



**UNIVERSITI TEKNIKAL MALAYSIA MELAKA**

**RADICAL OR INCREMENTAL INNOVATION? INSIGHT IN INNOVATION  
CHOICE OF MANUFACTURING INDUSTRY**

This report is submitted in accordance with the requirement of the Universiti Teknikal  
Malaysia Melaka (UTeM) for the Bachelor Degree in Technology Management  
(Innovation Technology)

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'I hereby declare that have read this thesis and in our research is sufficient in terms of scope and quality. This project is submitted to Universiti Teknikal Malaysia Melaka as a requirement for completion and reward bachelor's degree of Technology Management (Innovation Technology)'.

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**RADICAL OR INCREMENTAL INNOVATION? INSIGHT IN  
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I hereby declare that this project entitled “**Radical or Incremental Innovation? Insight in Innovation Choice of Manufacturing Industry**” is the result of my own research except as cited in references. The project paper has not been accepted for any degree and is not concurrently submitted in candidature of any other degree.

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## **ABSTRACT**

Innovation is generally known as the key factor for a firm to obtain competitive advantage and improve their performance. However, wrong decision in innovation could lead to failure as well, either keep on exploring (radical innovation) or exploiting (incremental innovation). This study aims to determine the factors influencing the decision on choosing radical or incremental innovation and the impact towards firm's performance. Cross-sectional explanatory research is used as the approach to investigate the conflict between the two types of innovation, and questionnaire is used for data collection. The result indicated that radical innovation is influenced by organizational culture, while incremental innovation is influenced by knowledge management. Both radical and incremental innovation are significant to firm's performance, where incremental innovation is relatively more significant, based on regression analysis. The study concluded with limitations and recommendation of future research.

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## LIST OF ABBREVIATIONS

<b>DOSM</b>	<b>Department of Statistics Malaysia</b>
<b>IPP</b>	<b>Innovation Policy Platform</b>

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## **CHAPTER 1**

### **INTRODUCTION**

#### **1.0 Introduction**

This chapter provides a background study of innovation, including definitions and classification of innovations. While radical innovation and incremental innovation are two extremely different type of innovation, each requires different approach and criteria to implement. Going for either type is beneficial to a business to improve the company's performance or to gain competitive advantage. Especially for industries that heavily rely on technology and capital intensive, it is extremely important for the firms to innovate in order to increase their productivity and be more efficient.

## 1.1 Background of Study

Innovation plays a vital role in a firm's growth. It affects a firm's growth at all phases of development, especially by diffusing and utilizing new technologies; different types of innovation affect different stages of development. (IPP, 2015). According to definition from Innovation Dictionary in Malaysia Innovation Foundation (n.d.), innovation is considered taken place if it has entered the market (product innovation) or been used within a process in certain type of production (process innovation). Based on Henderson-Clark model, innovation can be categories into four types, that is radical, modular, incremental and architectural (Naqshbandi & Kaur, 2015). This research will only focus on radical innovation and incremental innovation, as they express two extremely different approach on improvising an existing product or process.

Radical innovation is defined as a product or process that is competence-destroying and requires new knowledge or resource to surpass the existing products in terms of its technological advancement. (Naqshbandi & Kaur, 2015). Radical innovation is also known as disruptive innovation, as the innovation will create a new market, or a new way of doing something, which will cause confusion to the market and disrupt the market's behaviour, due to a dramatic performance break with the past (Dodgson, Gann & Salter, 2008). In short, it could also be defined as a new idea or method that provides a better solution to an existing market need (IPP, 2015).

Incremental innovation is defined as minor technological changes on product or process that are based on the existing knowledge and resources by further leverage it (Naqshbandi & Kaur, 2015). This type of innovation can be further divided into two different forms, one is improving a simple product in terms of its performance or lower the cost of production; another is improving a technical subsystem of a complex product that is comprised of different technical subsystems (IPP, 2015). Incremental innovation is always the type that an established firm will go for, as they just have to exploit what they have already know and make it better. (Dodgson et al, 2008).

