Industrial Engineering Letters
ISSN 2224-6096 (Paper) ISSN 2225-0581 (online)
Vol.7, No.3, 2017

The Effect of Technological and Non-technological Innovation Capability towards Operational Performance and Its Implication on Business Performance

Mulki Siregar*
Faculty of Industrial Engineering, Jakarta Islamic University, Jakarta, Indonesia

Achmad Sutrisna
Faculty of Industrial Engineering, Jakarta Islamic University, Jakarta, Indonesia

Abstract
One factor widely proposed as a fundamental aspect of operational and business performance improvement is innovation capability. Yet, it is also reported that both positive and negative effects of innovation capability on firm performance might arise. In addition, there is still a lack of study which provides a comprehensive explanation regarding innovation capability in SMEs. This study primarily aims to investigate the effect of technological and non-technological innovation capability towards operational performance and its implication on business performance. This study follows a survey methodology involving 118 Indonesian manufacturing SMEs. The findings of this study confirm that two factors being investigated, namely technological innovation capability and non-technological innovation capability, directly and indirectly provide a positive effect on operational and business performance. The findings imply that manufacturing SMEs owners or managers should be aware that high operational performance is a prerequisite condition for the success to compete in the marketplace. For this reason, the SMEs owners or managers should be aware that SMEs need to possess some degree of innovation capability. The premise is that both operational and business performance is influenced by the extent to which the organizational capability to innovate their product, process, marketing, and organization.
Keywords: innovation capability, operational performance, business performance, Indonesian manufacturing SMEs

1. Introduction

Recently, many manufacturing organizations have to cope with a business environment characterized by increasing uncertainty, competition, and globalization market. Such a condition has put increasing pressure upon manufacturing organizations, including small and medium-scale enterprises (SMEs) to search for new production and operation methods and strategies in order to improve their performance in term of product quality, cost, delivery (Raymond and St-Pierre, 2005). Gunday et al. (2011) highlighted the potential of this operational performance function as a source of competitive advantage for the company. In this regard, it is assumed that company's operational performance would lead logically to the increase of overall company's performance

While it is commonly agreed that higher performance is equivalent to higher competitiveness, manufacturing SMEs in developed and developing countries are still facing difficulties to compete in the regional and global competition mostly due to their low performance (Oke, 2007). Several problems have been identified as a common problem encountered by manufacturing SMEs. This includes less production and financial resources, weak networking, and lack of technological knowledge and expertise (Raymond and St-Pierre, 2005).

A number of studies on the performance of manufacturing SMEs have been conducted. These provide some empirical findings pertaining to determinants for SMEs performance enhancement. Among others, one factor has been proposed as potential determinants that are likely to contribute to the improvement of manufacturing SMEs performance, namely innovation capability. Innovation capability could be referenced as the capability of a manufacturing organization to perform innovation (Panayides, 2006). Researchers such as Camison and Vilar-Lopez (2010) and Jimenez-Jimenez et al. (2008) underlined that developing innovation capability is one effective response to cope with the increasing competition and globalization market. Other researchers (e.g. Forsman, 2011; Freel, 2005) proposed that innovation capability is a valuable competence the manufacturing organizations need to possess in achieving high performance. In particular, as Raymond and St-Pierre (2010) suggested, possessing some degree of innovation capability would enable the manufacturing organizations to enhance their performance in term of quality, cost, and delivery.

