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# The Effect of Knowledge Capability on Innovation in Malaysian Electrical and Electronics Firms

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***Abstract:***
*This paper examines the effect of knowledge capability on innovation in Malaysian electrical and electronics firms. This paper utilized a quantitative approach where questionnaires with five-point Likert scale were employed as the research tool. The respondents of this study consisted of 287 managers from electrical and electronics firms across Malaysia which included Kuala Lumpur, Selangor, Penang, Johor, Kedah, Melaka, Sabah and Sarawak. The list from the Federation of Malaysian Manufacturers (FMM) indicated that a majority of the firms were located in these states. The study used Statistical Package for Social Science (SPSS 22.0) to generate the descriptive statistics along with the Partial Least Squares Structural Equation Modeling (PLS SEM 3.0) to examine the measurement and structural models. The results have showed that only learning culture is significant to innovation in Malaysian electrical and electronics firms. This aspect is one out of four knowledge capability that consists of T-shaped skills, IT support, learning culture and centralized structure. The study has verified the importance of knowledge capability to organizations, as appropriate capabilities would lead to better achievement of organizational objectives.*

***Keywords:*** *Knowledge capability, innovation, electrical and electronics firms*

## 1. Introduction

In recent years the business environment has experienced a higher level of competition in terms of producing a variety of new products. In order for businesses to be successful, the development of new methods is required to create innovative products unlike in the past (Khin et al., 2010). Based on this factor, product and process innovations have been considered as important elements that influence organizational success (Damanpour &Gopalakrishnan, 2001). Tidd et al. (2005) pointed out that "Product innovation is concerned with generating new ideas or the creation of something entirely new that is reflected in changes in the end product or service offered by the organization. Process innovation represents changes in the way firms produce end products or services through the diffusion or adoption of an innovation developed elsewhere". Utterback and Bernathy (1975) argued that product innovation mainly targets customers and focuses on the market, while process innovation concerns internal operations such as productivity. As a result, technological innovation in terms of product and process is considered to be the ideal type of innovation adopted by manufacturing firms because this type of innovation is able to create new products and it enables firms to overcome their problems. It is also effective in achieving the required results (Cooper, 1998). In another classification of innovation, Damanpour and Evan (1984) as well as Knight (1967) have categorized innovations into technical and administrative. Technical innovations involve the use of technology to create new products or processes. Innovations such as these are linked to organizations' outcome because they concern processes and main actions of the organizations. On the other hand, administrative innovations concern daily activity management such as duty distribution among employees and method enhancement among departments. Administrative innovations are mainly related to managerial duties (Daft, 1978; Damanpour & Evan, 1984; Kimberly & Evanisko, 1981).

It is clear that innovation is centered on knowledge. Without knowledge, innovation will not take place. The creation of potential innovations requires the combination of different types of knowledge in such a manner that it can produce the expected technical item in a specific setting. Such knowledge could be result of research, observation, and previous practice. Since the expected innovation is unknown, previous experiences, research or different types of knowledge will help in identifying the potential innovation. The idea of implementing innovation is by turning the unknown factors into knowledge. Therefore, resources that show potential would play a role in decreasing the unknown conditions and unlock valuable knowledge that would help to reach the innovative target. Therefore, as Tidd et al., (2005) have suggested, incremental innovation is a convenient type of innovations because it does not involve much risk to the organization and it focuses on developing certain sectors. In contrast, radical innovation involves high risks and many unknowns, with uncertain results.