The choice of either a type of innovation results in totally different outcome for a manufacturing firm, as it involves different approach in terms of research and development (R&D) method, marketing strategy and human resource planning. As explained by Hashi and Stojčić (2013), larger firms tend to invest more in innovation, and the expenditure decreases as the firm size decreases. Many firms are willing to invest in R&D activities and innovation. This is due to the proven positive relationship between innovation and firm's sales growth, (Choi & William, 2012), product quality and operational performance as well (Kafetzopoulos & Psomas, 2015).

Atalay, Anafarta, & Sarvan (2013) emphasized the contribution of technological innovation (product and process innovation) towards firm's performance, specifically towards industries that is capital intensive and mass production based, as they tend to focus on improving the performance of products and production line. Hashi and Stojčić (2013) also supported the fact that innovation has positive impact on productivity. Thus, it is interesting to take a look into how the firms decide on which type of innovation to go for, in order to improve their performance, either in terms of product or process.



## 1.2 Problem Statement

While there is exhaustive literature found the positive relationship between innovation and business performance, there are actually businesses that had failed because of innovation. Haanaes (2015) shared that these failures usually come with either the reasons, they keep exploring or keep exploiting, where explore is about radical innovation and exploit is incremental innovation. He further stated that getting the balance between two, is the key to long-term survival.

Timing to introduce a radical innovation is crucial. If the timing is not right and the market are not ready to adopt the innovation, it is considered fail (BMI Lab, 2017). Radical innovation also requires skills and large knowledge base to generate ideas (Carr, 2015). On the other hand, although incrementally innovated products are easier to sell, compared to radical innovation (Fullagar, 2015), there is a possibility that the innovation will not stand out from the competitors and the market might not notice the difference between new and old products (Kadareja, 2013). Despite the widely-known advantages resulted by innovations, the setbacks of innovations are considered as well before a firm wants to decide which to go for. This research will focus on manufacturing firms' decision in terms of choosing an innovation type, and what are the conflicts behind their choice.

### **1.3 Research Questions**

The research questions below show how the objectives will be integrated into current research.

1. What are the factors influencing the company in choosing radical or incremental innovation?
2. How the choice will impact the company to strive in the industry?

### **1.4 Research Objectives**

1. To identify the factors influencing the company in choosing radical or incremental innovation
2. To evaluate the impact of the chosen innovation towards company's performance

### **1.5 Scope of Study**

This research will cover different sub-industries of manufacturing industry in Malaysia. To evaluate the difference and conflict among various types of innovation, the research will only focus on radical innovation and incremental innovation, as they require extremely different approaches to tackle.

## **1.6 Limitation**

Due to time and budget constraint, this research would not able to collect a very large sample. At the same time, the research will mainly cover manufacturing firms in Melaka and Selangor area. Other issues like honesty in answering the questionnaires are beyond the control of researcher.

## **1.7 Importance of the Project**

This research aims to provide a clearer understanding on manufacturing firms' decision on choosing either radical innovation or incremental innovation. This includes the factors that influence a firm's choice, the benefits and challenges, and the impact towards firm's performance as well. The research will also focus on the conflict between the two types of innovations which enables manufacturing firms to measure carefully before investing and implementing the new innovations, to minimize or even prevent failure in their research and development. Thus, this research can be used by organizations or firms that wish to engage in innovation activities, and considers the factors and advantages linked to the innovation before deciding which to go for.

## **CHAPTER 2**

### **LITERATURE REVIEW**

#### **2.0 Introduction**

This chapter covered the existing literatures of the main subjects under interpretation in this study. The first section included the definitions of main key terms such as manufacturing industry, innovation, radical and incremental innovation. Next section focuses on the insights and changes of innovation and manufacturing industry in Malaysia, finally followed by the conceptual frameworks that explains the interaction of the elements.

## 2.1 Innovation

Both researchers and industries have been looking for the definition of innovation, as the way the term is defined will influence the activities taken by a firm to implement it, either in-house or outsource (Popa, Preda & Boldea, 2010). The term innovation is introduced into economics by Joseph Alois Schumpeter in 1911, where he emphasized on the importance of bringing together knowledge of what is technologically possible with knowledge of what is needed (Elliot, 1985). He also describes innovation as one of the critical factors that results in economic change (Naqshbandi & Kaur, 2015). Innovation is heterogenous across industries and different approaches are used by researchers and industry to define it in their own perspective (Tang & Le, 2007; Popa et al, 2010), thus no universal definition that can be generally applied in different industries and studies (Gopalakrishnan & Damanpour, 1997). Table 1.0 shows definitions of the term by different authors from 1980s to recent. From the table, we could see that generally the definition of innovation focus on newness, as words like ‘new’ and ‘novelty’ are frequently used in expressing the term. Similar finding can be seen from the research done by Johannessen, Olsen and Lumpkin (2001), while some (Man, 2001; Kuczmarski, 2003) describe innovation as one’s mindset and closely related with creativity.