This study focuses on Indonesian manufacturing SMEs for several reasons. First, recently Indonesia has more than 50 million business entities that are classified as SMEs, which contribute over 95% of total employment (Hayashi, 2002). Second, while the SMEs need to enhance their innovation capability to survive and remain competitive, the SMEs mostly are still facing difficulties to perform innovation due to the lack of their own resources (Pullen et al., 2012). In this sense, based on Global Innovation Index (GII) released by

INSEAD, Indonesia has been ranked the 7th in the ASEAN and 99th in the world (INSEAD, 2013). It means that Indonesian business entities, including manufacturing SMEs are still facing problems that need to be improved in term of input and output of innovation. Third, previous studies focusing on operational performance and its antecedents mostly were carried out in the developed countries with large enterprises as the subject. Considering SMEs and large enterprise's characteristics are significantly different (Liu et al., 2009), accordingly, it is important to explore further how Indonesian manufacturing SMEs overcome their shortcomings to attain some degree of innovation capability and utilize it to foster their operational performance. Pagel and Krause (2004) underlined that the economy nature in developed and developing countries might be different and become an important contingency

This study aims to investigate the relationship involving technological innovation, non-technological innovation, operational performance, and business performance. The findings aim at contributing towards understanding the direct effect of technological and non-technological innovation towards operational performance, as well as the indirect effect of technological and non-technological innovation on business performance, namely through operational performance.

2. Review on the Literature

2.1 Concepts of innovation

Many definitions of innovation have been proposed in the literature. For example, innovation could be understood as an interactive process including the development and implementation of new ideas and practices within the organization (Purwanto and Raihan, 2015). In particular, literature on innovation widely suggests that innovation is present in various forms: [1] product or process innovation, [2] radical or incremental innovation, or [3] administrative or technological innovation (Panayides 2006). Peng et al. (2011) expresses that innovation encompasses activities focusing on the improvement of existing products and processes as well as the development of new products and processes. Innovation encompasses the implementation of incremental improvements or radical changes in the manufacturing system. Bigliardi and Dormio (2009) expressed that innovation is a process carried out to find and implement a new product, process, organizational form, and market. Meanwhile, the OECD (2005) defined innovation as "the implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organizational method in business practices, workplace organization or external relations". An innovation encompasses a wide range of possible innovations: i.e., the implementation of one or more types of innovations such as product and process innovations.

Furthermore, literature on innovation has introduced several types of innovations. For instance, Armbruster et al. (2008) distinguished innovations into two different types, that is, technological non-technological innovations. In this regard, technological innovation refers to product and process innovations, while concern with service and organizational innovations. Massa and Testa (2008) separated innovation between administrative and technical innovations, product and process innovations, technological and architectural innovations, and radical and incremental innovations. In the meantime, the OECD (2005) differentiates four types of innovation, namely product innovation, process innovation, organizational innovation, and marketing innovation. In this perspective, product innovation refers to "the introduction of a good or service that is new or significantly improved with respect to its characteristics or intended uses. This includes significant improvements in technical specifications, components and materials, incorporated software, user friendliness or other functional characteristics". Process innovation is concerned with "the implementation of a new or significantly improved production or delivery method. This includes significant changes in techniques, equipment and/or software". Marketing innovation relates to "the implementation of a new marketing method involving significant changes in product design or packaging, product placement, product promotion or pricing". Lastly, organizational innovation is associated with "the implementation of a new organizational method in the firm's business practices, workplace organization or external relations" (OECD, 2005).

2.2 Company's Performance

According to Raymond and St-Pierre (2005), company's performance could be classified into operational and business performance. Operational performance is related to production facility improvement, product quality improvement, and cost reduction, while business performance is associated with market and financial based performance. In this sense, Battor and Battor (2010) proposed that business performance could be operationalized into market and financial performance. Meanwhile, Kalchschmidt et al. (2010) argued that cost efficiency and customer satisfaction dimensions should be considered in the measurement of operational performance. Cost efficiency performance is related to the achievement in term of direct manufacturing cost, total product cost, and raw material cost reduction, while customer satisfaction performance concern with product quality and delivery.

Furthermore, the literature suggests that a company performance could be measured objectively or

subjectively. Objective measurement is conducted on the basis of actual values of the company performance, while subjective measurement is conducted on the basis of individual perception or assessment (Battor & Battor, 2010). Objective measurement is difficult to conduct if the companies involved in the research encompass companies with different sizes and different sectors or only applicable in specific situations (Chang, 2003). Subjective measurement is becoming prevalent in empirical research and operation management practices (Peng et al., 2011). Ketokivi and Schroeder (2004) argued that the use of subjective measures is appropriate when the attribute in the items is relevant and multiple items are used. It increases the reliability of the research instrument.