## 2. Knowledge Capability

Firms achieve innovation through the acquisition and distribution of existing knowledge. The ability to share and distribute knowledge can be referred to as knowledge capability. The role of human factor is important to knowledge capability in addition to knowledge gain and distribution (Ju et al., 2006). Knowledge capabilities are important in knowledge management because these can lead to organizational success (Gold et al., 2001). In addition, Gold et al. (2001) described the importance of knowledge processes and capabilities and argued that both processes and capabilities are important for a successful knowledge management. Lee and Choi (2003) argued that knowledge capabilities can be termed as knowledge management infrastructure because it is an important tool in knowledge processes. Gold et al. (2001) highlighted the importance of knowledge capabilities where knowledge capabilities support knowledge processes. These comprise information technology support, centralized structure, learning culture and T shaped skills. IT support is a tool that accelerates knowledge easily and can enhance it within organizations. The utilization of IT infrastructure facilitates the transfer and sharing of knowledge (Davenport & Prusak, 1998; Yang et al., 2009). Some IT infrastructures enable the development of and provide easy access to information. This is commonplace through the use of social media where there is leveraging of rapid knowledge and swift decision-making process is enabled. The use of IT also contributes towards sophisticated knowledge being stored and retrieved easily (Kankanhalli et al., 2003). Organizational structure can minimize the human factor in the sharing of information as it can enhance the technical aspects of an organization (Gold et al., 2001). Wang and Ahmed (2004) pointed out that organizational structure is an important factor because it concerns decisions and internal processes. Furthermore, it revolves around the allocation of responsibilities and tasks as well as the way methods and processes are carried out (Nahm et al., 2003). Distinctive organizational structures have been described in the literature which include organizational design, system-based approaches, and reward systems. As a result, different structures enhance knowledge management in different ways (Gold et al., 2001). Culture is considered to be one of the most important elements in developing knowledge because of the role it plays in facilitating knowledge within organizations (Davenport & Klahr, 1998). Interaction among employees is vital for the creation of new ideas in organizations. Employees need to participate in discussions and other forms of communication that will help to develop a culture of sharing and learning in order to enhance knowledge within their firms (O'Dell & Grayson, 1998). The existence of a learning culture facilitates the spread of knowledge within an organization. Leonard-Barton (1995) described T-shaped skills as matching "The vertical type of T and the horizontal type of T". Employees who possess T-shaped skills are very valuable to organizations because of their ability to generate and combine different types of knowledge that will result in the development of new knowledge. Moreover, the discovery of new areas of knowledge is made possible. Employees who possess T-shaped skills are able to combine different types of knowledge and recognize areas in organizations that need to be developed (Madhaven & Grover, 1998).

## 3. Hypotheses

### *3.1. The Relationship between Knowledge Capability and Innovation*

Sharing knowledge is important in promoting innovation. Japanese firms innovate by integrating internal and external knowledge, because innovation is generated through creating and transforming ideas into practice (Kuo, 2011). According to Ju et al., (2006), the more firms are capable of acquiring, sharing and applying knowledge in practice, the more innovation will be achieved. Knowledge is shared by means of the knowledge infrastructure and through the use of information technology such as databases and online forums (Gold et al., 2001). By converting knowledge from tacit knowledge to explicit knowledge that is put into practice, firms can increase organizational knowledge to stimulate innovation (Ju et al, 2006). However, innovation depends on knowledge and human capital. Thus, firms should focus on these two factors for future success (Gloet & Terziovski, 2004). Damanpour (1991) pointed out that previous studies on organizational structure and innovation have been inconclusive, but in his study, he found that there is a degree of connection between structure and innovation. On the other hand, according to Dewett and Jones (2010), information technology is regarded as one of the knowledge infrastructures that lead to innovation in organizations. It is also facilitates the flow of knowledge and helps in solving problems and thus will definitely enhance the different types of stored knowledge that can contribute to innovation. Information technology facilitates the sharing and transfer of knowledge that enables communication among employees. However, this type of infrastructure must be modern in order to support the transfer of knowledge (Newell et al., 2002). Financing information technology is required for the benefit of knowledge, as the Internet and management systems can reduce the gap between employees and enable them to collaborate (Rollett, 2003). Yang et al. (2009) claimed that IT support is a tool that accelerates knowledge easily and can enhance innovation within organizations. Kankanhalli et al., (2003) highlighted the role of IT by arguing that IT contributes significantly to sophisticated knowledge that can be retrieved and stored. Eventually, this will lead to innovation.Different knowledge capabilities contribute to innovation. For instance, a learning culture is considered as one of the important contributors to innovation. DeLong (1997) identified culture as an important tool for knowledge because it spreads moral values and beliefs among employees that will contribute to better cooperation needed to reach organizational objectives. O' Dell and Grayson (1998) argued that communication among employees is an important element that generates the culture of sharing and spreading of knowledge within organizations. Therefore, organizations should emphasis on daily communication among employees which can strengthen the learning culture. Also, communication is needed to share different types of task and important information such as customer information, different duties and future views. Structure is an important element to organizations because it reduces employee involvement through the centralization of decision-making in different departments. It also assists in creating cooperation among members which can result in enhancing knowledge sharing. Knowledge sharing is recommended in developing employees' skills and behavior that produce more knowledge needed for the benefit of the organization. Moreover, structure focuses on flexibility in the way knowledge is transferred (O' Dell & Grayson, 1998). Damanpour (1991) highlighted that his study on organizations revealed some connections between structure and innovation even though previous studies on organizational structure and innovation have produced unclear outcomes. The role of employees with T-shaped skills is very important to organizations because of their ability to produce different types of knowledge that will result in the development and discovery of new areas of knowledge (Leonard-Barton, 1995). Therefore, employees with T-shaped skills are needed in organizations for their respected skills and thoughts that can generate new knowledge which leads to organizational development (Lee & Choi, 2003). Also, employees who possess T-shaped skills have the ability to enhance the level of knowledge sharing among their peers and distinguish different functions within their organizations (Madhaven & Grover, 1998). Scarbrough (2003) argued that organizations which seek innovation tend to hire individuals with appropriate skills and backgrounds because they possess different sources of knowledge.