Table 2.1: Definitions of Innovation

Definition	Author
Innovation is the act that endows resources with a new capacity to create wealth.	Drucker (1985, p. 30)
Innovation = Invention + Exploitation	Roberts (1988, p. 13)
... the processes by which firms master and get into practice product designs and manufacturing processes that are new to them, if not to the universe or even to the nation.	Nelson (1993, p. 4)
Researchers in industries and innovation levels of	Gopalakrishnan &

analysis tend to define innovation to be synonymous with generation of new ideas; while those who focus on organizational level relates innovation with adoption of idea; and researchers that address sub-system level of analysis include both as part of their definitions.	Damanpour (1997, p. 19)
Innovation is an iterative process initiated by the perception of a new market and/or new service opportunity for a technology-based invention which leads to development, production, and marketing tasks striving for the commercial success of the invention.	OECD (1991; as cited in Garcia & Calantone, 2002, p. 112)
Some believe that creativity leads to innovation; others believe that innovation produces creative ideas. ... These elements of innovation and creativity are: <ul style="list-style-type: none"> <li>• New ideas are used, made used of in a creative way;</li> <li>• Solutions are extensive in their application;</li> <li>• The impact of solutions extends to departments and agencies in other organizations;</li> <li>• Solutions that are long lasting and revolutionary;</li> <li>• Work with new value added;</li> <li>• Solutions contributed in fulfilling business goals;</li> <li>• Ideas involve “out of the box” thinking.</li> </ul>	Man, (2001, p. 229)
A mindset, a pervasive attitude, or a way of thinking focused beyond the present into the future vision.	Kuczarski. (2003, p. 536)
Innovation is not only the creation of faster objects – it is much broader than this.	Gopalakrishnan, Kessler & Scillitoe. (2010, p. 263).
Innovation is defined more broadly and towards product/service, as process innovation in terms of something new to make it more efficient or solving a problem.	Sawang, Zolin, Matthews & Bezemer. (2014, p. 231)
I define innovation as <i>Valuable Novelty</i> , and	Stauffer. (2015, p. 169)

innovativeness as the capacity to produce <i>Valuable Novelty</i> .	
An innovation is the implementation of a new or significantly changed product or process.	Gault. (2018, p. 619)
Innovation is the creation of value by using relevant knowledge and resources for conversion of an idea into a new product, process, or practice, or improvements in an existing product, process, or practice.	Varadarajan. (2018, p. 154)

## 2.2 Dimensions of Innovation

Innovation has many dimensions, it could be classified into different types based on the capacity to innovate, in a way to turn knowledge and ideas into industrial applicable products, services or systems, to bring advantage to the organization and shareholder (Tang & Le, 2007; Popa et al, 2010). According to IPP (n.d.), innovation is categorized by few dimensions as shown in Table 2.2, including the degree of novelty, whether the innovation is on product or service (product or service innovation), the impact of radical and incremental (radical and incremental innovation), and the source of innovation is technological or non-technological (technological and non-technological innovation). Similar types of classifications are shown in Gopalakrishnan and Damanpour's research in 1997, innovations are categorised as such – product vs process; radical vs incremental; and technical vs administrative (non-technological), as these three categories are the three most frequently used comparison.

Table 2.2: Definition of Innovation by Innovation Policy Platform.

Types of innovation	Explanation
Product innovation	Introduction of a good or service that its characteristics or intended uses including significant technical improvements, user friendliness or other functional characteristics are new or significantly improved.
Process innovation	Implementation of techniques, production method, equipment and/or software that is significantly improved. Process innovations could be implemented to decrease delivery or production's unit cost, to improve quality or to produce or deliver new or significantly improved products.
Technological innovation	Associated with product and process innovations.