Knowledge and Skills Necessary for Product Innovation in SMEs Manufacturing Industry in Malaysia

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Abstract

Product innovation and its spill-overs into new products, technologies and productive capacity are deemed to be important determinants of firms' productivity growth, competitive advantage and ultimately their survival. In spite of its pivotal role, the process that leads to the production of innovation is still poorly understood among the Malaysian industries. The aim of this research is to identify the knowledge and skills necessary for product innovation in the manufacturing sector of SMEs in Batu Pahat, Johor. This research was conducted using quantitative approach, where questionnaires was used as the major instrument in data collection. The data was analysed by using the Statistical Package for Social Science (SPSS) programme . The research analysis outcomes showed that customer and market knowledge is the most dominant knowledge necessary for product innovation. The mean score was 4.22 for both which have high tendency towards product innovation. The overall outcome for the skills and knowledge showed high tendency towards the necessity for product innovation. Further analysis is suggested to be conducted to get better understanding of the real relationship between skills and knowledge towards product innovation.

Key words: knowledge, product innovation, skills

1.0 Introduction

The role of small and medium enterprises (SMEs) is set to expand over the years as its contribution to the national gross domestic product is expected to increase.(New Sabah Times, 2011). SMEs cover a wide spectrum of industries and play an important role in both the developed and developing countries economies. Developing a group of diverse and competitive small and medium enterprises (SMEs) is a central theme towards achieving sustainable economic growth. One of the important sources of competitiveness for SMEs has been to serve as agents of change, as the engines for new idea generation and innovative activity. Innovation is one of the key variables influencing productivity growth. Product innovation is the development of new products, changes in design of established products, or use of new materials or components in the manufacture of established products.The product innovation and its spill-overs into new products, technologies and productive capacity are deemed to be important determinants of firms' productivity growth, competitive advantage and ultimately their survival. In spite of its pivotal role, the process that leads to the production of innovation is still poorly understood among the Malaysian industries.

1.1 Research background

Small and medium enterprises (SMEs) play a vital role in the Malaysian economy and are considered to be the backbone of industrial development in the country.The Malaysian Government's commitment to, and concern for, the development of SMEs has been clearly evident since the early 1970s. The 'New Economic Policy' was introduced in 1971, which aimed to improve people's welfare and restructure ethnic economic imbalances. The government's commitment to the development of SMEs can also be seen in the second Industrial Master Plan (IMP2), which ended in 2005, which is followed by the Third Industrial Mater Plan (IMP3) 2006–2020, to coincide with the country's vision for 2020 (MITI, 2005).The IMPs were formulated to enhance the growth of the manufacturing sector across the entire value chain and cluster-based industrial developments. Hence, this plan provides an integrated approach to the development of industrial areas and opportunities for growth of SMEs.

1.2 Problem statement

There are two major problems associated with the product innovation among SMEs manufacturing industry in Malaysia. The first problem is internal resistance to innovate and organisational rigidities. Internal resistance to innovate could be due to the perception of the workforce itself. The second problem related to the product innovation in SMEs manufacturing industry in Malaysia is globalization. Globalization and liberalization has made business resources more mobile and transferable beyond borders. However, liberalization harms local SMEs as they have to compete with cheaper, more innovative incoming foreign products or services and compete for resources and capital.

1.3 Research questions

- What are the knowledge and skills necessary for product innovation in SMEs Manufacturing Industry in Malaysia?
- What is the acceptance of product innovation implementation in SMEs Manufacturing Industry in Malaysia?

1.4 Objectives

- To identify the knowledge and skills necessary for product innovation in SMEs Manufacturing Industry in Malaysia.
- To identify the acceptance of product innovation implementation in SMEs Manufacturing Industry in Malaysia.

1.5 Research scope

This research will be carried out among few SMEs in manufacturing industry especially technology based companies in Batu Pahat, Johor. A set of questionnaires will be distributed to workers and the management level of the companies.