## 4. Proposed Theoretical Framework

This paper proposes a theoretical framework that examines the effect of knowledge capability on innovation in Malaysian electrical and electronics firms.

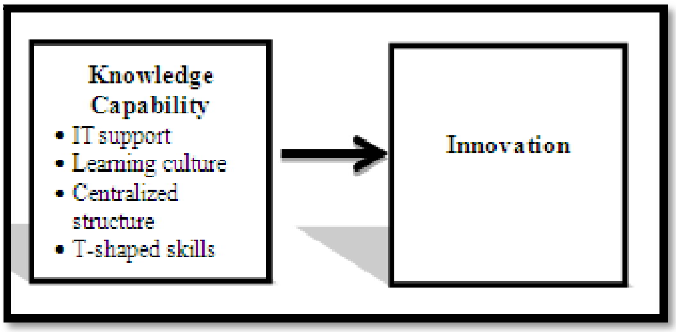


*Figure 1: Theoretical Framework*

### *4.1. Research Instrument*

Questionnaire design concerns how the questions are phrased, measured and eventually how the whole questionnaire is arranged. A questionnaire is the usual technique for data collection, a common approach used by researchers to find the necessary information. A questionnaire is especially helpful in reaching individuals in different locations. Therefore, it should be examined and careful attention should be paid to avoid faults and reduce participant bias (Sekaran, 2003). The present study uses a questionnaire as the research tool. The study uses a Likert scale for responses, due to its simplicity and widespread use in business research. Respondents report the extent to which they disagree or agree with statements, either negatively or positively. Commonly, researchers choose a 5-point scale ranging from strongly agree, agree, uncertain, disagree, to strongly disagree (Zikmund et al., 2010). This technique is considered efficient in obtaining answers from participants instead of asking them to provide data from open-ended questions (Lau and Ngo, 2004). The questionnaire used for data collection consists of three parts. The first part contains general demographic information about the survey participants. The second part contains eight items to measure innovation adopted from Wang and Ahmed (2004). A 5-point Likert scale was used, with possible responses ranging from 1 (strongly disagree) to 5 (strongly agree). The third part consists of 15 items to measure knowledge capability adopted from Lee and Lee (2007), using the same 5-point Likert scale.

### *4.2. Target Population and Sampling Procedure*

The population of this study is the electrical and electronics manufacturing firms in Malaysia. The list was taken from "Malaysian Industries (2013)", a directory published yearly by the Federation of Malaysian Manufacturers (FMM). The list contains 2,286 companies categorized under 17 industries. Electronic and electrical manufacturing firms are the third largest industrial sector after chemical companies, food-and-beverage and tobacco companies. A total of 287 electrical and electronics firms are listed under FMM. This study includes both local and foreign manufacturing firms in Malaysia.A total of 287 electrical and electronics firms are registered under the federation of Malaysian manufacturers 2013, scattered across the Malaysian states. Therefore, a "population sampling" is conducted because the study takes a sample that represents the whole population.

