RESOURCES FUNGIBILITY AS A MODERATOR IN THE RELATIONSHIP BETWEEN DYNAMIC CAPABILITIES AND INNOVATION CAPABILITY

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ABSTRACT

Managerial cognition of resources fungibility is an important dimension that shapes organizational responses. However, the role of managerial cognition of resources fungibility has been empirically overlooked by scholars. Furthermore, extant literature lacks a model to enable a systematic measurement and evaluation of managerial cognition of resources fungibility, which has yet to be developed. This study empirically examines the moderating role of resources fungibility in the relationship between dynamic capabilities and innovation capability. To operationalize managerial cognition to enable the development of a measurable model for resources fungibility, 209 large Malaysian manufacturing firms were selected as sample to study the relationship between resources fungibility and firm's capabilities. The Partial Least Squares (PLS) technique was applied. This study finds that resources fungibility moderates the relationship between integrating capability and coordinating capability and innovation capability. Meanwhile, resources fungibility does not moderates the relationship between learning capability and innovation capability.

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1. INTRODUCTION

The manufacturing sector of Malaysia has been considered as the engine driving the Malaysian economy, surpassing the agricultural sector following the structural alteration in the Malaysian economy after 1987 (Asadi et al., 2019). It is considered as the sector that contributes most significantly (23%) to Malaysia's Gross Domestic Product (GDP) (Bank Negara, 2021). This sector is very important as it has also led to the increase in Malaysia's exports, and created job opportunities for the citizens (Taghizadeh, Nikbin, Alam, Rahman, & Nadarajah, 2020). However, the Malaysian manufacturing sector is struggling to develop its competitive strategies, which is lowering its overall performance and competitiveness in local as well as international markets (Hameed, Basheer, Iqbal, Anwar, & Ahmad, 2018).

According to the Global Competitiveness Report issued by the World Economic Forum, Malaysia slipped five notches to 23th placing in the 2017-2018 World Competitiveness Ranking from 18th placing in 2015-2016 among economies in the world ranked as most competitive (World Economic Forum, 2018) (Figure 1). The drop by five places from 18th in 2015 was due to a decline in scores in eight of the indicators in the 12 pillars to measure both macro- and micro-economic aspects of competitiveness. Pervious study has shown that the contribution of Malaysian manufacturing firms to the nation's GDP is comparatively is small when compared to other countries in Asia (Hanifah, Abdul Halim, Ahmad, & Vafaei-Zadeh, 2019).

The report of "The Malaysian Economy in Figures 2020", issued by the Economic Planning Unit, Prime Minister's Department, shows that the production manufacturing index in Malaysia slipped downwards during the years of 2017 to 2020 to 6.1%, 4.8%, 3.6% and -8.4%, respectively, as in Figure 2 (Economic Planning Unit Prime Minister's Department, 2021). Further, the 'Developments in the Malaysian Economy Report', issued by Bank Negara 2019, shows that unlike other regional economies, Malaysia's manufacturing sector has generated less employment in high-value added segments (Bank Negara, 2019).

Figure 1: Malaysia's Global Competitiveness Index
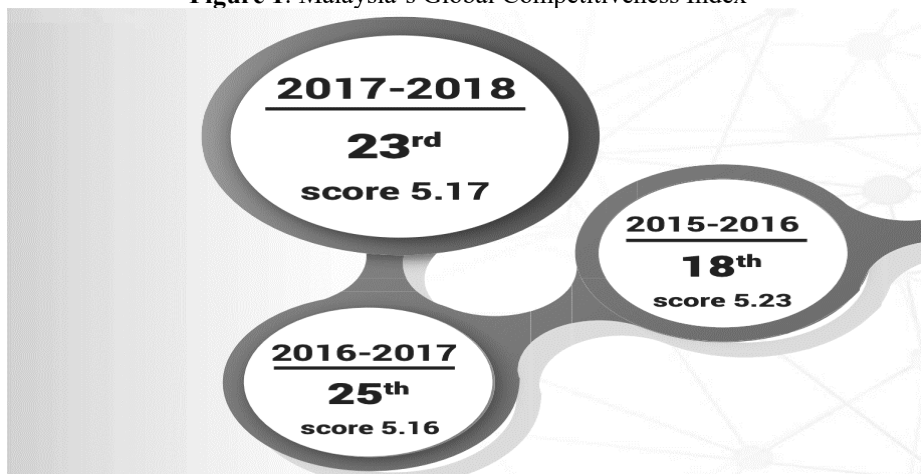
Source: The Global Competitiveness Report: World Economic Forum.

The Bank Negara Reports also show some problems in the Malaysian manufacturing sector. For example, the Bank Negara Report 2021 shows that the contribution of the manufacturing sector to GDP in 2020 was negative (-2.6) and the annual changes were also negative (-0.6) (Bank Negara, 2021). Moreover, Bank Negara Report 2020 shows a decrease in the growth in production in Malaysia for the years 2017, 2018 and 2019 in some manufacturing sectors. For example, growth in electrical products was 5.0, 4.9 and 4.7, respectively; in wood and wood products, it was 5.6, 4.8 and 4.6, respectively; in fabricated metal products, it was 5.2, 5.0 and 4.9, respectively; and in beverages, it was 9.7, 9.2 and 3.3, respectively (Bank Negara, 2020). Furthermore, Bank Negara Report 2019 shows that Malaysia's manufacturing competitiveness in 2018 fell to -15% (Bank Negara, 2019).

Figure 2: Manufacturing Production Index

Selected Industries	2017 % p.a.	2018 % p.a.	2019 % p.a.	2020 [4/] % p.a.
3.5 Industrial Production Index [1/] (2015 =100)	4.4	3.1	2.3	-7.7
Manufacturing [2/]	6.1	4.8	3.6	-8.4
Export-Oriented Industries [3/]	6.7	4.4	2.9	1.4
Electronic and electrical cluster	7.8	5.8	3.2	1.5
Primary-related cluster	5.9	3.5	2.7	1.3
Domestic-Oriented [3/] Industries	4.9	5.6	5.1	1.0
Construction-related cluster	5.0	4.9	4.2	-0.2
Consumer-related cluster	4.9	6.1	5.8	1.8

Note :   [1/] This index covers mining, manufacturing and electricity sectors as defined under the Malaysian Standard Industrial Classification (MSIC) 2008
[2/] The index covers 245 out of the 259 manufacturing industries, which accounted for 99.98% of the value of total manufacturing gross output and 99.97% of the value-add in the 2015 Economic Census
[3/] January-March 2020
[4/] January-April 2020

Source :   Bank Negara Malaysia and Department of Statistics Malaysia

MANUFACTURING PRODUCTION INDEX 2017-2020[4/]
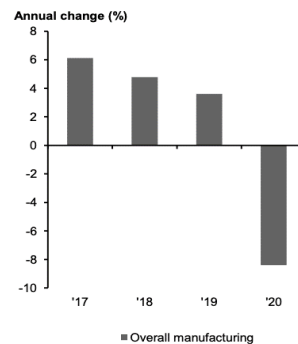
Source: Economic Planning Unit, Prime Minister's Department (2021).

