

RISK FACTORS AFFECTING NEW PRODUCT DEVELOPMENT (NPD) PERFORMANCE IN SMALL MEDIUM ENTERPRISES (SMES)

Nusaibah Mansor^{1*}, Siti Norbaya Yahaya² & Kazuhiro Okazaki³

^{1,2,3}Graduate School of Business Administration and Computer Science, Aichi Institute of Technology (Motoyama Campus), 1-38-1 Higashiyama-dori, Chikusa-ku, Nagoya 464-0807, Japan.

^{1,2}Universiti Teknikal Malaysia Melaka, Hang Tuah Jaya, 76100 Durian Tunggal, Melaka, Malaysia

ABSTRACT

Small medium-sized enterprises (SMEs) are known to contribute to any countries' economic growth. To ensure their survival in a competitive market, SMEs need to have the ability to innovate and develop new products. Prompt decisions making therefore needed to innovate and produce new products to reach market first before their competitors. However, due to their size as well as financial and human resources constraints, SMEs face obstacles and huge challenges. Therefore, one of the major aspects of developing a successful new product is managing risks. Risk can have either a positive or negative impact on new product performance. It is crucial for companies to manage risks in order to achieve the desired new product development (NPD) performance without compromising quality. Therefore, this study aims to identify the influence of risk on NPD performance in SMEs. Four main types of risk may affect NPD performance: technology, market, operational and financial risks are discuss pertaining to NPD performance.

Keywords: *risk management, new product development, SMEs.*

1. INTRODUCTION

Small and medium-sized enterprises (SMEs) are the backbone of most economies globally. In most countries, SMEs account for more than 90 percent of all established companies [1]. They are known to create jobs in the private sector, thus reducing the unemployment rate. In terms of organizational structure, SMEs have a much simpler structure; therefore they are faster and more flexible at responding and adapting to change [2]. Nonetheless, the fact that economic conditions are always unpredictable and the current marketplace is highly competitive, have put SMEs in a position where they need to find ways to survive in such an environment. Numerous studies agree that in order to succeed in an intensely competitive environment, SMEs need to take the lead in new product innovation [3,4].

To develop and innovate new products is no easy feat, especially for SMEs, as the NPD process itself is associated with several risks. The product life cycle is becoming shorter, increasing the competition to become the first to introduce new products into the market. Having fewer resources and structural features also results in a greater vulnerability to risk. A study conducted in the UK found that most SMEs find it problematic to implement a new product development process due to some constraints such as poor definition of product requirements. The study highlighted that the process was delayed due to poor understanding of customer requirements and insufficient knowledge of a product's technology and market [5]. The same assumption cannot be made for the success of developing new products in small firms compared to large firms because they are severely constrained by limited resources, both human and financial [6]. They are relatively vulnerable to external events because of a low equity ratio. Compared to larger enterprises, SMEs have weak financial foundations and fewer accesses to resources. This suggests that SMEs are more easily threatened and exposed to risks when it comes to managing NPD.

Risk management may help SMEs to mitigate significant risks that could otherwise impede their move to success in developing new products [7]. Failure to manage risks will lead to unwanted consequences such as losing customers, environmental damage and even bankruptcy. Nevertheless, most SMEs do not have sufficient capacity to apply risk management practices, mostly because they cannot afford to rededicate resources due to their constraints. Most studies are fragmented when it comes to risk management and new product development in SMEs. Research in risk management on SMEs mostly delves into strategic action but not risk management in new product development in SMEs [7,8,9]. Therefore this study will address a gap in the literature by linking risk management of NPD to SMEs.

2. METHOD

This study is carried out using method adopted from Tranfield *et al.* [10] to conduct review on scholar journals and academic literatures. In their paper, the authors evaluate the process of systematic review that was used previously in medical science to be applied in management and business field. The basic steps in conducting systematic review as

set out by the authors are divided into three steps which are; planning the review, conducting the review and lastly reporting the review.

The initial step is on planning review that is presented earlier in the introduction section that discusses the direction of this paper. The second step is to conduct the review by identifying relevant research in journal articles on risk management of NPD in SMEs using wide key word using the following database:

- (1) EBSCO Business Source Elite.
- (2) Elsevier Science Direct.
- (3) Emerald Management Extra Plus.
- (4) Google Scholar.
- (5) ProQuest
- (6) Scopus.

In order to screen through vast collections of documents in database, main keywords are used with the combination of important words, and also combination of words present in an abstract of an article. The first keyword we look up for is on SMEs. Word such as “small medium enterprises” OR “small firm” OR “SME” OR “medium sized company” OR “small medium sized business” were search in database.