## 5. Data Analysis

The Statistical Package for Social Science SPSS 22.0 was used to analyze the descriptive statistics such as mean, standard deviation of constructs and the demographic characteristics of respondents and organizations such as position held, gender, level of education, number of years in employment, number of employees, type of ownership, and type of industry the firm is involved in. According to Zikmund et al. (2010) "Descriptive statistics summarize and describe the data in a simple and understanding manner". SmartPLS 3.0 Structural equation modeling technique was employed in this research to examine the measurement model and structural model. Table 1 shows the mean and standard deviation for each construct. With regard to innovation, two main types of innovation (product and process) had mean scores of 3.50 and 3.81, respectively. In terms of knowledge capability; T-shaped skills, IT support, learning culture and centralized structure have mean scores of 3.84, 3.87, 3.78 and 3.15 respectively. Table 1 shows the descriptive statistics of the study.

| Variables | Mean | Standard Deviation |
|---|---|---|
| Product | 3.50 | .55 |
| Process | 3.81 | .61 |
| T-shaped skills | 3.84 | .56 |
| IT support | 3.87 | .67 |
| Learning culture | 3.78 | .63 |
| Centralized structure | 3.15 | .72 |

*Table 1: Descriptive Statistics*

*5.1. Profile of Respondents*

Out of 287 respondents, only 102 replies were received. Just over half (54.9%) are human resource managers, followed by general managers (18.6%) and managing directors (17.6%); 5.9% are chief executive officers, and other senior managers account for the remainder (2.9%). The majority (62.7%) of respondents are males, compared to 37.3% females. With regard to the level of education, nearly three-fifths (59.8%) are degree holders; 16.7% hold masters degrees, while 6.9% have PhDs, 4.9% hold a professional certificate, 9.8% are diploma holders and 2 are high school graduates. Just over half (52%) of the organizations are locally owned firms, and 48% are foreign firms. Most firms are engaged in manufacturing electronics components (44.1%), and electrical products (34%); 12.7% produce industrial electronics and 8.8 % produce consumer electronics. In terms of working experience of respondents, nearly two-thirds (64.7%) have less than 10 years' experience; 29.5% have between 10-30 years of working experience, and 7% have between 20-30 years of working experience. Two-thirds (66.2%) of firms have fewer than 500 employees; 17.6% of firms have between 500 and 1000 employees; 14.8% of firms have between 1000 and 2000 employees: while only 5% of firms have more than 2000 employees. Table 2 shows the profile of respondents.

| Demographic Variables | Categories | Frequency | Percentage (%) |
|---|---|---|---|
| Job position | General manager | 19 | 18.6 |
| | HR manager | 56 | 54.9 |
| | Chef executive officer | 6 | 5.9 |
| | Managing director | 18 | 17.6 |
| | Other managers | 3 | 2.9 |
| Gender | Male | 64 | 62.7 |
| | Female | 38 | 37.3 |
| Education | High school | 2 | 2.0 |
| | Diploma | 10 | 9.8 |
| | Degree | 61 | 59.8 |
| | Masters | 17 | 16.7 |
| | Professional certificate | 5 | 4.9 |
| | Doctorate | 7 | 6.9 |
| Ownership | Locally owned | 53 | 52 |
| | Foreign owned | 49 | 48 |
| Types of business | Electronics components | 45 | 44.1 |
| | Consumer electronics | 9 | 8.8 |
| | Industrial electronics | 13 | 12.7 |
| | Electrical products | 35 | 34.3 |
| Working experience | > 10 | 66 | 64.7 |
| | 10-20 | 28 | 29.5 |
| | 20-30 | 7 | 7 |
| | <30 | 1 | 1 |
| Number of employees | >500 | 67 | 66.2 |
| | 500-1000 | 15 | 17.6 |
| | 1000-2000 | 11 | 14.8 |
| | <2000 | 9 | 5 |