The above indicators show that the Malaysian manufacturing sector has been having problems in its contribution to the country's economic growth over the last years from 2017-2020. Such problems may hinder the overall performance and competitiveness in local as well as international markets (Hameed et al., 2018). The question in such a situation is, what are the reasons that have led to a decrease in competitiveness of the Malaysian manufacturing sector. Several past studies in the Malaysian manufacturing context have provided some insights related to this issue. For example, Hameed et al. (2018) mentioned that the Malaysian manufacturing sector is struggling to develop its competitive strategies relating to innovation performance. According to the Global Innovation Index, Malaysia was ranked 72nd in terms of business innovation, and thus, the innovation problem in the Malaysian manufacturing sector is undeniable and warrants more attention. Taghizadeh et al. (2020) stated that manufacturing firms in Malaysia are still reluctant to practice innovation strategy because of the risk of failure. They also argued that such innovation incapability impacts on operational capabilities of firms, considering the moderating effect of environmental dynamism. Muneeb, Khong, Ennew, and Avvari (2019) asserted that learning and integrating capabilities can help Malaysian manufacturers in information gathering and dissemination more efficiently. However, improper processes or untimely dissemination of information resulting from learning may be at the cost of the firm's innovation capability. Backhaus, Karl, and Devika (2019) argued that the Malaysian manufacturing firms are competing with Southeast Asian countries, such as Vietnam, the Philippines and Thailand, as well as China

and India, where the labour wages are lower than in Malaysia. This is an opportunity for Malaysia to increase the competitiveness of its manufacturing sector by embracing innovation capabilities

Studies on strategy have suggested that long-term competitive advantage lies in the new configuration of resources that managers create using dynamic capabilities (Shang, Chen, & Li, 2019). This means that competitive advantage does not lie in the capabilities resources fungibility per se, which are necessary but not sufficient to achieve sustainable competitive advantage (Cho & Linderman, 2019; Eisenhardt & Martin, 2000), but in managers' decisions about what to do with their firm's resources to develop capabilities (Cho & Linderman, 2019; Helfat & Martin, 2015; Vecchiato, 2017; Yang, Wang, Zhou, & Jiang, 2019). Previous studies on strategy have suggested that the dynamic capabilities (DC) theory and the managerial cognition perspective represent useful and complementary ways to provide an integrative explanation about sources of a firm's competitive advantage. Scholars have considered managerial cognition as a cognitive process related to managers' cognition of resources fungibility. This cognitive process of resources fungibility affects the relationship between situational uncertainty and the ability to formulate new operational capabilities (Autio, George, & Alexy, 2011; Mannor, Shamsie, & Conlon, 2015).

However, the role of managerial cognition of resources fungibility in the deployment and formulation of a firm's operational capabilities to create competitive advantage has only been implicitly recognized by previous studies on strategy. Over the last two decades, the impact of a firm's capabilities on competitiveness has been receiving significant scholarly attention. Scholars have been noting that managerial cognition of a firm's resources is a missing element in the DC theory (Danneels, 2011; Egbunike, Purvis, & Naim, 2019), and the role of the manager has been empirically overlooked by scholars (Cho & Linderman, 2019; Eggers & Kaplan, 2013; Yang et al., 2019). It has been argued that managerial cognition of firms' resources and the understanding of their fungibility affect the directions through which renewal is being pursued (Mannor et al., 2015). That is because managerial cognition of resources fungibility affects the relationship between situational uncertainty and formulation of new capabilities (Autio et al., 2011). Accordingly, managerial cognition of resources fungibility is an important dimension that shapes organizational responses (Danneels, 2011; Eggers & Kaplan, 2013; Wang, Hung Li, & Xiaoya, 2018). Some scholars have begun to link these two perspectives (Eggers & Kaplan, 2013) in order to provide an integrative, dynamic and cognitive approach to the areas of management and strategy (Andersén & Kask, 2012; Laamanen & Wallin, 2009; Wang et al., 2018). Nevertheless, the efforts to integrate these two insights are still limited. In fact, the determinants of operational capabilities lack sufficient empirical testing. Furthermore, extant literature lacks a model to enable a systematic measurement and evaluation of managerial cognition of resources fungibility.

In an attempt to fill this research gap, this study empirically examines the moderating role of resources fungibility in the relationship between dynamic capabilities and innovation capability. This is important because it can explain how managerial cognition and their decisions about the redeployment of their firm's resources and capabilities play a role in maximising the impact of dynamic capabilities on operational capabilities (Eggers & Kaplan, 2013; Yang et al., 2019). The second objective of this study is to reconceptualize and operationalize resources fungibility to enable the development of a measurable model for this construct. Such a measurable model can enable the empirical examination of the role and importance of resources fungibility in the capabilities building paradigm.

2.   LITERATURE REVIEW

Historically, the study of dynamic capabilities within strategic management research seems new compared to other studies on strategic management. Since Teece, Pisano, and Shuen (1997) original contribution on the term 'dynamic capabilities', research on this aspect has been increasing, and many scholars have offered their own contributions to dynamic capabilities as an innovative way to survive in a rapidly changing environment. In the recent times, studies on cognition and capabilities have increased. This increase may have been resulted from the need for an integrative capabilities and cognitive approach in the strategic area (Wang et al., 2018; Wilkens, Lienert, & Elfving, 2016), in order to explain how managers' cognition of resources fungibility can enhance firms' resources formation into new capabilities, and how these capabilities in turn affect a firm's competitiveness (Wang et al., 2018). In the following, this study provides some of such past studies.

Mannor et al. (2015) conducted a sample of 837 films that were made by a major Hollywood studio between 1996 and 2003 in the USA; they found that resources fungibility strongly affects managers' ability to generate higher levels of performance, and allows managers to identify the best possible method for capabilities development. Autio et al. (2011), based on multiple longitudinal case studies and 41 semi-structured interviews with managers in Finland, found that resources fungibility positively moderates the relationship between situational uncertainty and formulation of new capabilities by enhancing the multiple combinations of possible processes. Degravel (2011) argued that resource and capability management comprise cognitive steps, i.e., resource conceptualization, action steps and keystone steps. They argued that managerial cognitive process helps to identify critical operational capabilities, the organization's strategy and competitive advantage. Danneels (2011) based on an in-depth historical case study at Smith Corona in the USA, found that managerial cognition of resources fungibility is essential to explain how managers exercise dynamic capability and to understand how this fungibility influences directions of renewal pursued by the firm.

Although previous studies have provided compelling arguments that managerial cognition matters for capabilities formulation and for the firm's subsequent competitiveness (Helfat & Peteraf, 2015; Wang et al., 2018; Yang et al., 2019), previous studies, however, lack a unified conceptualization for managerial cognition of resources fungibility. Further, the role of managerial cognition of resources fungibility in developing capabilities and strategic competitive actions, has received less attention (Degravel, 2011; Kor & Mesko, 2013; Mannor et al., 2015). Such prior studies have not provided a reliable measure to examine managerial cognition of resources fungibility. Thus, there is a need to develop an operational measurement of the resources fungibility construct (Mostafiz, Sambasivan, & See, 2019b).