Second keyword is on “risk management” OR “risk” OR “managing risk” or “uncertainties”. And third combination keyword which we search for is “new product development” OR “NPD” or “product development”. Most of the articles extract from high impact journal namely *Journal of Product Innovation Management*, *Technovation*, *The Journal of Risk Finance*, *Small Business Economics*, *Journal of Small Business Management*. The search leads to several journal articles then are further scanned through to fit the criterion of this study. Unfit articles were excluded from further analysis, as they do not made any reference to SME but large company instead. The findings will be discussed and presented in the following sections.

3. RESULTS AND DISCUSSION

3.1. Risk Management

Risk management can be defined as the process of determining the maximum acceptable level of overall risk for engaging in business activities. In the risk management process, it involves using risk assessment techniques to identify the initial level of risk and then develop a strategy to rectify appropriate individual risks until the overall risk is reduced to an acceptable level. Risk management approaches differ from one firm to the next, whether small or larger firms, which have different, strategic management goals. The importance of risk management is now greater and beyond other issues such as long-term and short-term financing constraints [11]. Recognizing the existence of a risk management strategy is insufficient; enterprises need to actively engage in risk management practices to address the major risks as experienced in the current unpredictable economic climate are impacting both individuals and enterprises.

Across small or larger firms, strategic actions are different; however in terms of managing risks and uncertainties the importance of recognizing it is very crucial in both. Different industries have diverse approach in managing risks. And when International Organization for Standardization (ISO) published ISO31000: 2009 *Risk Management: Principles and Guidelines* in November 2009, it has marked another significant milestones for risk management. Although the standard is still impractical and unclear to follow, there is room to improvise it. The standard in hope will assimilate understanding of risk management thus have common language and uniformity in understanding risk management.

Where SME is concern, risk management is the core principle on which the entrepreneur or management should be focused, including identifying future uncertainties, measure risks, predicting possible patterns and effects, and formulating plans to address these risks and reduce or eliminate their impact on the enterprise. One of the skills required of entrepreneurs is the ability to identify and analyze risks to ensure that they take calculated risks [12].

3.2. Risk Management in NPD

New product development (NPD) is a process to transform ideas and materialize it into innovative products to eventually move it into the market. It is inherently linked to taking and managing risks, as most activities can be interpreted as a structured reduction of uncertainty. Studies of customer needs and market trends can reduce the uncertainty surrounding requirements to develop new product. This will ensure certainty company’s capabilities

over technology development, testing and evaluation when undergo NPD process [13]. Reducing risks in new product development can also increase customer value [14], and can be used to analyze and optimize product development processes. Research findings by Moenaert *et al.* [15] conclude that the more uncertainty is reduced during the new product innovation process, the higher the possibility of the success of commercializing a new product. The research agrees on the reduction of market uncertainty to ensure commercialization of new products.

Using structured and systematic process to categorize risks in NPD will assist companies to assess and diagnose causes of risks and their level of predictability more easily. Keizer *et al.* [16] developed a risk management diagnostic methodology for how to manage risk in new product development projects. They emphasize that the risk assessment process is to identify potential risks in four main domains, namely technology, market, finance and operations risks. Mu *et al.* [13] improved upon prior studies in risk management on NPD by proposing a three-dimensional risk management framework for NPD. Their framework emphasizes that firms can identify, analyze, respond to, and monitor the major risks in the NPD process by various means such as learning from customers and other entities, sourcing external knowledge, and integrating specialized knowledge internally. Park [17] classified risks in NPD into two categories, external and internal risks. The author identified internal risk as operational risks, technology risks, and organizational risks, meanwhile external risks are as market risks and supplier risks.

Kim and Vonortas [7] conducted empirical research on young enterprises in Europe on how they manage risks during their early establishment. Although they do not study risk on NPD, they adapted four main domain usually used in NPD that are technology, operational, financial and market to study young enterprises mitigate and manage risks. In fact they chose risk domain from Keizer et al. [16] risk management diagnostic method used in developing new product. The research shows evidence of strategic actions by young enterprises in managing risk. Evidence found that entrepreneurs would extensively use internal risk mitigation strategies in volatile environment especially on managing technological risk and operational risk and form more network.

Based on prior research, the following points shows in Table 1 regarding the effect of risk on NPD performance are further discussed, notably technology, market, organizational and financial risk.