*Table 2: Profile of Respondents*

*5.2. Assessment of Measurement Model*

When using PLS SEM to examine reflective indicators of the measurement model, validity and reliability must be considered. Next, Validity is assessed by convergent validity and discriminant validity of a construct. To examine the convergent validity, a few elements must be considered, such as item loadings, composite reliability and the average variance extracted (Hair, 2009). Next, is examining the discriminant validity. It refers to the distinction of construct from other constructs or the construct measures what is expect to measure. Discriminant validity is achieved by Fornell and Larcker (1981) criteria, by comparing the square root of the average variance extracted and the correlations of constructs (Fornell and Larcker, 1981). Another way of assessing discriminant validity by the cross loading of indicators. Average variance extracted (AVE) of the measurement model displays the following: Centralized Structure (0.559), IT Support (0.729), Learning culture (0.638), T-shaped skills (0.6), Process Innovation (0.565) and Product Innovation (0.603). All constructs expressed an AVE that is considered as adequate for measuring the convergent validity of the measurement model. Composite Reliability (CR) of constructs reveals the following results: Average variance extracted (AVE) of the measurement model displays the following: Centralized Structure (0.559), IT Support (0.729), Learning culture (0.638), T-shaped skills (0.6), Process Innovation (0.565) and Product Innovation (0.603). All constructs expressed an adequate score for measuring the convergent validity of the measurement model. Table 3 shows item loadings, composite reliability and average variance extracted.

| Construct | Item | Loadings | CR | AVE |
|---|---|---|---|---|
| Structure | CTST1 | 0.864 | 0.83 | 0.559 |
| | CTST2 | 0.888 | | |
| | CTST3 | 0.566 | | |
| | CTST4 | 0.619 | | |
| IT support | ITSP1 | 0.874 | 0.931 | 0.729 |
| | ITSP2 | 0.901 | | |
| | ITSP3 | 0.9 | | |
| | ITSP4 | 0.79 | | |
| | ITSP5 | 0.797 | | |
| Learning Culture | LECU1 | 0.852 | 0.898 | 0.638 |
| | LECU2 | 0.789 | | |
| | LECU3 | 0.806 | | |
| | LECU4 | 0.78 | | |
| | LECU5 | 0.764 | | |
| Process | PCIN1 | 0.713 | 0.838 | 0.565 |
| | PCIN2 | 0.801 | | |
| | PCIN3 | 0.813 | | |
| | PCIN4 | 0.669 | | |
| Product | PDIN1 | 0.861 | 0.818 | 0.603 |
| | PDIN2 | 0.826 | | |
| | PDIN3 | 0.621 | | |
| T-shaped Skills | TSSK1 | 0.778 | 0.882 | 0.6 |
| | TSSK2 | 0.791 | | |
| | TSSK3 | 0.816 | | |
| | TSSK4 | 0.729 | | |
| | TSSK5 | 0.757 | | |

*Table 3: Item Loadings, Composite Reliability and Average Variance Extracted*

*5.3. Assessment of Structural Model*

Evaluation of the structural model requires few steps to confirm the hypothesis relationships; consequently a decision is made on the confirmation of the theory. Therefore, evaluating the structural model requires assessing the coefficient of determination R2 and path coefficient, the effect size f2,and the predictive relevance Q2(Hair et al, 2014). The coefficient of determination is an essential principle is evaluating the structural model. It represents the sum of variance derived from the exogenous construct to the endogenous. The higher R2value is the prediction of the accuracy of the structural model (Hair et al, 2012; Hair et al, 2014). The value on R square level depends on the research settings, for instance Hair et al, (2010) suggest R2 value with 0.10 is the minimum level, on the other hand, Chin (1998) claimed that R2of 0.19, 0.33, 0.67 is considered " weak, moderate, substantial". Table 4 shows R2 of IT support 0.34, which is moderate, learning culture 0.50 which is moderate as well, centralized structure 0.10 which is weak and T shaped skills 0.31 weak In this case, smart PLS bootstrapping was used with a 5000 sample. The effect size displays the change in the R2 when a given exogenous construct is deleted with its relation to the endogenous construct.f2 of 0.02, 015,0.35 represents values as weak, moderate and strong (Cohen, 1988). In this study the effect size ranges from 0.01- 0.09.The predictive relevance refers to the model prediction without samples, because when smart PLS estimates the predictive relevance of the model it predicts the data that do not exist within the model.in this study a predictive relevance was implemented by the blindfolding technique as suggested by (Stone 1974; Geisser 1974).

| Hypothesis | | Std beta | Std error | T value | Result | $R^2$ | $F^2$ | $Q^2$ |
|---|---|---|---|---|---|---|---|---|
| H13 | IT support -> Innovation | 0.099 | 0.12 | 0.831 | Not supported | 0.345 | 0.007 | 0.239 |
| H14 | Learning culture -> Innovation | 0.373 | 0.117 | 3.177** | Supported | 0.505 | 0.09 | 0.345 |
| H15 | Centralized structure -> Innovation | 0.077 | 0.081 | 0.954 | Not supported | 0.101 | 0.01 | |
| H16 | T shaped skills -> Innovation | 0.092 | 0.133 | 0.691 | Not supported | 0.319 | 0.006 | 0.216 |