Although, managerial cognition construct has been wieldy consider as an implicit concept in the strategy theories, it has not been tested as a moderator in the capabilities building paradigm (Egbunike et al., 2019; Mostafiz et al., 2019b). This study fills this gap by providing a major contribution to the strategy literature, which is the provision of the first empirical evidence to validate the moderating role of resource fungibility in maximising dynamic capabilities impact on innovation capability. First, this study provides a valuable contributes to the dynamic capabilities (DC) theory by verify the moderating role of resource fungibility in capabilities building paradigm. This is an important contribution because the moderating role of resource fungibility has not been

previously studied empirically. This study also provides an empirical evidence that resource fungibility is an essential and integral part of the dynamic capabilities theory and should be integrated into the future dynamic capabilities research frameworks. Second, this study contribute to the managerial cognition perspective by empirically validate that resource fungibility is a valid empirical construct based on the manager's analysis of internal or external factors, not just an implicit concept. In the same vein, lack of examining of resources fungibility role maybe result from to the lack of a valid scale to measure this construct in the current literature (Mostafiz et al., 2019b). This study contributes to the strategy literature in general and managerial cognition in specific by reconceptualisation of resources fungibility and development of scale for this construct. Such measurement model has not been developed previously, because current cognition literature is based on conceptual papers, case studies or literature review. This study is consistent with the DC theory that focuses on the contingencies approach, for example, the contingency effect of internal factors (resources fungibility) on the relationship between dynamic capabilities and innovation capability.

2.1. Identification of Innovation Capability

Innovation capability (as an operational capability) is viewed as a process that is set apart from current technological or market competencies because it focuses on processes and routines related to search, experimentation, discovery and implementation, which are more likely to create significant changes (Benner & Tushman, 2003; Sheng, 2017). Innovation capability is defined as, "an integrative and interactive process between product, process, and organizational level changes" (Mousavi, Bossink, & van Vliet, 2018, p. 235). It is also defined as, "the ability to explore the needs of emerging customers and markets, create new knowledge, and produce new products" (Sheng, 2017, p. 31). Innovation capability is also regarded as, "the ability to engender innovative behaviour, new methods of production and new ways of doing things within the firms" (Wang, Senaratne, & Rafiq, 2015, p. 29). Innovation capability is also defined as, "the ability to create and implement unique manufacturing processes that radically improve manufacturing performance" (Swink & Hegarty, 1998, p. 381). Innovation stems from both cognition of new technological developments and the ability to adapt and apply these new technologies to create opportunities that are consistent with customer needs (Swink & Hegarty, 1998). Thus, scholars have suggested that innovation capability is an important determinant of a firm's competitiveness (Peng, Schroeder, & Shah, 2008; Swink & Hegarty, 1998; Wu, Melnyk, & Flynn, 2010).

2.2. Conceptualization of resources fungibility

Literature provides some definitions of managerial cognition of resources fungibility: for example, Danneels (2011, p. 20) defined managerial resource cognition as "identification of resources and the understanding of their fungibility and results in resource schemas". Resource fungibility has also been defined as the ability to use the resources for alternate uses (Autio et al., 2011; Danneels, 2011). Strategy literature often regards perception of resources fungibility as a cognitive process which relates to the firm's ability to achieve competitive strategies (Combe, Rudd, Leeflang, & Greenley, 2012; Eggers & Kaplan, 2013). This is because, more fungible resources, such as available cash, can be used in many different ways by managers in order to create as much value as possible (Mannor et al., 2015). Resources fungibility has been considered in literature as a cognitive process that reflects: understanding of their fungibility (Danneels, 2011); is generic (highly fungibility) vs. specific (low fungibility), and amenability of a resource to use in diverse

applications (Danneels, 2007; Mannor et al., 2015); is a mental representation of firm assets (Degravel, 2011); and are flexible resources (Combe et al., 2012). These cognitive processes are considered as enablers for resource leveraging to pursue environmental opportunities (Noman, Baroto, Ayesh, & Saeed, 2020; Wang et al., 2018), and as an important factor to effectively implement a chosen strategic option (Helfat & Peteraf, 2015). That is because a firm's decision to allocate its scarce resources to formulate a new capability or improve an operational routine, depends on managers' cognitive understanding of firms' resources, and what they can do with available resources (Eggers & Kaplan, 2013; Laamanen & Wallin, 2009).

Given that resources fungibility is a cognitive process in strategy literature, this cognitive process comprises different aspects. For example, Mannor et al. (2015) and Danneels (2011) considered the ability to use the resource in alternate uses is essential to explain dynamic capability and for a firm's renewal. Manral (2011) referred to carrying out of new combinations using existing resources, and pursuit of organisational resources to support the new ideas, help managers to cope with the complexity of the internal environment. Combe et al. (2012) also considered that building excess and liquid assets, a flexible resource pool and slack resources as important factors to effectively implement a chosen strategic option. Assembling necessary resources is also considered as an enabler to start and grow businesses (Mitchell, Shepherd, & Sharfman, 2011; Mitchell et al., 2007). It is also argued that managers' interpretation of the organisational resources and capabilities that underlie the firm's strategy are significant dimensions in resource allocations in a firm (Barr, Stimpert, & Huff, 1992; Wilkens et al., 2016). Accordingly, resources fungibility in this study is the degree of managers' understanding of the potential use of firms' resources and their ability to improve the firms' processes. This study argues that manager's cognition of resources fungibility enables firms to exercise dynamic capability to formulate new capabilities that better fit environmental changes.

The measurement items of resources fungibility are based on new items developed for the purpose of this study. Standard procedures for scale development were followed in order to develop this new measure. Resources fungibility measurement items are developed to capture different underlying aspects of this cognitive process. These underlying aspects include: amenability of human resources to use in diverse applications which relate to ability of resources to provide a range of services (Danneels, 2007; Yang et al., 2019); adjustability of technology resources which enable technology leveraging to develop new products or services (Autio et al., 2011; Mannor et al., 2015); flexibility of a firm's resources which increase its ability to achieve competitive differentiation (Combe et al., 2012); ability to combine a firm's resources to enhance the multiplicity of possible process combinations that result in innovative processes (Manral, 2011; Martin & Bachrach, 2018); and development of updated schemas about the potential applications of a firm's resources (Danneels, 2011).

This study argues that a firm's possession of flexible resources is important to enhance competitive performance because flexible resources allow the creation of new combinations using a firm's existing resources and then supporting the firm's strategic decisions. This is essential for effective use of dynamic capabilities to reconfigure routines and processes to fit the environment. However, flexibility of resources is not enough unless supported by the manager's ability to develop updated schemas about the potential applications of the firm's key resources. These cognitive schemas are the only ways that enable managers to balance between their interpretive schemes about external environment and the firm's ability to cope with expected changes and to exploit environmental

opportunities. Therefore, resources fungibility is important to facilitate a firm's coping with the complexity of the internal environment.