Table 1 Type of risks effecting NPD performance

Technology Risk	Market Risk
Not completely understand or predict technology environment	Customer feels uncertain or fearful product don't meet with needs or expectation
Lack of technical capabilities	Customer changing needs
Customer do not fully understand technology brought into new product or service	Potential actions of competitor
	Changing economic and social conditions
Organizational Risk	Financial Risk
Competition among companies on resources	Access to working capitals
Human resource availability	Project goes over budget
Supply chain changes	
Conflict within organization	

3.2.1. Technology Risk

Perceived technological risk denotes a firm's inability to completely understand or predict some aspects of technological environment related to NPD projects [18]. The source of technology risk can comes either form inside or outside of organization. The higher the complexity and sophistication of technological environment the higher the technology risk is. Firms might not foresee the rise of new technology or predict when technology becomes obsolete [19].

Another identified technological risk is capability. When companies are about to engage in the process of NPD, often firms might lack the technical capabilities. Therefore in order to mitigate technical risk, firms might consider finding outside experts. However, that is not the case for small firms due to their constraints and lack of resources. Yap and Souder [20] recommended that small firms improve their new product success rate by avoiding hiring from outside the organization for the purpose of procuring new technologies. Hiring outside experts is only encouraged when the technological uncertainties are very high and the company has very good reason to proceed with the NPD

project. Kim and Vonortas [7] also found in their empirical study that the higher young companies perceived technology risk, they will likely to extensively engage in networks especially for knowledge-intensive sectors. The study also agree with Yap and Souder [20] that firms will introduce new products or services to the market and by not hiring outside experts but rather set up formal R&D and engineering and technical studies departments to deal with technology risk. Companies with strong technical competence in the NPD team can ensure the success rate of a new product both in small and large companies [21].

Another aspect of technological risk is when customers do not fully understand the new technology brought into their new product. Customers expect ease of use of new products they purchase, so if it becomes difficult to use, the new product might fail to capture the market. Meyer and Roberts [22] recommended a strategy to small-technology based firms to adopt only one key growth-sustaining technology and avoid high levels of diversification in developing new product. This strategy may put SMEs in better position by mitigating risk and develop learning curve in core technology, thus better understanding of technology in product or service introduce to customer. In respond to technology risk, Kim and Vonortas [7] suggested that SMEs need to continuously improve their products frequently by maintaining formal in-house research activities.

3.2.2. Market Risk

Market risk refers to uncertainty about the types and extent of customer needs that can be satisfied by a particular technology or new product [23]. Much of the existing research evidence suggests that failure of NPD may largely be due to improper marketing. Market risk is high when consumers have had little consumption experience with a product, thus making product requirements difficult to define. Unlike technology risk, market risk is external to firms [17], and it is the least controllable risk factor in NPD [7].

The causes of market risk can be numerous. First is customer perceived risk in which customers feel uncertain or fearful and doubt whether a new product can meet their needs and expectations [24]. The second is changing needs of customers. Customers' needs may change according to the latest trend and their lack of understanding of a new product in the market. The third is predicting; it is becoming difficult for firms to forecast and predict potential sales volume of new products [25]. The prediction of future revenue and possible profit depends not only on forecasting the total quantity that can be sold, but also on forecasting future costs of production, prices and price elasticity. Market competition volatility makes NPD success more unpredictable. Potential moves made by competitors might pose a threat and risk to small firms.

Market risk still can be managed although it seems difficult and complex. A better and more precise understanding of customers' needs and behavior has been proven to lead to success in NPD. Studies have found that timely and reliable knowledge about customer preferences and requirements is among the most important types of information for product development [21]. According to Ledwith [6], a strong correlation between market certainty and new product success was found for the small firms, suggesting that external factors had a substantial impact on the outcomes of projects. The study also affirmed the need of small firms to pay close attention to their customers' needs. Yap and Souder [20] suggest that small firms with resource constraints position their product in low market uncertainty and low technical uncertainty conditions. This positioning strategy allows customers to evaluate the product much more quickly and easily.

3.2.3. Organizational Risk

Organizational risk refers to the state of uncertainties in which firms deal with the internal and external environment. It can directly affect NPD performance. Mu *et al.* [13] discussed this in their study on the effect of direct environmental risk on firms' NPD performance. They elaborate upon three direct effects of environmental factors, namely complexity, munificence and dynamism, which are drawn from Aldrich's [26] work. Due to a volatile marketplace, heightened competition among companies contributes to environmental complexity. This can cause organizational risk to increase because it is difficult for companies to implement strategic actions against competitors. Limitations on resources also can become a hindrance for firms in beginning NPD projects. It then will increase uncertainties and risk before companies decide to compete for the scarce resources [27]. One way of reducing this kind of risk is by integrating a firm's capabilities into the environment, their business strategy and organizational process. Another way is by utilizing existing networks. Firms can learn best practices and share knowledge and capabilities since external networks have been regarded as important factors in enhancing innovation [28].