*Table 4: Structural Model and Hypothesis Testing*

### 6. Discussion of Results

The results show that IT support is not significant to innovation. As Davenport and Prusak (1998) pointed out, the utilization of an IT infrastructure would also facilitate the transfer of knowledge and the sharing of such knowledge. Some IT infrastructures enable the development and easy access of information through social media that help in leveraging rapid knowledge and make possible swift decision-making processes. Moreover, IT is particularly useful in overcoming the barriers of distance and time which affect some knowledge workers (Nonaka ,1996). Kankanhalli et al., (2003) highlighted the role of IT by arguing that, IT contributes significantly to the sophisticated type of knowledge that can be retrieved and stored, and which can lead to innovation. Therefore, electrical and electronics firms should reconsider the existing IT infrastructure in their organizations to evaluate whether it operates to maximize the acquisition and sharing of information among different departments and thereby lead to product innovation. Culture is regarded as the most important element in developing knowledge because of the role it plays to facilitate knowledge within organizations (Davenport & Klahr, 1998). Also, culture is important component because of the role it plays to identify the future direction of organization. This direction helps to identify the values and mission needed (Dell and Graysin, 1998). The result shows that the presence of a learning culture is positively related to innovation in Malaysian electrical and electronics firms. A learning culture enables the spread of knowledge in organizations that will enhance innovation. Donate and Canales (2012) supported this view by arguing that different knowledge tools such as learning culture are important in enhancing innovation. The results show that a centralized structure is not significant to innovation in Malaysian electrical and electronics firms. This finding contradicts Damanpour (1991), who highlighted that, although previous studies on organizational structure and innovation have produced unclear outcomes, his own study on organizations revealed some connection between structure and innovation. This finding may have come about because decision-makings are not centralized within electrical and electronics firms; for instance, some employees are not allowed to make their own decisions without approval from their manager. Therefore, decisions should be centered within Malaysian electrical and electronics firms to enhance the level of confidence in making decisions among employees. Employees should have opportunities to express their opinions and act on their own initiative in order to develop a sense of responsibility among them as well. Employees who possess T shaped skills are very valuable to organizations because of their ability to generate and combine different types of knowledge that will result in the development of new knowledge and will also enable the discovery of new areas of knowledge (Leonard-Barton, 1995). However, the results in the present study did show that T-shaped skills are not significant in encouraging innovation in Malaysian electrical and electronics firms. This is despite the fact that such skills are important in enlarging employees' understanding about their daily tasks and responsibilities. The possession of such skills would enable employees to perform their duties on a broader scope that would expand their horizons on all aspects of their routine duties.

### 7. Limitations and Future Research

This study has confronted some limitations, which future scholars should avoid. One of the limitations of this study concerns the sample size. There are different organizations that claim their databases are accurate when it comes to companies involved in electrical and electronics. These include the Department of Statistics, the electrical and electronics association of Malaysia and the Malaysian Chamber of Commerce. However, the list obtained from the Federation of Malaysian Manufacturers (FMM, 2013) directory is accurate, and follows international standards when categorizing items. Furthermore, it has been used before in previous research, and therefore enables comparisons to be made accordingly used in this study.A second limitation is the level of caution among Malaysian managers regarding surveys, especially online surveys and postal surveys, and the response was slow for this study. However, face-to-face interview also faced many delays and challenges, partly because of the wariness of managers in dealing with surveys in general, and also because potential respondents are busy people. Third, the study was limited to electrical and electronics manufacturing firms; future research could investigate the situation in other sectors of Malaysian manufacturing.The study has verified the importance of knowledge capability to organizations, as appropriate capabilities would lead to better achievement of organizational objectives. Future research could examine the influence of knowledge capability on different types of innovation. In addition, future research could investigate different types of Malaysian manufacturing. Also, future researchers could explore different types of knowledge capability and it is recommended to expand findings to cover all types of manufacturing in Malaysia to spread the sample size and to make it possible to compare the difference between different types of manufacturing.

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