The significances of this research can be divided into three categories namely significance towards the SMEs, government and future research. This research will be beneficial to both employees and employers in the SMEs manufacturing industry. Once the knowledge and skills are identified, development of skilful and innovative workers can be carried out to meet the economic challenges and demand. Government is the largest contributor in SMEs continuous development especially in terms of financial support and programs. Through this research, product innovation among employees is expected to provide benefits to the government to drive innovation-based economy. This research can assist the future researches by making it more transparent and specific as well as having a better approach.

2.0 Literature Review

2.1 *Introduction*

This chapter imparts the findings of a literature review carries out to acknowledge existing research, work and thoughts of experts and practitioners within the subject field, it begins by briefly presenting the overview of SMEs in Malaysia and the knowledge and skills necessary for product innovation.

2.2 Innovation

2.2.1 Definition of innovation

Innovation is a change in a product offering, service, business model or operations which meaningfully improves the experience of a large number of stakeholders. (Hutch Carpenter, 2010)

2.2.2 Model of innovation

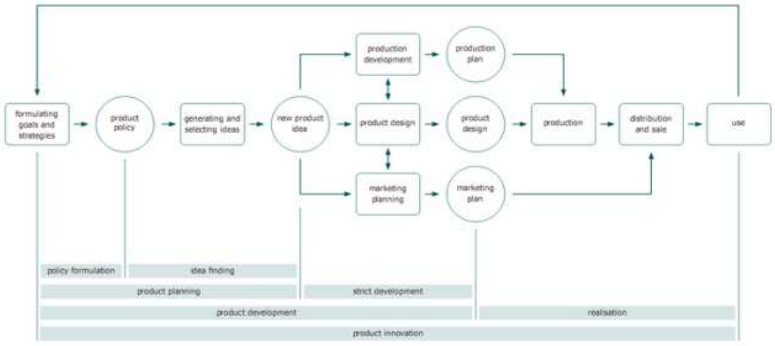
The innovation-decision process is the process through which an individual passes from gaining initial knowledge of an innovation, to forming an attitude toward the innovation, to making a decision to adopt or reject, to implementation of the new idea, and to confirmation of this decision.

2.3 Product Innovation

2.3.1 Definition of product innovation

Product innovation is the creation and subsequent introduction of a good or service that is either new or improved on previous goods or services of its kind.

2.3.2 Model of product innovation



2.4 Knowledge

2.4.1 Definition of Knowledge

Knowledge is a familiarity with someone or something, which can include facts, information, descriptions, or skills acquired through experience or education. It can refer to the theoretical or practical understanding of a subject.

2.4.2 Dimensions of knowledge

2.4.2.1 Customer and market knowledge

Assessments of the size of the market, likely segments, how quickly is the market is likely to evolve, and what are the key underlying drivers of that evolution are essential

2.4.2.2 Technology knowledge

“Technology” is used to refer to science or engineering-based knowledge used to create products and manufacturing processes, such as microbiology, materials science, information systems, software, chemical engineering, or electronics.

2.4.2.3 Core operations knowledge

Knowledge of core operations refers to the knowledge of what the organization as a system can do, of how various sets of technologies can be combined with other organizational systems to create and launch products or knowledge of how to make things happen.

2.5 Skill

2.5 Definition of skill

A skill is the learned capacity to carry out pre-determined results often with the minimum outlay of time, energy, or both.

2.5.1 Dimensions of skills

2.5.2.1 Engineering skills

Use a wide range of tools, techniques, and equipment (including software) appropriate to their specific discipline

2.5.2.2Design skills

- developing concepts with a strong idea of how they might be produced
- Sketching, modelling and prototyping ideas, physically and digitally

2.5.2.3 Technological skills

Use technology as a tool to research, organize, evaluate and communicate information

2.6 Small and medium enterprises

Malaysia adopted a common definition of Small and Medium Enterprises (SMEs) to facilitate identification of SMEs in the various sectors and subsectors. This has facilitated the Government to formulate effective development policies, support programmes as well as provision of technical and financial assistance. According to SME Corporation (2008), an enterprise is considered an SME in each of the respective sectors based on the Annual Sales Turnover or Number of Full-Time Employees.