The management of internal and external relations in new product development is in fact one area where there is a difference in the existing literature on small and large firms. Most of what is published about large firms deals with internal relations. It is discussed that integration between different functional departments will achieve better results both in the characteristics of the products developed and the time taken to develop them [29,30]. Literature dealing with small firms, however, focuses on external relations, addressing issues such as industrial services, subcontracting relationships, licensing, networking, and collaborative R&D [31,32].

3.2.4. Financial Risk

Due to their relatively small size, SMEs lack adequate financial resources to accommodate their growth. Furthermore in order to invest in new product development, SMEs need capital. SMEs are viewed by the current literature as being highly dependent on external financing, and a loan is usually the main source of financing available [9]. This, however, involves the risk that interest rates on the loans may change over the time. It is very difficult for SMEs to secure funding, especially when banking and private financial institutions do not trust in their capability to pay back the loans. If they have a strong financial position, high chances or probability credit are offered [7]. A strong financial position can, at least partially will compensate for high-risk tolerance. Moreover, SMEs with limited collateral are unlikely to be given a loan, regardless of their willingness to take risks, whereas for companies with high collateral, the likelihood of being granted a loan is significantly higher when their willingness to take risks is low. It is suggested that strong collateral cannot compensate for the negative aspects of high risk-taking [33].

Access to working capital is always one of the major challenges faced by SME, and it is classified as one of the risk domains [34]. Previous work by the authors [35] suggested that risk around NPD for design-based entrepreneurs was dominated by both financial risk and risk of reputation. However, the results from continuous study suggest that this may not always be the case; financial risk is limited to the promotion and selling process and how the product is viewed in competitive markets.

Another major concern in this risk domain is that once the new product has been developed, there might be a risk that the project will go over budget. The fact that SMEs have limited financial resources means that they should be more cautious when working on forecasting the budget for any new project [34].

3.3. NPD Performance in SMEs

Successful new products and services are important for many organizations, since product innovation is significant in helping organizations to adapt to changes in markets, technology, and competition. Ensuring optimal new product performance is essential for small firms, particularly in light of the strong relationship between new product success and a company's health [36]. However, given that the success rate of new products worldwide has been low, increasing understanding of what drives new product success is critical. Griffin and Page [37] in a study measures new product success into three categories; customer-based success, financial success and technical performance. These categories were used with product development professionals that explored the degree to which different success measures were appropriate in different situations. Based on an examination of 18 different success measures, Griffin and Page [37] found that the usefulness of measures depended on the project and business strategy adopted and therefore recommended using multidimensional sets of measures for new product success. Huang et al. [38] based their study investigating the success measures used by Australia SMEs on the measures proposed by Griffin and Page [37] and found that the most frequently used success measures were customer acceptance, customer satisfaction, meeting performance goals, and meeting quality goals. These measures can be classified as either customer-based or technical. The findings of this study support earlier research that also identified customer acceptance and customer satisfaction as the most commonly used measures of new product success [37].

Most of the discourse about new product success relates to large companies. One of the most cited studies of product success, done by Cooper and Kleinschmidt [39], highlighted eight critical drivers of success. One of these is product superiority, in which a new product to be introduced into the market is unique and can be differentiated from those of competitors. He also emphasizes building in the voice of the customer (VoC). New products well perceived by customers will guarantee financial return. On the other hand, their feedback should be heard as early as possible and integrated into the new product development process, from the early stage until product launch, to guarantee success. Many researchers agree that commonly used NPD performance dimensions can be classified as development time, cost and quality. They include the length of development cycles and products first to market, development productivity and financially successful new products, or the proportion of sales from new products [4,5,20].

Park [17] concludes that performance measurements for NPD have two main categories: commercial performance and knowledge-based performance. In the research, one of the clear predictors of the performance of new product development for a company is commercial performance. Fulfilling customers' needs, meeting product specifications, meeting timing goals, meeting market-share goals, meeting unit cost objectives, meeting service goals, meeting productivity goals, creating new markets, and fostering a good reputation are considered commercial performance. Another measurement used to measure NPD performance in the research is knowledge-based performance. This is when the new product launched is able to lead into the next projects. New product development process activity may also lead to developments in the company's worker skill and capabilities, and therefore lead to more positive outcomes for future development projects. Meanwhile, Mu *et al.* [13] measured NPD performance using four items: overall NPD process, overall performance of product is satisfactory, product reaches market in a timely manner and cost management of NPD is satisfactory.