2.3 Innovation and performance

Drawing on the literature, innovation has been extensively investigated in the previous studies. At least, three domains of research concerning innovation exist, that is, identification of determinants of innovation, conceptual framework for innovation implementation and development, and examination of the relationships between innovation and performance. This research focused on the latter domain. Innovation and performance relationship have been investigated intensively, providing empirical evidence regarding a positive relationship between innovation and performance. For example, Nassimbeni (2001) clarified that Technological innovation capability positively associated with export performance of manufacturing SMEs. Calantone et al. (2002) found that Innovation capability positively impact on the improvement of financial-based performance; both manufacturing and service companies. Guan and Ma (2003) confirmed that Technological and non technological innovation capability positively associated with export performance of manufacturing firms. Furthermore, Keskin (2006) showed that innovation capability positively impact on the improvement of financial-based performance. The same result is provided by Battor and Battor (2010) who found that innovation capability has a direct and positive effect on the improvement of financial-based performance

Despite a number of studies have demonstrated that the relationship between innovation capability and performance is positive, other studies provide a somewhat ambiguity result. For example, Varis and Littunen (2010) found that organizational innovation does not associate with the improvement in financial-based performance. In similar, Laforet (2012) demonstrated that organizational innovation tends to enhance a company's productivity, financial, and market performance, but not for operational efficiency and employee retention. Furthermore, the study of Goedhuys and Veugelers (2011) provides evidence that product and process innovation capabilities individually tend to enhance the financial-based performance. However, simultaneously, the two types of innovation capability have no positive impact on sales growth. Meanwhile, McDermott and Prajogo (2012) verified that while neither exploration nor exploitation innovation individually has a significant relationship with business performance, yet, the interaction between exploration and exploitation innovation has a positive effect on business performance.

2.4 Proposed Conceptual Framework

The main purpose of this research is to investigate the effects of technological innovation and non-technological innovation capability toward the operational performance and its implication on business performance. Based on literature reviews described, this research proposed a conceptual framework as guidelines for the conduct of data analysis and hypotheses development. Figure 1 presents the conceptual framework of this research.

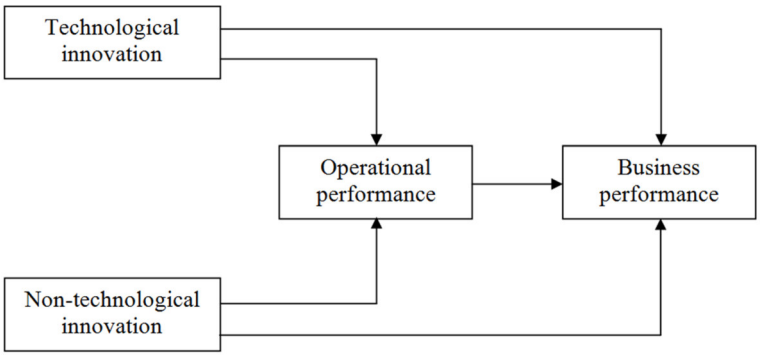

Figure 1
The proposed model of the study

The framework postulated that manufacturing companies need to improve their operational and business performance to survive and remain competitive in the recent severe marketplace. Toward this end, the companies need to develop some degree of technological innovation and search for the way to obtain non-technological innovation capability. Both technological innovation and non-technological innovation capability could be directed to speed up operational performance and business performance.