3. HYPOTHESES DEVELOPMENT

3.1. *The Effects of Dynamic Capabilities on Innovation Capability*

Lichtenthaler and Ernst (2012) found that dynamic capabilities jointly influence innovation performance and innovation performance has a positive and significant effect on firms' subsequent performance. Similarly, Ellonen, Jantunen, and Kuivalainen (2011) found that dynamic capabilities have a positive effect on innovation-related operational capabilities. Dynamic capabilities enable firms not just to invent but also to innovate profitably (Teece, 2007). For example, when firms can integrate their knowledge and coordinate/orchestrate their resources efficiently, they can monitor progress of operational processes and achieve fast cycle time to introduce a new product (Pavlou & El Sawy, 2011). Chin, Hamid, Raslic, and Heng (2014) found that integration capability affects operational capability in Malaysian manufacturing firms. Hosseini, Kees, Manderscheid, Röglinger, and Rosemann (2017) concluded that integrating capability influences a firm's innovation. Learning mechanisms also facilitate the development of innovation capability (Peng et al., 2008; Sheng, 2017). This is because learning capability helps to accumulate knowledge within firms (Duh, 2013; Teece, 1982), and increase their ability to apply the knowledge in operational processes (Egbunike et al., 2019; Swink & Hegarty, 1998). Furthermore, learning enhances effectiveness and efficiency of processes through repetition and monitoring to avoid past mistakes, thus enabling the exploitation of knowledge to introduce new products (Lin & Wu, 2013; Sheng, 2017). In the same vein, it has been argued that a firm's ability to design difficult-to-imitate bundles of innovation routines, such as working in teams, mutual designing of product and process and anticipating the potential of new manufacturing practices and technologies, can be sources of operational performance (Peng et al., 2008). This is because these bundles of innovation routines allow firms to differentiate their products and services from competitors, thus achieving competitive operational performance (Lichtenthaler & Ernst, 2012). Integrating these arguments, this study hypothesizes that:

H1: There is a significant relationship between learning capability and innovation capability.
H2: There is a significant relationship between integrating capability and innovation capability.
*H3: There is a significant relationship between coordinating capability and innovation capability.*

Danneels (2011, p. 21), defined managerial resources cognition 'resources fungibility' as, "the identification of resources and the understanding of their fungibility and results in resource schemas". Resources fungibility has also been defined as the ability to use the resources for alternate uses (Autio et al., 2011; Danneels, 2011). Danneels (2011), found that managerial cognition of resources fungibility is essential for explaining how firms can exercise dynamic capabilities to influence the direction of renewal that is being pursued. Some scholars have considered that cognition of a firm's resources fungibility is a significant dimension in the pattern of resource allocations within the firm (Barr, 1998; Mannor et al., 2015). Autio et al. (2011), found that resources fungibility positively moderates the relationship between situational uncertainty and formulation of new capabilities by enhancing the multiple combinations of possible processes. Similarly, Combe et al. (2012), also based on a case study, found that flexible resources moderate

the relationship between strategic options and competitive differentiation performance. Previous studies have also suggested that the quality of firms' capabilities and their underlying routines is contingent on managers' understanding of firms' capabilities and how to achieve operational flexibility by renewing operational tasks or routines (Barrales-Molina, Bustinza, & Gutiérrez-Gutiérrez, 2012; Peng et al., 2008; Wang et al., 2018). Therefore, it is suggested that the relationship between dynamic capabilities and innovation capability is contingent on external factors that affect each firm differently depending on managers' cognition and their decision of what to do with their firm's resources (Aragon-Correa & Sharma, 2003; Cho & Linderman, 2019; Zahra, Sapienza, & Davidsson, 2006). Integrating these arguments, this study hypothesizes that:

H4:   Resources fungibility moderates the relationship between learning capability and innovation capability.

H5:   Resources fungibility moderates the relationship between integrating capability and innovation capability.

H6:   Resources fungibility moderates the relationship between coordinating capability and innovation capability.

Figure 3: The conceptual Framework
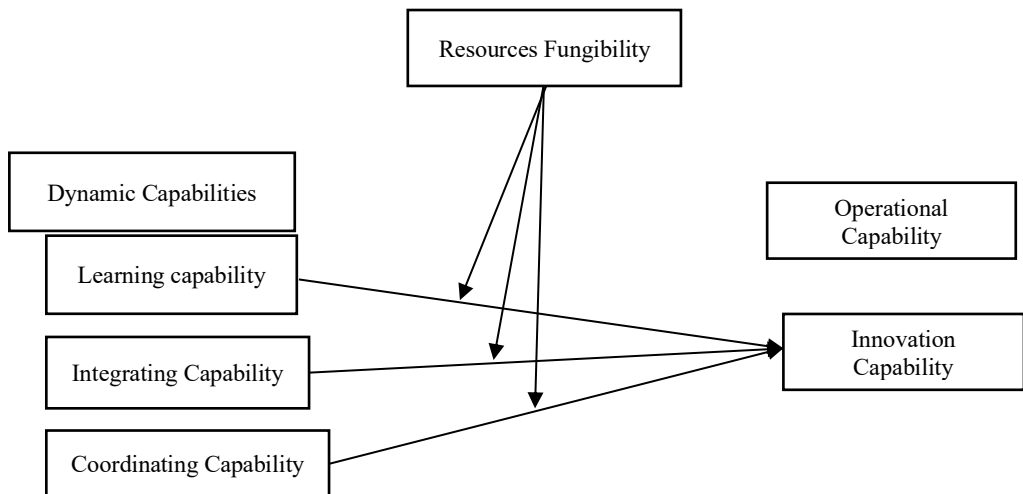
3.2.   *Development of a Resources Fungibility Scale*

Three stages have been suggested in order to develop a new measure using the deductive approach: (i) items development; (ii) measure development; and (iii) measure evaluation (Germain, 2006; Hinkin, 1995; Moore & Benbasat, 1991). These three stages applied in this study are discussed below:

Items development stage: Content validity is the primary concern in this stage. Scholars have argued that content validity is an integral part and must be built into the measure in the items development stage (Germain, 2006; Hinkin, 1995). Six items have been generated from relevant

literature to capture a firm's ability to cope with the complexity of the internal environment. These items related to resources fungibility are: amenability of human resources to be used in diverse applications (Danneels, 2007; Yang et al., 2019); adjustability of technology resources (Autio et al., 2011; Mannor et al., 2015); overall flexibility of a firm's resources (Combe et al., 2012); ability to combine the firm's resources to enhance the multiplicity of possible process combinations to support the new ideas (Manral, 2011; Martin & Bachrach, 2018); and development of updated schemas about the potential applications of the firm's resources (Danneels, 2011). These six selected items reflect the potential set of items that are proposed to capture the similar attributes for resources fungibility construct.

Measure development stage: By using these six selected items related to resources fungibility, the scale items of resources fungibility can be formulated. The primary concern in this stage is construct validity of the measure. This is because it is important in this stage to assess construct validity and to ensure that the measurement items are free from ambiguity and redundancy (Germain, 2006; Moore & Benbasat, 1991). In order to achieve construct validity, a group of six academicians and four practitioners/managers from Malaysian firms were approached to assess the items. These procedures are consistent with Moore and Benbasat's (1991) guidelines.

