smedley (2010), which also proved the impact of knowledge acquisition on innovative culture. The H_2 results indicate that information conversion practices influence the creative community. One approach to sustain awareness conversion that will promote innovative culture is by practices like face-to-face conversation and observational learning (Choo, 2003). Knowledge transfer includes tasks performed by workers to update the old information within the company with current information. Since employees of high-tech industrial and manufacturing MNEs are usually

technologically savvy, it is highly likely that the employees themselves would be held up to date with current knowledge in the attempt to be adequately prepared to perform at work (Marm-Garcia & Zarate-Martinez, 2007; Nonaka & Toyama, 2003). In addition, these workers are often technologically oriented and might have the perception that the on-the-job phase of new skills transfer, such as coaching, is essential and important.

Next, this study's H_3 results are in line with Jasimuddin and Zhang's (2014) reports, which demonstrate that the implementation of knowledge accelerates the transition of knowledge into a creative society. Indisputably, the results of this study also reinforce the work of others who have established that the implementation of information is a significant indicator of creative culture (Racherla et al., 2008). Similarly, H_4 results are in conformity with previous findings, which showed that the security of information has a significant effect on creative culture (Väyrynen et al., 2013). The findings confirm Chang et al.'s (2017) studies, which demonstrate that information security enables organizations to develop a structured contact line by a creative process, like the assignment of technical communicative coding on the responsibilities and duties of organizations. At the same time, organizations must regulate and create appropriate rules for the security of information and offer workers a creative and technical framework that avoids unauthorized exposure to knowledge (Moser & Deichmann, 2020). On the other hand, the H_5 results are consistent with a study by Jun et al. (2020), which found that innovative culture is moving organizations towards innovation, as well as by Brettel et al. (2015), who recommended that innovative culture strengthen this organizational attribute.

The study's proposed mediating relationships, as manifested by H_6, H_7, H_8, and H_9, have all been supported. As companies practice high levels of innovative culture, they increase inventive activities inside the company (Gabaldón-Estevan & Ybarra, 2017). By gaining knowledge, this will have a beneficial influence on firm innovativeness, and as a direct consequence, innovative culture will intensify this influence. Previous research has demonstrated how that expertise gained by consumers, trading associates, and vendors could theoretically strengthen the technical capabilities of the company and facilitate the production of innovative technologies and promote the development of technical capabilities within the organization (Singh & Soltani, 2010). The findings of this study underscore the reality that innovative culture makes a difference in encouraging performance amongst workers, which inspires them to master new techniques required to enhance innovation across industries. The results are also aligned with the research by Khan et al. (2019), which showed that innovative culture promotes the concept of innovative goods and processes in organizations. This demonstrates that the cultivation of innovative culture in MNEs in Malaysia would benefit both the workers and the organizations. Innovative culture could successfully bring about innovations that would result in superior performance (James, 2005; Ramella, 2017). This research strengthens the resource-based view, which asserts that companies that make better utilization of their knowledge and culture as a resource possess the capability to attain higher levels of innovation and produce better results (Austin & Ciaassen, 2008; Wilson & Douglas, 2007). The results hence support that innovative culture significantly affects MNEs' performance by enhancing the innovative capability of such MNEs that finally leads to the superior performance of firm innovativeness (Hau, 2016; Martínez-Costa et al., 2019; Wang et al., 2012).

CONCLUSION

The whole study epitomizes the analysis of the role that innovative culture plays in mediating the relationship between KM and firm innovativeness in MNEs in Malaysia. The findings of the study indicate that there are significant connections between the KM components (i.e., knowledge acquisition, knowledge conversion, knowledge implementation, and knowledge security) and innovative culture, and in turn, firm innovativeness. The function of innovative culture as a mediator in the relationship between innovative culture and firm innovativeness has also been proven in this research. While the value of KM as an antecedent of firm innovativeness is well known in the literature, there still exists a lack of empirical studies on the possible factors that mediate or moderate such

relationships. This study is perhaps among the first to explore the measurements of KM, innovative culture, and firm innovativeness together within the system. Most importantly, this research offered an in-depth understanding of the mediating mechanism of innovative culture in the partnership between KM and firm innovation. This study has therefore added to an increasing body of knowledge on the context of KM, innovative culture, and firm innovativeness.