The above literature discusses new product performance and success in large companies. A study done by Ledwith [6] on small electronic firms is more relevant to the current study. The research highlights several factors that contributed to the success of NPD in SMEs. The author agreed that both technical and marketing proficiency in NPD activities are crucial to small and large companies. A large number of studies also reached the same conclusion that speed to market is another factor to ensure NPD success e.g., Cooper [40]. However that is not the case for small companies. For small firms, being first is important but being the best is more important. Although most research indicates that finance is one of the indicators of NPD performance, for small companies it is not of as great interest compared to large companies. This is due to the fact that most small companies have limited financial resources.

Huang *et al.* [38] found measurement of new product success through their empirical investigation of Australian SMEs in chemical and machinery industries. The research attempted to fill the gaps of whether new product measurement develop for large firms can be applied to SMEs. Results from the research indicated that four commonly use measurement of product success in SMEs are financial performance, objective market acceptance, subjective market acceptance, and product-level measures. These four measurements are related to each other and can predict overall product success. From the survey, although other factors contribute to new product success, managers believed that customer acceptance and customer satisfaction contributed most to the overall success of a new product.

Based on the above discussion of prior studies, it is clear that four main types of risk affect NPD performance in SMEs, namely technology, market, organizational, and financial risk. The following Figure 1 illustrates a conceptualization of risk determinants. Hence, NPD performance is measured by overall product performance, financial performance, commercial performance and skills and capabilities acquired throughout the process of developing a new product.

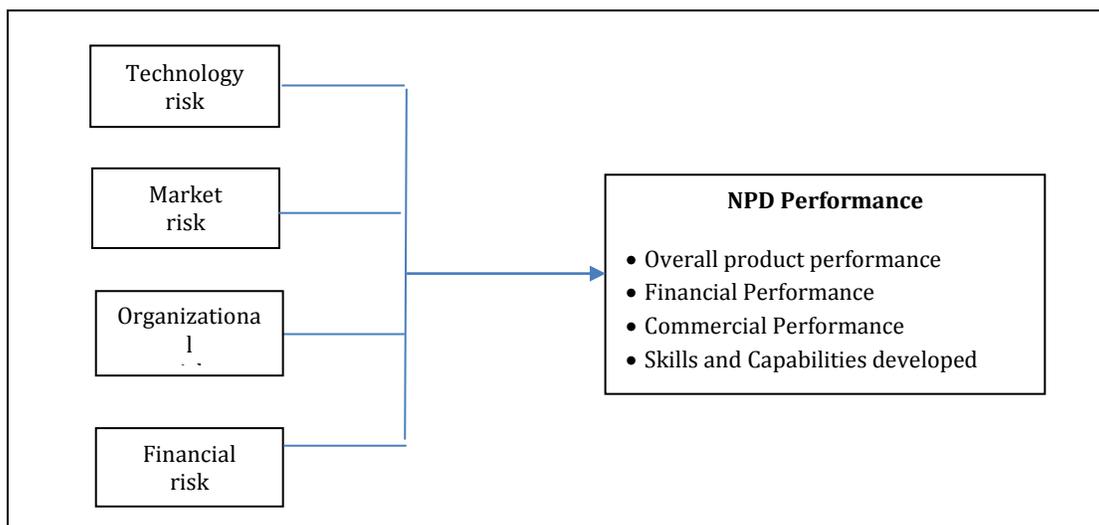


Figure 1 Conceptualization of risk factors on NPD Performance in SMEs

4. CONCLUSION

In order to succeed, SMEs must take risks to launch new products speedily and successfully. Therefore there is a need to take strategic action to mitigate and avoid risks through risk management when developing new products. It is therefore vital for SMEs to have the ability to assess, diagnose and manage risk in the NPD process. Thus, this exploratory study examined the existing literature and identified four main categories of risks which affect new product development performance: technology, market, organizational and financial risks. According to Hollman and Mohammad-Zadeh [41], the first step in the risk management process should be carried out continuously and systematically by identifying possible sources of loss, and therefore risks. This research findings will help SMEs to carry out the initial stage of risk management process through risk identification. Further empirical research is expected to examine the effect of risk management on NPD, determine the implications and deploy best practices for SMEs to increase their new product success rate.

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