2.7 Manufacturing Industry

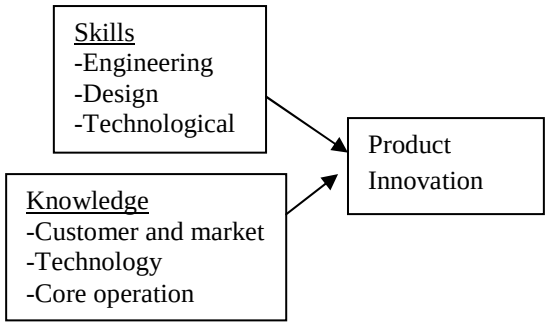
Manufacturing Industry is the sector of production that process or reprocess industrial and agricultural raw materials.

2.8 Previous studies

WRITER	TITLE OF RESEARCH	RESEARCH FINDINGS	SUMMARY
1) Lawrence Green, Barbara Jones and Ian Miles (2007)	Mini Study 02 – Skills for Innovation - Human capital is a major complement to R&D and physicalcapital, attracting and retaining skilled people is crucial to the stimulation of innovation.	1) Scientific and Technological 2) Engineering 3) Design and Packaging 4) Market and User Research	There is somelimited evidence for a positive relationship between sectorial innovation propensity and the average amount of expenditure on innovation associatedtraining per employee.
2) Deborah Dougherty (1999)	Organizational capacities for sustained product	1) markets and customers 2) product and process	Aspects of all three kinds of knowledge must be connected in

	innovation "product innovation" refers to the whole process of bringing a new product or service to the market, and includes product conceptualization	technology 3) organization's own core operating abilities	the specific product's design and business plan, in the guidingstrategy for the business, and in the organization's policies

2.9 Theoretical framework



3.0 Methodology

3.1 Introduction

A quantitative research approach is used in this research. In the following section, the researcher would discuss about data collection method, quantitative data collection technique and data analysis technique.

3.2 Research design

The collected information and results that is obtained from the respondents, together with the literature review will be analyzed and studied to achieve the objective of this study.

3.3 Research population

3.3.1 Target respondent

The population of this study is SMEs of food manufacturing sector around Batu Pahat, Johor.

3.3.2 Sampling frame

The sampling frame is the list of food manufacturing companies from the Malaysia Food and Beverage Directory. The target respondents of this study are workers of the food manufacturing companies in the area of Batu Pahat, Johor.

3.4 Sampling

3.4.1 Unit of analysis

The workers of SMEs food manufacturing industry around the area of Batu Pahat are the unit of analysis.

3.4.2 Sampling technique

For this research, simple random sampling method will be use. Simple random sampling is the purest form of probability sampling. Each member of the population has an equal and known chance of being selected.

3.5 Data collection

3.5.1 Primary Data

The primary data is collected from questionnaires which are focused on obtaining data related to the knowledge and skills necessary for product innovation in SMEs manufacturing industry from conducting cross-sectional survey.

3.5.2 Secondary Data

The secondary data collected is the information that is gathered from existing sources.The secondary data collected is the information that is gathered
from existing sources. The secondary in this research is collected from books, journal, internet articles and newspaper articles and it is presented in the form of literature review in this research.

3.5 Research Instrument

A questionnaire is a reformulated written set of questions to the respondent which in this case is employees in SMEs manufacturing. It is distribute via representative of the employees in the SMEs after giving a call or email to the representative.

3.6 Research procedure

3.6.1 Reliability Test for the Study

A pilot study was carried out to ensure the consistency and the reliability of the questionnaire items being used, result indicated $\alpha = 0.915$. Next, the reliability test for the real study, showed $\alpha = 0.946$ which considered strong. The Cronbach's alpha reliability coefficient was identified to show a positive relationship between each item in the questionnaire. Cronbach's Alpha value of less than 0.6 is identified as weak, while the value of 0.7 and more is acceptable.