Measure evaluation stage: In order to assess the new scale items, the preliminary questionnaire was subjected to pilot testing. The analytical techniques applied in this research are explained in the data analysis section.

3.3.   *Research instrument*

Based on the literature, a questionnaire with four sections was developed. Section A is on the measurement items of learning capability, integrating capability and coordinating capability. Five items were used to measure routines of learning capability, i.e., acquiring; assimilating; transforming, and exploiting knowledge. Five items were used to measure the underlying routines of integrating capability i.e., contribution of individual knowledge to the group; representation of individual and group knowledge; and interrelation of diverse knowledge inputs into a collective system. Five items were used to measure the underlying routines of coordinating capability, i.e., assigning resources to tasks; appointing right persons to right tasks; identifying synergies among tasks, activities, and resources; and orchestrating activities. These 15 items were adopted from the work of Pavlou and El Sawy (2011); this is because the study has empirically affirmed that the conceptualization and measurement of learning, integrating and coordinating capability as a set of dynamic capabilities, are reliable. Section B includes the measurement items for innovation capability used to measure the underlying routines of innovation capability i.e., search for new technologies; processes and equipment development; and cross-functional product development. Six measurement items were adopted from operations literature based on the work of Peng et al. (2008) and Wu et al. (2010). This is because these studies have empirically affirmed that the conceptualization and measurement of innovation capability as a dimension of operational capabilities, are reliable. Section C includes six items used to measure resources fungibility, which are based on new items developed for the purpose of this study. Standard procedures for scale development were followed in order to develop this new measure as discussed in the previous section. Section D includes firm's profile.

4.   DATA COLLECTION, ANALYSIS, AND RESULTS

4.1.   *Survey Administration*

Malaysia was chosen as the field for this research. A study of operational capabilities using their underlying routines requires using the manufacturing firms as the unit of analysis, where the routines are actually implemented (Peng et al., 2008). Large manufacturing firms were selected as a sample frame in this study because large manufacturing firms have more access to better capabilities and lower cost of capital (Drnevich & Kriauciunas, 2011; Schilke, 2013). Further, the decision to reconfigure operational capabilities is under the authority of managers; therefore, managers holding positions of assistant manager to chief executive officer were selected as the key informants for this research because they are deemed to have the required authority to change their firm's resources base. The questionnaire survey was the method used to collect the data and provide sufficient evidences for the objectives of the research (Malhotra, 2010; Sekaran & Bougie, 2016). Non-probability sampling through the convenience sampling technique was adopted. In this technique, the researchers sought to achieve a personal contact with manufacturing firms' managers during their attendance at conferences and exhibitions held in Malaysia related to manufacturing issues.

Study of innovation capability using their underlying routines requires using the manufacturing firms as the unit of analysis, where the routines are actually implemented (Peng et al., 2008). For these reasons and for accessibility purposes, Malaysia is chosen as the research field for this study. The targeted population are the manufacturing firms. All measures that used in this study reflect the firm as the unit of analysis. The targeted sample frame for this study drawn from the list of the manufacturing firms operating in Malaysia. The decision to reconfigure operational capabilities is under the authority of managers; therefore, managers who have the position and knowledge required for this study were selected as the key informants for this study. Managers holding positions of assistant manager to chief executive officer are deemed to have the required authority to change the firm's resources base. This approach to choose the key informants will enhance the reliability of the collected data, because responses that were collected are within their domain of responsibility (Karia, 2011).

The questionnaire items were designed using a closed response approach, where respondents were asked to choose a specific option to examine how strongly they agree or disagree with the statements, anchored on a five-point Likert scale, where 1 = strongly disagree and 5 = strongly agree (Sekaran & Bougie, 2016). Data were collected on the independent and dependent constructs from the same source; there was a possibility of common method bias resulting from the provision of data from the same source. To minimize this type of bias, some procedural methods were applied in this research: (i) reverse-coded items were not used; (ii) all hypotheses in this study were formulated in a positive direction; (iii) personal contact was made to ensure that respondents are middle to senior-level managers (supposed to have high levels of relevant knowledge); (iv) guarantee for the respondents that the information provided would be kept confidential; and (v) separating the construct items over the whole questionnaire. These procedural methods helped to minimize common method bias related to a single information source, according to Fugate et al.'s (2010) guidelines.

Out of 260 questionnaires distributed to the managers of Malaysian manufacturing firms, 240 were returned; 31 observations were found to have missing values (incomplete) or the numbers of employees were less that 200, thus were omitted from the analysis. A total of 209 responses were used for the subsequent analysis, giving a response rate of approximately 86.4.

The majority of firms were from the business associated with building material (24.40%), followed by automotive manufacturing (12.44%), (11%) from chemical industries, (9.57%) from pharmaceutical industry, (9.09%) from agricultural, (7.66%) from plastic industry, (7.18%) from rubber product (5.74%) from food and beverage industries, (5.26%) from ceramic and tiles industries, and lowest number of firms was from iron and steel (4.31%). In terms of gender, 78.47% of the respondents are male and 21.53% are female. In terms of work position, the majority of the respondents hold manager position as follow: operations manager (22.49%), Assistant general manager (18.18%), general manager (15.79%), Managing director (14.35%), executive director (11.96%), export manager (6.69%), Sale and marketing Manager (4.81%) and CEO (3.34%). It can be noted that the firms cover most of manufacturing business in Malaysia according to the classification of the FMM, thus give a good indicator about generalising the research finding to the Malaysian manufacturing firms context. The firms in the sample represent the large manufacturing firms in Malaysia according to the identification of the National SME Development Council (NSDC), which are suitable for this study and the majority of the respondents hold manager position. This mean that the respondents are suitable persons to fill up the questionnaire because the decision to reconfigure operational capabilities is under the authority of them.

4.2. Pilot Test

Measuring the managerial cognition was based new items developed for the purpose of this study. Pilot test in this study conducted based on three stages. First, before the conduct of the final survey and hypotheses testing, the preliminary set of items were judged four academicians work at the Azman Hashim International Business School (AHIBS), two academicians work the Malaysia-Japan International Institute of Technology (MJIIT), and the four practitioners/managers work in Malaysian firms. Initially, they were asked to assess how well the six items fit the theoretical definition of resources fungibility. This procedure helped to enhance the confidence in content validities of the new scales as recommended by Moore and Benbasat (1991).

Second, the same group of six academics experts in AHIBS and MJIIT in addition to a group of 4 professional practitioners who work as managers at Malaysian manufacturing firms were used to assess the preliminary whole questionnaire. The objective was to ensure the content validity of the scales and to ensure that the measurement items are free from ambiguity and redundancy and to detect, if any, any confusion of items, refine the items and to ensure that measurement items cover all aspects of variables being measured and to detect any possible shortcomings in the questionnaire design (Sekaran & Bougie, 2016). This process also helps to re-word ambiguous questions and adjust any double-barrelled questions in order to increase the questionnaire's efficiency (Moore & Benbasat, 1991), thus helping to achieve highest reliability and content validity (Karia, 2011). The feedback and comments that collected from the judges were as follow: (i) the measurement items were found to be satisfactory and comprehensive; (ii) the measurement items cover all aspect of the operational definition of variables being measured; and (iii) the judges agreed that respondents should be able to understand the measurement items; (iv) some adjustments were made to the wording based on the judges' feedback.

