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بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

ASSESSING AND MANAGING THE IMPACT OF
TECHNICAL AND MARKET RISKS ON THE
COMMERCIAL SUCCESS OF NEW PRODUCT.

BY

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A dissertation submitted in partial fulfilment of the
requirements for the degree of Master of Science
(Manufacturing Engineering)

Kulliyyah of Engineering
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ABSTRACT

Technical and market risks are inherent in every new product and pose significant threat to the commercial success of a new product. Identification and mitigation of these risks are the major challenges faced by many manufacturing companies. The common practice is extrapolation of past technical knowledge to new product or technology development. Consequently, many new products or technologies fail to meet customers' requirements and thereby suffer commercial failure in the market. Though, there had been several attempts to resolve this problem, but recent studies suggest that proactive risk management is capable of mitigating the problem to an average of 90 percent level of acceptance. Therefore, this research work aims at studying the effect of mitigating the inherent technical and market risks on the commercial success of new products. In order to achieve this aim, the research exploited previous works and questionnaire survey. Two hundred and ninety five questionnaires were administered to the targeted respondents, out of which one hundred and forty eight questionnaires were returned. The collected data was analyzed using SPSS version 12.0 utilizing analytical tools such as frequency distribution, principal component and regression analyses. The findings revealed that technical and market risks are closely related at a level of significance of 0.01, and have significant impact on predicting commercial success of new products.

ملخص البحث

0.9

12.0

SPSS

0.01

APPROVAL PAGE

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DECLARATION

I hereby declare that this dissertation is the result of my own investigation, except, where otherwise stated. I also declare that it has not been previously or concurrently submitted as a whole for any other degree at IIUM or other institutions.

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CHAPTER ONE

INTRODUCTION

1.0 INTRODUCTION

Risk management in projects especially in large manufacturing companies is a challenging task. Every organization or industry experiences risks, which means there is a chance that things may not work out exactly as planned. Like many other industries the manufacturing industry is subject to risk which could be either internal or external. The process of manufacturing product right from the initial product research and development to finished product and into use or consumption is complex. The complexity however, is compounded by many external, uncontrollable factors (Roger and George, 2000). Also, modern manufacturing companies face a range of risk issues that can be described by the business structure involved, types of risk and approach taken to the risk (NCMS, 2002).

Despite the complexity and risks, all organizations, either private or public have responsibilities to their various stakeholders. These responsibilities demand that an organization has to run efficiently and effectively. Chapman and Ward (2003) argues that risks can potentially affect every single organization. But crucially, these risks, and the organizations' exposure to them can be managed. Indeed, managing risk to ensure that organization meets its responsibilities, no matter what is the hallmark of a well run and professional organization.

Failure to manage risk frequently may result to serious consequence such as damage to the reputation of the organizations as well as relationship with customers,

suppliers and staff. The organizations are also left vulnerable to malicious attack and wastage of money invested in the technology system (Harold, 2001).

This study is motivated by the fact that modern manufacturing is characterized by high technology operations. Such manufacturing employs high tech tools and processes. Technical risk and uncertainty are inherent in the nature of technological innovation. This is true not only because technological innovation uses new and not fully formed science as its tools and seeks to create the demand that it must then satisfy, but also because it seeks to destabilize markets and produce unusually favorable returns. However, technical uncertainties are not determined by the unpredictable manifestation of nature alone, but are dependent on available knowledge about market, since technology determines available product specification, which in turn are constrained by acceptable market opportunities (Lewis and Philip, 2001). A readily available good example is the technical uncertainties in relation to problems usually exhibit by batteries in Dell PC and Laptop computers.

This study does not intend to look at all risks involved in general risk management in the broad and general perspective. Instead, it focuses on the identification and analysis of technical risk and market risk variables, relationship between technical risk and market risk, impact of these risks on the success of new products. The study also examines the effects of both technical and market risks on the prospect of the manufacturing companies and how they can be properly and effectively assessed and managed.

1.1 BACKGROUND TO THE STUDY

Over the recent years, manufacturing firms especially high-tech manufacturing companies had come increasingly to the realization that new product or technology

may hold the key to their future survival and growth (Phillip, 2001). Evidenced by the present advancements in the global economy, it is obvious that in today's globalized market, new product or technology provides the competitive edge for organizational growth and survival. Hence, the decision by the leading and high-tech manufacturing companies to embark on innovative projects.

According to Cooper (1996), a host of forces including changes in customer needs and requirements, competitor behavior and change in technology have combined to make product innovation a vital element in the formulation of corporate strategy and planning to put the firm in a better competitive position. Crucial to the development of new product or technology are innovation and management of new product or technology which requires allocating resources to complementary value adding competencies (Cooper, 1988).