3.7 Analysis Method

The main data analysis for this research was carried out on descriptive analysis only (such as frequencies, percentages, and mean centre of tendency) using Statistical Package for Social Science (SPSS). The analysis involved two parts; Part A, the level of Product Innovation Implementation and Part B, Knowledge and Skills necessary for Product Innovation.

4.0 Results

4.1 Introduction

The data obtained was analyzed through descriptive analysis. The data used for the study was obtained from the questionnaires that were answered by the respondents. The return rate of questionnaires was only 80 percent which was 32 of 40 distributed.

4.2 Respondent's background

4.4.1 Gender

Gender	Frequency (N)	Percentage (%)
Female	21	65.6
Male	11	34.4

The analysis showed that a total of 21 female, 65.6% and 11 male, 34.4% who had responded to the questionnaire of the 32 respondents.

4.4.2 Age

Age	Frequency (N)	Percentage (%)
21-25 years old	4	12.5
26-30 years old	7	21.9
31-40 years old	13	40.6
41 years old and above	8	25.0

The analysis showed the largest group of respondents were from the age of 31 – 40, represented 40.6 %. Next, 8 % the age group of 41, followed by the age group of 26 – 30 (21.9 %), and 21 – 25 the least age group of only 12.5 %.

4.4.3 Duration of Service

Duration	Frequency (N)	Percentage (%)
Less than one year	8	25.0
1-5 years	10	31.2
5-10 years	6	18.8
10 years and above	8	25.0

The data showed duration years of service 1 – 5 years was the biggest number represent this study , which was about 31.2 %. This followed by 25.0% of the respondents who worked less than 1 year and 10 years and above with the frequency of 8, and 18.8 % work less than 5 – 10 years.

4.4.4 Position within organization

Position	Frequency (N)	Percentage (%)
Technician	7	21.9
Supervisor	10	31.2
Manager	5	15.6
Others	10	31.2

The analysis also showed the respondents position in the organization. Major involved in this study was from the group of supervisors and others, 10 respondents with 31.2 %, next group was technician, 7 (21.9 %), and Manager, 5 (15.6 %).

4.5 Descriptive Statistical Analysis

4.6 Product Innovation Implementation

The results of the analysis showed Data was analyzed to determine the contribution of product innovation implementation practices necessary in the organization towards knowledge and skills.

4.7 Analysis of Product Innovation Implementation

No.	Item	Mean Score	Standard Deviation	Tendency Level
1	Always generate new ideas in the production process of a product	4.25	0.803	High
2	Carries out renewal of the products based on demand and market requirements	4.03	1.092	High
3	Adds value to existing products in accordance with current market needs	4.19	0.931	High
4	All changes made are dependent on the views and comments of consumer.	4.12	0.660	High
5	Creates new products to attract customers' purchase.	4.16	0.954	High
6	Produces a lot of creativity and innovation in products to stay competitive in the market.	4.09	0.928	High
7	Ensures the product being produced can help bring profit to the company.	3.88	1.008	High
8	Always sensitive to current changes in the local and international market.	4.12	0.976	High
9	Implements ongoing efforts to improve on existing products.	4.13	0.871	High
10	Implements ongoing efforts to renew existing products.	4.06	1.014	High
	Total Average	**4.10**	**0.924**	**High**

The analysis showed the distribution of overall total mean score for each item questions related to product innovation implementation was 4.10, with a high central level of tendency. The highest mean in related to product innovation implementation was “always generate new ideas in the production process of a product” mean 4.25, high central level of tendency. The lowest was “ensures the product being produced can help bring profit to the company” mean 3.88, still give high central level of tendency. This gave an indication that product innovation implementation is much being practice and understood by all respondents involves.

4.8 Analysis of knowledge and skills necessary for product innovation

This part showed the total average score of mean value for the knowledge and skills necessary for product innovation. The factors involved were engineering skills, design skills, technological skills, customer and market knowledge, technology knowledge and core operation knowledge.