2.5 Hypotheses Development

Furthermore, literature suggests that innovation capability is one of the most important determinants for manufacturing SMEs development. In particular, innovation capability is widely cited as one source of the performance improvement, as well as a driving force behind the competitiveness enhancement. Therefore, manufacturing SMEs need to possess some degree of innovation capability to compete in the marketplace and to obtain benefits in terms of manufacturing cost reduction, product quality improvement, as well as service level enhancement (Bigliardi and Dormio, 2009; Raymond & St-Pierre, 2010; Jimenez-Jimenez et al., 2008). Despite the type of innovation being investigated, research concerning innovation capability and operational performance relationship proposed that innovation capability positively impact on the company performance improvement (Purwanto and Raihan, 2015). Drawing on the literature review and the proposed conceptual framework, this research puts forward five hypotheses and will be examined in the context of Indonesian manufacturing SMEs. Table 1 presents the developed five major hypotheses concerning the relationship among variables being investigated in this study.

Table 1
Hypotheses Examined in this Research

Hypotheses	Description
1.	Technological innovation is positively associated with operational performance
2.	Non-technological innovation is positively associated with operational performance
3.	Technological innovation is positively associated with business performance
4.	Non-technological innovation is positively associated with business performance
5	Operational performance s positively associated with business performance

3. Research Methodology

3.1 Selection of sample

The sample selection primarily consists of two stages. The first stage of sample selection was the industrial cluster selection. Out of several available clusters, the research selected was the Tegal Industrial District for conducting the research. The district is located in the Central Java Province of Indonesia. The second stage was determining the targeted company to be the sampled. The sample selection was conducted using a purposive sampling method: i.e., the selection of the sample was carried out in accordance with the requirements determined by the researcher. In this perspective, three criterions were considered in choosing the company to be the targeted sample: [1] the maximum net assets is IDR 10 billion, [2] the maximum number of full time employees is 100 employees, and [3] the targeted company is operating in an industrial cluster. Out of 400 questionnaires distributed, 118 were returned and have been valid for the analysis.

3.2 Variables Measurement

3.2.1 Technological innovation capability

Following OECD (2005), technological innovation is concerned with the implementation of two types of innovation: product innovation and process innovation. A total of 10 items, adopted from Camison and Lopez (2010), were employed to capture Technological innovation capability. Table 2 presents the items applied to operationalize the construct of technological innovation capability. In this research, all items were measured using perceptual scales. In the survey, respondents were asked to indicate the extent of their agreement with each of the items on a five-point Likert-type scale ranging from 1 (much worse) to 5 (much better).

Table 2
Operationalization of technological innovation capability

Dimensions	Items
Product innovation capability	1. Ability to replace obsolete products
	2. Ability to extent the range of products
	3. Ability to develop environmentally friendly products
	4. Ability to improve product design
	5. Ability to reduce the new product development time
Process innovation capability	6. Ability to master the key manufacturing technologies
	7. Ability to develop programs to reduce production cost
	8. Ability to manage production facility
	9. Ability to assign resources to the production department
	10. Ability to integrate production management activities

3.2.2 Non-technological innovation capability

On the basis of OECD (2005), this study classified organizational innovation and marketing innovation into non-technological innovation. A total of 10 items, adopted from Camison and Lopez (2010) and Gunday et al. (2011), were utilized to capture non-technological innovation capability. Table 3 presents the items applied to operationalize the construct of non-technological innovation capability. In this research, all items were measured using perceptual scales. In the survey, respondents were asked to indicate the extent of their agreement with each of the items on a five-point Likert-type scale ranging from 1 (much worse) to 5 (much better).

Table 3
Operationalization of non-technological innovation capability

Dimensions	Items
Organizational innovation capability	1. Ability to develop employees' competence
	2. Ability to improve employees' retention
	3. Ability to implement inter-functional working group
	4. Ability to cooperate with suppliers
	5. Ability to cooperate with customer
Marketing innovation capability	1. Ability to renew the product promotion techniques
	2. Ability to renew the distribution channels
	3. Ability to renew the product pricing techniques
	4. Ability to renew the design of products.
	5. Ability to renew marketing management activities

3.2.3 Operational performance

While a wide variety of operational performance measures advanced in the literature, this research focused on three widely recognized types of operational performance: product quality, manufacturing cost, and delivery performance. A total of 11 items, adopted from Alegre-Vidal, et al. (2004), were utilized to capture the three dimensions of operational performance. Table 4 presents the operationalization of operational performance construct.