However, business practitioners as well manufacturing companies need to understand how technological issues related to innovation, efficient manufacturing, responsive new product development, skilled human resources and so on, are linked to the organization's marketing strategy for gaining sustained advantage over competitors (Ettlie, 2000). In fact, there is a belief in the business circle that there is a tradeoff between speed to market, quality and product performance. (Stephen, 2006) believes that a number of discontinuous market trends have a profound impact on the way technology-driven firms compete with each other in the market. It has been observed that the expectations of the customers around the world are very high. They demand satisfaction from the goods or services that are provided by the manufacturers. This had spurred the technology-driven firms to alter the way they developed their new products or technology (nearly every new product or technology

requires a new or modified process), and the way they marketed these products to the increasing picky customers (Ettlie, 2000)

According to McGrath (2001), as a result of advancement in information technologies customers could access more information on new product than ever before. With intense global competition and the fast-spreading information, the effective and fast-response development and commercialization of new products or technology became the prerequisites to market success (Polk et al, 1996). So also the customer satisfaction acquired a critical significance for competitive survival and growth of companies, industries and nations. In order to realize this fit, the manufacturing companies must put necessary measures in place for identification and management of inherent risks in a new product or technology because of challenges and complexities involved in new product development and marketing new product.

1.1.1 Research Impetus

There are literatures on management of inherent risks in new products and performance of new products in terms of success or failure in the marketplace. Literatures that specifically relate to technical risk and market risk and their impacts on the success or failure of new products are prolific (see Polk et al 1996, Cooper, 1996, Gary et al, 1999, Preston, 1999, Charlotte, 2003 and Preston & Guy, 2006). In spite of the suggestions by the researchers, the problem of new product failure still persists and could not be alleviated due to the fact that the researchers treated each risk separately without considering the relationship between them. Another, shortcoming is that the researchers based their studies on the opinions of only marketing manager, leaving out other functional managers involved in development

and manufacturing new products, such as project manager, research manager, and so on.

Therefore, this research seeks to add to the existing study and body of knowledge by conducting empirical study on managing the impacts of combination of both technical risk and market risk, correlation between the two risks that would involve all the cross-functional managers in new product development.

However, in order to do justice to the research topic, there is a need to elaborate on some of the terms associated with it.

1.2 SIGNIFICANCE OF THE RESEARCH

Manufacturing activity to some extent determines the economic health and growth of any nation. However, modern manufacturing, due to high technology operations and highly risky innovative product development involved is susceptible to both technical and market risks. Therefore, this research tends to identify, analyze, and examine various ways of managing inherent technical and market risks in new products. These will help in building understanding of risk issues and appropriate confidence in dealing with them. Also, would ensure that the new products meet product specifications and customer's requirements which will eventually reduce the new products' market risks.

1.3 PROBLEM STATEMENT

Developing new products is a high-risk process but can be potentially very rewarding. This is possible if the technical and market risks inherent in every new product are identified and well managed before the introduction of the products to the market. Failure to identify and mitigate these risks usually causes the following problems;

failure of technical performance, inability to achieve specifications necessary to meet customer expectations, unavailability of value chain elements for product delivery, insufficient market assessment, and insufficient differentiation to distinguish a new product from competitive offerings.

These problems often lead to loss of financial resources invested in new product or technology development, damage to manufacturing firm's reputation, loss of competitiveness and eventual commercial failure of new products. All these problems have been linked to non mitigation of technical and market risk inherently present in new product.

Therefore, identifying and mitigating the relative influences of the risks inherent in new product will reduce the tendency for commercial failure. This will enhance the products' acceptability, companies' achievement of their objectives as well as companies' profitability.

1.4 RESEARCH OBJECTIVES

The objectives of this research are;

1. To identify the main technical and market risks variables that influenced the commercial success of new products
2. To determine the correlation between technical risk and market risk
3. To determine the variables that have greater impact on the prediction of new products' commercial success

1.5 SCOPE OF THE STUDY

Though there are different types of risk that are associated with new products, but this study does not intend to consider all the risks inherently present in a new product. Rather, it focuses on the identification, analysis and management of technical and market risks that are inherent in new products in order to enhance their performance in the market.

1.6 LIMITATION OF THE STUDY

The researcher's constraints of time and resources formed the major basis of limitation of this study. Also, due to lack of enough awareness of importance of risk management in manufacturing companies few works or resources are available on technical risk and its effects on the performance of new products, majority of the available ones were only on general technical risk assessment. Another limitation was the general low responses of the respondents. Some manufacturing companies, by a way of policy did not allow the researcher to administer questionnaires to the targeted respondents in their companies. Some complained of tight schedule which did not give them room to entertain such exercise. At the end the received responses fell short of expectation. In general the limitations of the study are the following:

1. The variables used in the study were those that could be identified from the literatures obtained from resources accessible to the researcher within the constraint of cost and time available for the construction of the survey instrument.
2. Due to the cost and time constraints of the research, the questionnaire could only be personally administered to the respondents within Malaysia, with majority in Selangor catchment's area.