4.8.1 Engineering Skills

No.	Item	Mean score	Standard deviation	Tendency level
1	Employees have excellent analytical skills	4.22	0.553	High
2	Employees are continually examining ways to help improve product innovation.	4.09	0.588	High
3	Able to use laboratory and workshop equipment to generate valuable data	3.88	0.707	High
4	Have the ability to use a wide range of tools, techniques, and equipment (including software) appropriate for product innovation.	4.03	0.647	High
5	The current engineering skills are adequate for product innovation.	4.22	0.832	High
	Total Average	4.09	0.665	High

The highest mean score obtained is 4.22, "Employees have excellent analytical skills" and "the current engineering skills are adequate for product innovation", with both have high central tendency level towards product innovation. The rest of the item also resulted in high central tendency level towards product innovation with mean between 3.88 – 4.12. This indicated that the high central tendency level of engineering skills towards production innovation is necessary.

4.8.2 Design Skills

No.	Item	Mean Score	Standard Deviation	Tendency Level
1	Employees are able to develop concepts with a strong idea of how they might be produced.	4.12	0.660	High
2	Able to perform sketching, modeling and prototyping ideas, physically and digitally.	4.12	0.660	High
3	Understanding, selecting and implementing different product innovation methods	4.12	0.660	High
4	Design, development and implementation of new ideas or concepts to improve efficiency of product innovation.	4.09	0.588	High
	Total Average	4.11	0.642	High

The total average mean score for design skills is 4.11 which has a very high central tendency level towards product innovation. The highest mean score are for item "employees are able to develop concepts with a strong idea of how they might be produced, able to perform sketching, modeling and prototyping ideas, physically and digitally and understanding, selecting and implementing different product innovation methods". The rest of the item also showed high central tendency level of mean 4.11 and 4.09. This also indicated that Design skills do necessary for the implementation of product innovation.

4.8.3 Technological Skills

No.	Items	Mean Score	Standard Deviation	Tendency Level
1	Employees are able to operate equipment with the understanding of scientific and technological principles	4.16	0.677	High
2	Employees are able to explore, acquire, adapt and operate systems.	4.00	0.842	High
3	Employees are able to use technological tools to solve problem that may arise in the process of innovation.	4.16	0.515	High
4	Employees are able to work in a virtual environment using technological tools where they work non face-to-face with teams.	4.00	0.762	High
	Total Average	4.08	0.699	High

The total average mean score for technological skills was 4.08 which have a high central tendency level towards product innovation. The highest mean score was 4.16 which are "employees are able to use technological tools to solve problem that may arise in the process of innovation and employees are able to operate equipment with the understanding of scientific and technological principles" towards product innovation. The rest of the item also showed high central tendency level with mean 4.00 – 4.08. The same as the other three factors, which necessary for the implementation of product innovation.

4.8.4 Customer and market knowledge

No.	Items	Mean Score	Standard Deviation	Tendency Level
1	Employees are able to understand and listen to customer needs and requirements on product innovation.	4.19	0.535	High
2	To effectively develop and present information to target customers	4.09	0.588	High
3	Providing tailored solution to meet customer's requirement	4.25	0.568	High
	Total Average	4.18	0.564	High

The total average mean score for customer and market knowledge was 4.18 which have a high central tendency level towards product innovation. The highest mean score was 4.25 which are "Providing tailored solution to meet customer's requirement" towards the necessity for product innovation. The rest of the item also showed high central tendency level with mean 4.09 and 4.19. These factors showed the necessity for the implementation of product innovation.