Third, pilot study is an association between the data gathering instrument with few respondents from the entire population towards the research with complete scale (Sekaran & Bougie, 2016). The preliminary questionnaire after adaptation in the first stage also piloted with 20 managers of manufacturing firms. The objective is to measure the reliability of the instrument before distributing the final questionnaires. Firms that were used for the pilot test were excluded from the final sample. Reliability is the assessment of the internal consistency level among multiple items in a construct (Hair, 2010). The reliability of the instrument indicates that the instrument produces the same outputs if used repetitively (Sekaran & Bougie, 2016). Cronbach's Alpha test is the dominant reliability testing method used in the context of social science research (Hair, William, & Barry, 2010). Table 1, shows the results of the reliability test. The scales utilised are reliable if the Cronbach's coefficient alpha scores of each tool exceed the minimum scores that are 0.60 to 0.70 (Hair, 2010). Table 1, shows that the scales that were used in this pilot test have an average to high internal consistency with Cronbach's alpha coefficient values between 0. 885 and 0.927, for all measurement scales. Therefore, all the factors also exceeded the recommended value of 0.70.

Table 1: Result of reliability analysis (pilot test) (N= 20)

No	Constructs	Items	Cronbach's Alpha
1	Learning capability	5	.927
2	Integrating capability	5	.901
3	Coordinating capability	5	.905
4	Innovation capability	6	.885
5	Resources fungibility	6	.903

4.3. Assessing the Measurement Model

The reliability and validity of the variables and items in the measurement model were tested to ensure that only reliable and valid measures were used before evaluating the relationships in the overall model. Construct validity was checked using Cronbach's Alpha (Cronbach's α) and composite reliability, convergent and discriminant validity were also checked. The outer model or measurement model in PLS was used for the factor analysis to evaluate the extent to which observed items loaded on their underlying construct. The outer model is recommended to confirm the underlying relationship of the observed items with the factors (Hair, Black, Babin, & Anderson, 2006). Confirmatory factor analysis (CFA) was performed to validate the measurement model (outer model) by examining the association between items and their respective underlying constructs. The results of assessing the model fit of the measurement model are presented below:

The factor loadings of the items should load highly on the construct they are designed to measure or these items will be candidates for deletion if they load on some other factors higher than their respective construct (Hair, Ringle, & Sarstedt, 2011). The recommended standardized loading is 0.5 or higher, and ideally, 0.7 or higher, to be significantly loaded on their respective construct (Hair, 2010; Hair, Sarstedt, Pieper, & Ringle, 2012). Table 2 shows that the factor loadings of the items/dimensions in the model exceed the recommended value 0.70, and all the item loadings are therefore significant.

Table 2: Internal consistency and convergence validity results

Constructs/Items	Factor Loadings	CA	CR	AVE
Re. fungibility		0.870	0.900	0.603
Re. Fun 1	0.873			
Re. Fun 2	0.739			
Re. Fun 3	0.744			
Re. Fun 4	0.852			
Re. Fun 5	0.788			
Re. Fun 6	0.732			
Learning C.		0.875	0.909	0.666
Lea. C 1	0.762			
Lea. C 2	0.892			
Lea. C 3	0.838			
Lea. C 4	0.754			
Lea. C 5	0.872			
Integrating C.		0.780	0.849	0.534
Int. C 1	0.845			
Int. C 2	0.826			
Int. C 3	0.853			
Int. C 4	0.755			
Int. C 5	0.791			
Coordinating C.		0.851	0.894	0.628
Coo. C 1	0.724			
Coo. C 2	0.779			
Coo. C 3	0.726			
Coo. C 4	0.810			
Coo. C 5	0.854			
Innovation C.		0.881	0.910	0.629
Inn. C 1	0.805			
Inn. C 2	0.844			
Inn. C 3	0.785			
Inn. C 4	0.756			
Inn. C 5	0.774			
Inn. C 6	0.806			

Notes: En. Int = Environmental interpretation, Lea. C = learning capability, Int. C = Integrating capability, Coo. C = Coordinating capability, Inn. C = Innovation capability.

Cronbach's α is used to assess the internal consistency of the entire scale by measuring items/observed variables with each other. The underlying latent variable explains item variance that indicates item reliability (Gotz, Liehr-Gobbers, & Krafft 2010). The general accepted lower limit of Cronbach's α is 0.70 (Henseler, Christian, & Sarstedt, 2015). However, Cronbach's α coefficient of 0.6 can be acceptable for an exploratory research (Hair et al., 2010). Table 2 also shows the absolute correlations between the construct and its measuring items, which manifests that the factor loadings are between 0.720 to 0.893, which is above the minimum threshold criterion of Hair et al. (2010) and Henseler et al. (2015).

Construct reliability is also observed by composite reliability and Cronbach's α. Composite reliability refers to the extent to which the items consistently represent the same latent construct (Hair et al., 2010); it measures how well all assigned items represent their constructs (Gotz et al., 2010), thus providing a better estimate of variance shared by the respective indicators (Hair et al., 2006). Cronbach's α measures the unidimensionality of a multi-item scale's internal consistency (Cronbach, 1951). Table 2 also shows that the composite reliability is higher than the cut-off value of 0.70 (Cronbach, 1951; Hair et al., 2010); Cronbach's α is more than the recommended value of 0.7 (Cronbach, 1951; Hair et al., 2010).

Convergent validity was tested by using the Average Variance Extracted (AVE) technique (Hair et al., 2006; Henseler et al., 2009; Tabachnick & Fidell, 2007). AVE refers to the average percentage of the variance extracted commonly among the observed variables of a construct (Hair, Ringle, & Sarstedt, 2013). Table 2 also shows that AVE for every variable is greater than the recommended value of 0.5 (50%), which indicates that every variable could explain more than half of the variance in its measuring items on average (Fornell & Larcker, 1981).

The Fornell and Lacker criterion is applied to confirm discriminant validity. A construct must represent more variance with its items than it does with others in the model (Hair et al., 2011). Thus, the value of the square root of AVE of one construct must be higher than the value of inter-correlations between the constructs. Table 3 shows that the square roots of the AVE of all constructs are more than their corresponding inter-correlations. Therefore, the evaluation of discriminant validity proves that the measurement model is acceptable.

Table 3: Discriminant Validity – Fornell and Lacker Criterion

Constructs	Coo. C	Inn. C	Int. C	Lea. C	Re. Fun
Coo. C.	**0.792**				
Inn. C	0.576	**0.793**			
Int. C	0.464	0.410	**0.731**		
Lea. C	0.550	0.569	0.500	**0.816**	
Re. Fun	0.448	0.568	0.342	0.414	**0.776**

Notes: The off-diagonal values are the correlations between variables, and the diagonal values are the square root of AVE

Factor loading, Cronbach's α, convergent validity and discriminant validity were used to assess the measurement model. Five variables were tested i.e., learning capability, integrating capability, coordinating capability, innovation capability and resources fungibility. The results support the

reliability and validity of the model. Therefore, the measurement model in this study is with sufficient prediction quality and satisfactory goodness of fit (GoF).