In terms of managerial implications, this research paper offers management teams and professionals an understanding to better appreciate skills and capabilities such as KM and firm innovativeness. The findings of this research demonstrate that innovative culture, knowledge acquisition, knowledge conversion, knowledge application, and knowledge protection can all enhance firm innovativeness. It is thus essential that managers of MNEs in Malaysia establish an effective culture – in this situation, an innovative culture, as the current analysis has demonstrated how it can act as a catalyst to stimulate organizations to learn, transform and implement appropriate information that enhances firm innovation (Gonzalez-Loureiro et al., 2017; Oboreh, 2021; Rajapathirana & Hui, 2018; Wu et al., 2020).

Companies that are poised to evolve would have a greater chance of producing superior results. It is thus important for organizations to step up the practice of innovative culture within their company in order to establish the standards for their workers to be innovative, such as in the production of innovative goods, procedures, or services. Likewise, the findings of the present study indicate that an inventive community is beneficial to accelerating the transition from KM to firm innovation. Consequently, it underscores the reality that managers should consider appropriate capital distribution based on the results of this study to promote firm innovativeness. As such, it is advised that managers in MNEs pay more attention to the development and management of knowledge, as well as to the inculcation of an innovative culture, in order to achieve firm innovativeness that can eventually contribute to improved results (van Oostrom & Fernández-Esquinas, 2017). The relationship between different KM practices provides a guide on how firms in developing countries can enhance firm innovation. The different practices suggest specific practices that firms can focus on. MNEs can reflect on the roles of different knowledge management practices and how they interact in different ways to influence firm innovativeness. The study has shown that MNEs that apply KM can improve their innovation effectiveness.

LIMITATIONS AND FUTURE RESEARCH DIRECTIONS

Similar to many other reports, this analysis endures a range of weaknesses that might hinder the generalization of results yet offer opening opportunities for new analysis. While this study aims to be as comprehensive and analytical as practicable, the foregoing drawbacks exist in the review of the literature, empirical methodology, information gathering, and statistical analysis. Firstly, the study results are extracted from self-reported data, which may contribute to possible common method variances. Furthermore, the methodology utilized in this analysis is cross-sectional and does not represent the long-term efficiency of the pathways explored in this research. Thirdly, the practice of KM is highly complex. While this research centered on just four KM variables – knowledge acquisition, knowledge conversion, knowledge application, and knowledge protection, there are many other measurements of KM that have not been studied but can also be helpful in illustrating the management of knowledge in other sectors. As a recommendation for potential studies, other researchers may explore the influence of other KM variables on firm innovation in various industries. Longitudinal research can also be carried out to explore the long-term effects of these KM activities. Besides, the generalizations of existing findings to other sectors or countries should entail more study. More analysis should also be carried out on respondents from different divisions across organizations to allow findings to be more relevant and generally applicable. While it is possible that managers are generally well educated, we should not rule out the discrepancies in understanding the KM variables within the company. It will, thus, give managers useful guidelines to further implement such activities in their firm.

Furthermore, this study distributed questionnaires to verify the hypotheses, which is a temporal cross-sectional approach, and the samples were still material from the same period. Theoretically, conducting a longitudinal study to collect data can better support causal inference (Beugre & Viswanathan, 2006). Therefore, the causal inference in this study seems slightly weak. While many of these problems might be troublesome, it is not simple to gather data from MNEs, and numerous attempts have been made to validate the integrity of the data, as well as the variation, reliability, and accuracy of the research procedure. Another limitation is that study is often restricted by the usage of the same scale of creative culture in all industries. Context-dependent innovation scales could offer a more detailed explanation of the partnership between variables in various industries (Mlozi et al., 2018). Lastly, there is a shortage of predictors in the individual-level and industry-level analysis (Pater & Lewandowska, 2015) in our firm innovativeness model due to the constraints placed by the accessible database.

Despite such limitations, this research presented realistic, scientific evidence of the connection between KM and firm innovativeness via the mediating role of innovative culture in MNEs. Future studies can be extended to discuss relevant corporate reactions to a far wider variety of external knowledge management inputs. The empiric emphasis of this paper was on the Malaysian background. While we assume that our hypothesis can take root in other empiric contexts, potential studies may explore the generalization of this study by utilizing evidence from other geographical contexts.

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