4.8.5 Technological Knowledge

No.	Items	Mean Score	Standard Deviation	Tendency Level
1	Employees are competent in assimilating external knowledge in similar fields due to the positive feedback between experience and learning.	4.12	0.751	High
2	The accumulation of technological knowledge increases the firm's ability to evaluate and use new technologies and skills in product innovation.	4.19	0.693	High
3	The firm can quickly identify new technological trends and experiment with emerging designs.	4.19	0.644	High
4	The firm is able to engage in product innovations beyond the current technological boundaries.	4.16	0.767	High
	Total Average	4.17	0.714	High

The total average mean score for technological knowledge was 4.17 which have a high central tendency level towards product innovation. The highest mean score was 4.19 which are "The accumulation of technological knowledge increases the firm's ability to evaluate and use new technologies and skills in product innovation and The firm can quickly identify new technological trends and experiment with emerging designs" towards the necessity for product innovation. The rest of the item also showed high central tendency level with mean 4.12 and 4.17. These factors showed the necessity for the implementation of product innovation

4.8.6 Core Operational Knowledge

No	Items	Mean Score	Standard Deviation	Tendency Level
1	Employees understand deeply the vision and mission of the company towards successful product innovation.	4.22	0.608	High
2	Leaders are able to lead and motivate people to achieve corporate goal.	4.06	0.716	High
3	Leaders are able to manage projects from concept to implementation.	4.12	0.492	High
4	Employees have the knowledge of what the organization as a system can do and how to make things happen.	4.28	0.581	High
	Total Average	4.17	0.599	High

The total average mean score for core operational knowledge was 4.17 which have a high central tendency level towards product innovation. The highest mean score was 4.28 which are "Employees have the knowledge of what the organization as a system can do and how to make things happen" towards the necessity for product innovation. The rest of the item also showed high central tendency level with mean 4.06 and 4.22. These factors showed the necessity for the implementation of product innovation.

4.8.7 Overall Analysis of Knowledge and Skills Necessary for Product Innovation

The Customer and market knowledge factor has the highest average mean score of 4.22 compared to others The other factors of knowledge and skills necessary for product innovation gave total average mean score for engineering skills is 4.09, design skills is 4.11, technological skills is 4.08, customer and market knowledge is 4.18, technology knowledge is 4.17 and core operation knowledge is 4.17.. According to the table, all of the knowledge and skills factors have high central tendency level towards the necessity for product innovation to be implemented.

5.0 Discussion

5.1 Discussion

The research objective drawn in this research, that is to identify the knowledge and skills necessary for product innovation in the SMEs manufacturing sector. The results of the study showed that knowledge and skills necessary for product innovation, which comprises of engineering skills, design skills, technological skills, customer and market knowledge, technology knowledge and core operation knowledge have high central of tendency towards product innovation. This is much supported by Louis Lengrand & Associés (2007), reported that the skills required for product innovation are technological, design and engineering skills.

Regarding, customer and market knowledge which has a high tendency level towards product innovation with total average mean score of 4.22. Moorman (1995) and Atuahene-Gima (2005), market information processing can lead to a deep understanding of customers and competitors. The finding further supported as in innovative product to be successful, the product innovation for a company must link technological competence, such as engineering and process know-how, with customer competence such as knowledge of customer needs (Danneels, 2001).Increasing the productivity of knowledge work and managing customers' knowledge so as to understand their needs and wants, enables a company to gain a competitive advantage in the market.

5.2 Recommendation

5.2.1 Recommendation for SMEs

Managers should consider providing training for the employees in order to help them to acquire more knowledge and skills that are required in the product innovation process. Besides, managers should always pay attention to the performance of employees at work. They should assist the employees when there is any problem encountered at work.

5.2.2 Recommendation for future researchers

Among the proposals put forward a researchers should give and provide more knowledge and information to enhance the understanding and to provide proper guidance to other researchers in the future. Future researchers can diversify the survey respondents by increasing the number of respondents in order to achieve more relevant and accurate resultsand also widen the scope ofthe study.

5.3 Conclusion

The overall result of the research has achieved the s to identify the knowledge and skills that necessary and contribute for product innovation in SMEs manufacturing industry and also acceptance of product innovation implementation. The six knowledge and skills factors necessary to contribute to for product innovation was determined. These knowledge and skills are engineering skills, design skills, technological skills, customer and market knowledge, technology knowledge and core operation knowledge. The mean analysis shows that customer and market knowledge is the most dominant element that must be acquired by employees in order to carry out product innovation. Besides, mean analysis also show that the level of acceptance of product innovation implementation is high in central of tendency.

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