The lukewarm attitudes of some companies toward the administered questionnaires served as obstacle that contributed to the low rate of returned responses

1.7 RESEARCH METHODOLOGY

The research methodology adopted for this research includes;

- a. Literature review
- b. Quantitative method of primary data collection
- c. Quantitative data analysis.

Literature review involved reviewing of relevant documents related to the topic of the research such as; Books, Academic journals, Seminar/Conference papers, Reports of Government researches, Articles, Theses/Dissertations and Online Databases. Questionnaire is adopted as the instrument used for collecting the primary data. The statistical techniques used for data analysis are the following:

- a. Frequency Distribution
- b. Principal Components Analysis.
- c. Regression Analysis.

1.8 LAYOUT OF THE DISSERTATION.

The contents of this study aside from the preliminaries are divided into five chapters. Chapter one comprises of introduction, background to the study and others, such as problem statement, significance of the research, scope of the study, research objectives, research methodology, and finally the theoretical frame work. Chapter two of the study deals with literature review on risk, new product development, technical risk, market risk and risk management. Chapter three concentrates on the research methodology employed in carrying out this study. Chapter four discusses the data

analysis, results and findings of this study. Chapter five is all about the conclusion and recommendation

CHAPTER TWO

LITERATURE REVIEW

2.0 INTRODUCTION

The majority of new product development decisions in the past were done with more emphasis and considerations on the cost and schedule. This was due to the fact that little was known about technical risks and there was rare performance of technology forecasting. The common practice was extrapolation of the past technical knowledge into the present.

Today, the state of the art of technology forecasting is being pushed to the limit. For new product developments with time duration of less than one year, it is normally assumed that the environment is known and stable, particularly the technological environment. For new product development projects over a year or so in length, technological forecasting must be considered (Harold, 2001). According to Harold (2001), computer technology doubles in performance about every two years and engineering technology is said to double every three or four years. How can a project manager accurately define and plan the scope of a three or four years project without expecting engineering changes resulting from technology improvement? (Harold 2001). Inability to perfectly forecast technology development and the associated design needed to meet performance requirement will contribute to a project's technical risk and will eventually lead to market risk

It is tempting to discuss about the concepts of technical and market risks in relation to manufacturing companies and new product development at a practical level without fully explaining all the terminology and other concepts involved.

2.1 RISK

Risk is believed to be an abstract concept, therefore, it is difficult to define and in most cases impossible to measure with any precision (Raftery, 1999). He also noted that risk is a two ways concept in the sense that the outcome of an event may be better or worse than originally expected. However, Nicholas (2001) argued that risk as a concept has many dimensions and interpretations and the meaning of the word “risk” depends on the perspective with which individual looks at it. He believed that generally, risk is a function of the uniqueness of a project and the experience of the project team.

Therefore, when activities are routine or have been performed several times before, based on the acquired experience managers can anticipate and forecast the array of potential outcomes and maneuver aspects of the system design and project plan to achieve the desired outcomes. When the project is unique or the team is inexperienced, the potential outcome tend to be more uncertain, making it difficult to know what could go wrong and how to avoid such problems.

Nicholas (2001), believed that there is risk even in routine projects, because there is likelihood of outcomes being influenced by either new and emerging factors, or those that are beyond anyone’s control. Generally, the notion of organizational risk involves two concepts:

- a. The likelihood that some problematic events will occur
- b. The impact of the event if it does occur

Therefore, risk is a joint function of the two:

$$\text{Risk} = f(\text{likelihood, impact})$$

Ordinarily, a situation will be considered risky, if at least one factor, either likelihood or the impact is large. For example, a process will be considered risky when the potential impact is human fatality or massive financial loss, even when the likelihood of either of them is negligible. Newell et al (2002), submitted that risk can be divided into two: that is known and unknown risks. He believed known risk can be identified and unknown risk cannot be identified, but the effect of the unknown risk can be recognized and they can be adequately planned for. Arguably, it is believed that risk cannot be totally or completely eliminated from projects or processes in an organization, but it can be reduced to a considerable and acceptable level (Nicholas, 2001). This brings about the essence and necessity of risk management.

According to Harold (2001), risk constitutes a lack of knowledge of future events. Typically, future events (or outcomes) that are favorable are called opportunities, whereas unfavorable events are called risks. Another element of risk is the cause of risk. Something or the lack of something can induce a risk situation. Harold said, this source of danger can be denoted as hazard. Certain hazards can be overcome to a great extent by knowing them and taking action to overcome them. This leads to the second representation of risk.

$$\text{Risk} = f(\text{Hazard, Safeguard})$$

Risk increases with hazard but decreases with safeguard (Harold, 2001). This equation shows that good risk management tends to identify hazard and at the same time develops safeguard to overcome them. Availability of enough safeguards reduces the risk to an acceptable level.