4.4.   Assessing the Structural Model

Unlike the Covariance-based SEM (CB-SEM) approach that has GoF indices for the structural model, PLS indices for GoF for structural model are still in the experimental stage. However, in PLS, the *R* package provides a good index for GoF for structural models (Tabachnick & Fidell, 2007). Therefore, coefficient of determination of R^2 in PLS is considered as an equivalent index for GoF for the structural fit in the CB-SEM approach. To check the structural model, some evaluation criteria are suggested, such as explanation of endogenous latent variables (coefficient of determination of R^2), significance and relevance of path coefficients (β), effects size (f^2 and q^2) of path coefficients and multicollinearity (inner VIF) and predictive relevance (*Q*) (Gotz et al., 2010; Henseler, Christian, & Rudolf, 2009; Sarstedt, Ringle, & Hair, 2017).

The R^2 value helps to explain the variance in the endogenous variable(s) that is explained by the exogenous variable(s) (Henseler et al., 2009). Cohen (1988) recommended three criteria to evaluate R^2 value for endogenous variable, i.e., substantial (0.26 and above), moderate (from 0.13 to 0.25), and weak (from 0.02 to 0.12) . Table 4 shows that the R^2 value for innovation capability is 0.548, which is above 25%, which is at the substantial level, thus demonstrating a high prediction level.

Table 4: R-squared (R^2) result

Endogenous Variable	R-Squared	R-Squared Adjusted
Innovation Capability	0.548	0.537

Notes: Substantial > 0.25; Moderate > 0.12, Weak > 0.02.
Source: Cohen (1988).

To determine the change in R^2 value when a specific predictor variable is omitted from the structural model, effects size (f^2) is used (Sarstedt et al., 2017). Cohen (1988) recommended three criteria to evaluate f^2, i.e., 0.35, 0.15 and 0.02, for large, medium, and small effects sizes, respectively. Table 5 shows that learning capability has a medium effect on innovation capability ($f^2 = 0.120$), while other exogenous variables have small effect on innovation capability.

Table 5: Effect size result and multicollinearity

Exogenous Variables	Innovation C.	Multicollinearity – Inner VIF values
Coordinating C.	0.034	1.860
Integrating C.	0.005	1.710
Learning C.	0.120	1.694
Re. fungibility	0.105	1.429

Notes: Large: > 0.35; Medium: > 0.15; Small: 0.0 > 0.02.
Source: Cohen (1988).

Collinearity occurs when two predictor variables in a multiple regression have a high correlation, while multicollinearity occurs when more than two predictor variables are highly inter-correlated. Variance inflation factor (VIF) was conducted by using multiple regressions of each variable in the

structural model to test for multicollinearity on all the other constructs of the model (Sarstedt et al., 2017). As a rule of thumb, VIF value must not be greater than five, because VIF values above five are indicative of collinearity among the variables. Table 5 also shows that the VIF values are between 1.429 and 1.860, which indicate the absence of collinearity among the independent constructs.

To identify the predictive accuracy of the structural model, Q^2 value assessment was conducted to observe the predictive capabilities of the endogenous variables, as recommended by Stone (1974). As a rule of thumb, the model has predictive relevance if the Q^2 value is more than zero for a particular endogenous variable, which indicates that the path model's predictive accuracy is acceptable for this particular construct (Sarstedt et al., 2017). Table 6 shows that the structural model in this study has high predictive relevance as the Q^2 value is higher than zero for the endogenous variable.

Table 6: Result of predictive relevance

Endogenous Variable	CCR Q^2 (=1-SSE/SSO)	CCC Q^2 (=1-SSE/SSO)
Innovation C.	0.339	0.475

Notes: CCC = Construct Cross-validated Communality, CCR = Construct Cross-validated Redundancy.

Table 7 shows that the first direct hypothesis is Learning C. -> Innovation capability, is statistically significant as p=0.037, which is less than 0.05 and t-value is 2.093, which is higher than the standardised value of 1.96, and the corresponding regression weight is β=0.210. Accordingly, hypothesis H1 is supported. The second direct hypothesis is Integrating C. -> Innovation capability, is statistically significant as p=0.026, which is less than 0.05 and t-value is 2.238, which is higher than the standardised value of 1.96, and the corresponding regression weight is β=0.136. Accordingly, hypothesis H2 is supported. The third direct hypothesis is coordinating C. -> innovation capability, is significant as p=0.002, which is less than 0.01 and t-value is 3.061, which is higher than the standardised value of 1.96, and the corresponding regression weight is β=0.178. Accordingly, hypothesis H3 is supported.

Table 7: Path Coefficient Result (Direct effect)

Hypotheses (Path)	Original Sample (O)	Sample Mean (M)	SD	T	P Values	Decision
Learning C. -> Innovation Capability	0.210	0.192	0.100	2.093*	0.037	Significant
Integrating C. -> Innovation Capability	0.136	0.138	0.061	2.238*	0.026	Significant
Coordinating C. -> Innovation Capability	0.178	0.180	0.058	3.061**	0.002	Significant
Lea C. *Re. fun -> Inn. C	-0.079	-0.065	0.127	0.623	0.533	Not Significant
Int. C. *Re. fun -> Inn. C	0.263	0.257	0.070	3.744	0.000	Significant
Coo. C *Re fun -> Inn. C	0.108	0.095	0.091	1.990	0.042	Significant

Notes: Significant: **p < 0.01, *p < 0.05.

Table 7 also shows that the first moderating hypothesis is learning capability *resources fungibility -> innovation capability, is not significant. Accordingly, hypothesis H4 is not supported. The second moderating hypothesis is integrating capability *resources fungibility -> innovation capability, is statistically significant as p=0.000, which is less than 0.05 and t-value is 3.744, which is higher than the standardised value of 1.96, and the corresponding regression weight is β=0.263. Accordingly, hypothesis H5 is supported. The third moderating hypothesis is coordination capability * resources fungibility -> innovation capability, is significant as p=0.042, which is less than 0.05 and t-value is 1.990, which is higher than the standardised value of 1.96, and the corresponding regression weight is β=0.108. Accordingly, hypothesis H6 is supported.

5. DISCUSSION

PLS-SEM path modeling was used to test the hypotheses. The result from the empirical data analysis supports the direct relationships between dynamic capabilities, i.e., learning capability, integrating capability and coordinating capability and innovation capability. The three direct hypotheses are significant at the 0.001 level of significance. This result is consistent with the new arguments in the DC theory that dynamic capabilities affect directly on innovation capability (Eggers & Kaplan, 2013; Zahra et al., 2006). The result also supports the resources based theory that the dynamic capabilities have a significant relationship with innovation capability (Sheng, 2017). The empirical results of this research strongly support Ellonen et al. (2011) and Pavlou and El Sawy (2011), who found that dynamic capabilities are significantly related to innovation capability.

Regarding the moderating role of resources fungibility, as expected, the empirical data analysis shows that resources fungibility has a significantly moderating association at the 0.05 level of significance for the relationship between the two dimensions of dynamic capabilities (i.e., integration capability and coordinating capability) and innovation capability. Relevant literature has argued that managerial cognition of resources fungibility can play an important role in the assessment and assembly processes of the firm's resources and routines into capabilities that better fit the environment (Eggers & Kaplan, 2013; Mannor et al., 2015). Consistent with these arguments, the results of this research found that resources fungibility is essential to innovation capability through recombine the firm's resources and routines into new capabilities that better fit the changing environment. Further, managers' perception of the potential of their firm's resources can enhance the operational flexibility through renewed operational tasks and routines. The results indicate that the fungibility of resources allows firms to leverage on the full potential of their integrating capability and coordinating capability in the innovation processes for the firm's core competencies. Resources fungibility enhances firm's innovation by carrying out new combinations using existing resources to create difficult-to-imitate capabilities, e.g., creating new combinations of technological or market-related capabilities. However, this study finds that resources fungibility is not a moderator in the relationship between learning capability and innovation capability. These results also indicate that resources fungibility does not allow firms to leverage on the full potential of their learning capability in the innovation processes. These results are contrary to expectations in prior relevant studies on strategy which have argued that learning capability allows the firm to acquire new knowledge and technologies which affect innovation and development of the manufacturing system and the better exploitation of the knowledge that has already been learnt to provide new innovative products (Pavlou & El Sawy, 2011).

6. IMPLICATIONS FOR DECISION-MAKING AND PRACTICE

The findings carry significant practical implications for managers of manufacturing firms. This study raises the awareness of the managers of the manufacturing companies in Malaysia on the importance of institutionalizing capabilities reconfiguring innovation process in their firms so as to be competitiveness. For example, the development of a measurable model of managerial cognition enables managers to understand and rely on their cognitive schemas to enhance their decisions to reconfigure innovation capability to cope better with environmental turbulence. This can be further enhanced by utilising the cognitive schemas of internal resources to achieve co-specialisation between dynamic capabilities and innovation capability. This is pertinent since managers' ability to identify the means to build new innovation capability is crucial to support the competitive objectives of business and operations. Managers should establish learning routines to create individual knowledge, and on coordinating routines to orchestrate such created individual knowledge and on integrating routines to create co-specialization between the three capabilities and direct them to interacts sequentially and jointly to enhance a firm's ability to deliver new products more cost effectively and with different attributes. Managers should know that a combination of resources required to achieve competitive advantage cannot be purchased externally, but firms need to integrate them internally. Manager should develop effective routines that ensure interrelation of diverse knowledge inputs into a collective system to facilitate the process of exploiting their newly reconfigured competencies in the firm's cost structure according to firm's competitive priorities. When managers ensure integrating individual knowledge in the group and collective system, the firm will be able to offer quality and differentiated products and satisfy customers need. Managers of Malaysian manufacturing firms should also continually develop such integrating routines to integrate scattered knowledge into in the firm's level, such way helps to create complicated path dependency between integrated routines and a firm's products, which lead to create differentiated innovative products. Managers also should give high attention to understanding of the potential use of firms' resources to address how firm can use dynamic capabilities to improve operations within manufacturing firms. Managers should focus on reallocate firm's existing resources to carry out of new combinations of resources that can support the new ideas. They should continually develop updated schemas about the potential applications of their key resources.

7. LIMITATIONS AND SUGGESTIONS FOR FUTURE RESEARCH

This study has developed a measurement scale to study the resources fungibility construct. This scale can facilitate the verification of the relationship between managerial cognition of resources and organizational capabilities. It would be interesting to validate this scale in other contexts to investigate the generalizability of the scale. Further, future studies could use this useful tool to systematically measure and evaluate different antecedents and consequences of the resources fungibility construct. This research focuses on large Malaysian manufacturing firms; therefore, the findings of this study may not apply in the context of small and medium manufacturing firms. In order to generalize the results, it is suggested that future studies expand the sample frame to include small and medium manufacturing firms in order to get more generalizable results. This research is based on a cross-sectional design, in which all variables were measured at one point in time. A longitudinal study would enable the long-term observation of the influences between cognition of resources and firm's capabilities. Moreover, The exact number of large manufacturing firms in

Malaysia is not known; thus, the sample frame for this study is drawn from the annual directory of FMM. The directory did not include all manufacturing firm in Malaysia. Although the directory provides contact numbers for listed firm, but it did not provide any other information such as sales volume. This directory includes a list of 2,577 manufacturers of different sizes. This study used the number of employees of each firm (the only indicator available in this directory) to prepare an initial list of sample frame. Fourthly, the researcher contacted the firms by email and telephone calls in order to encourage respondents to participate and fill up the questionnaire, but due to the very low response rate researcher decided to change the sampling method and used the non-probability sampling through using convenience sampling technique. Although, the researcher sought to achieve a personal contact with manufacturing firms' managers, during their attendance the conferences and exhibitions that conducted in Malaysia related to manufacturing issues. Using convenience sampling method is one of the study limitations. This is because, such sampling method lower the ability to generalise the results of the survey to the population as a whole, the possibility of under- or over-representation of the population and due to the reasons why some firms choose to take part and some do not. Future studies may consider applying more generalisable sample method such as random sampling method.

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APPENDIX

Measurement items

Learning capability (Pavlou and El Sawy, 2011)
- We have effective routines to identify, value, and import new information and knowledge.
- We have adequate routines to assimilate new information and knowledge.
- We are effective in transforming existing information into new knowledge.
- We are effective in utilising knowledge into new processes/products.
- We are effective in developing new knowledge that has the potential to influence process/product development.

Integrating capability (Pavlou and El Sawy, 2011)
- We are forthcoming in contributing our individual input to the group.
- We have a mutual understanding of each other's tasks and responsibilities.
- We are fully aware who in the group has specialised skills and knowledge relevant to our work.
- We carefully interrelate our actions to each other to meet changing conditions.
- Group members manage to successfully interconnect their activities.

Coordinating capability (Pavlou and El Sawy, 2011)
- We ensure that the output of group work is synchronised with the work of others.
- We ensure an appropriate allocation of resources (e.g., information, time, reports) within our groups.
- Members are assigned to tasks commensurate with their task-relevant knowledge and skills.
- We ensure that there is compatibility between members' expertise and work processes.
- Overall, our work is well coordinated.

Innovation Capability (Peng et al., 2008; Wu et al., 2010)
- We have created innovations that fundamentally changed our prevailing processes.
- We make an effort to anticipate the potential of new manufacturing practices and technologies.
- We actively develop proprietary equipment.
- We have created innovations that made our prevailing processes obsolete.

- We work in teams, with members from a variety of areas (marketing, manufacturing, etc.) to introduce new products.
- We have reduced the time to introduce products by designing product and process together.

Resources Fungibility
- Human resources in our firm are characterised by low role specialisation and broader role definitions.
- Technology resources in our firm could be adjusted to address new product or service.
- In general, the resources are flexible to use in diverse applications in our firm.
- The resources of our firm enhance the multiplicity of possible process combinations.
- The management of our firm develops updated schemas about the potential applications of our key resources.