Table 4
Operationalization of operational performance

Dimensions	Items
Product quality	1. High performance products
	2. Consistent quality with low defects
	3. Durable products
	4. After sales support
	5. Working condition and safety
	6. Environmental friendly products
Manufacturing cost	7. Material cost reduction
	8. Labor cost reduction
	9. Overhead cost reduction
Delivery	10. Dependable deliveries
	11. Fast deliveries

3.2.4 Business performance

Following previous studies (Raymond and St-Pierre, 2005; Battor and Battor, 2010), business performance is associated with market and financial based performance. For the purpose of this study, a total of seven items, adopted from Gunday et al. (2011), were applied to operationalize the construct of business performance. Table 5 presents the operationalization of business performance construct.

Table 5
Operationalization of business performance

Dimensions	Items
Financial performance	1. Return on assets
	2. Profitability
	3. Return on sales
	4. Cash flow excluding investme
Market performance	5. Total sales
	6. Market share
	7. Customer satisfaction

4. Results and Discussions

4.1 Technological innovation and operational performance relationship

The first objective of this research was concerned with the relationship between technological innovation and operational performance. This research treats both technological innovation and operational performance as multidimensional constructs. Technological innovation consists of two dimensions and operational performance encompasses three dimensions. The results of confirmatory factor analysis (CFA) confirmed that technological innovation is a construct that consists of two significant dimensions: product innovation and process innovation. The results of the CFA also verified that the three dimensions were valid to reflect operational performance construct: product quality, manufacturing cost, and delivery. Figure 2 presents the multidimensional relationship between technological innovation and operational performance. This figure has been excerpted from the full model of this research.

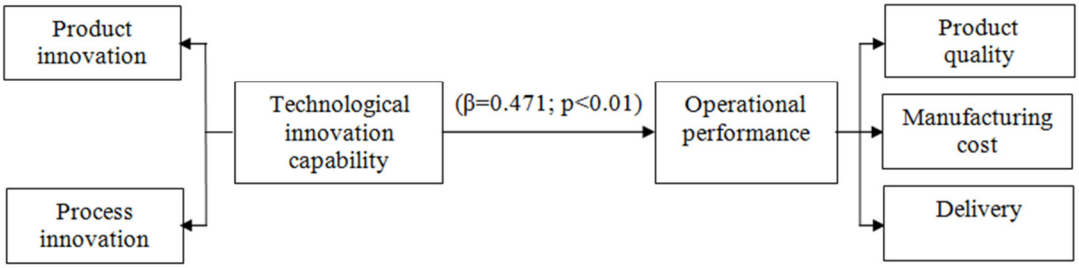

Figure 2
Multidimensional relationships between technological innovation capability and operational performance

As has been hypothesized in this research (H1), technological innovation capability was found to have a positive effect on operational performance, as measured by product quality, manufacturing cost, and delivery ($\beta = 0.471$; $p < 0.01$). The findings, underline the important role of technological innovation in enhancing operational performance of manufacturing SMEs.

4.2 Non-technological innovation and operational performance relationship

The second objective of this research was concerned with the relationship between non-technological innovation and operational performance. This research treats both non-technological innovation and operational performance as multidimensional constructs. Non-technological innovation consists of two dimensions and operational performance encompasses three dimensions. The results of CFA confirmed that non-technological innovation is a construct that consists of two significant dimensions: organizational innovation and marketing innovation. The results of the CFA also verified that the three dimensions were valid to reflect operational performance construct: product quality, manufacturing cost, and delivery. Figure 3 presents the multidimensional relationship between non-technological innovation and operational performance. This figure has been excerpted from the full model of this research.

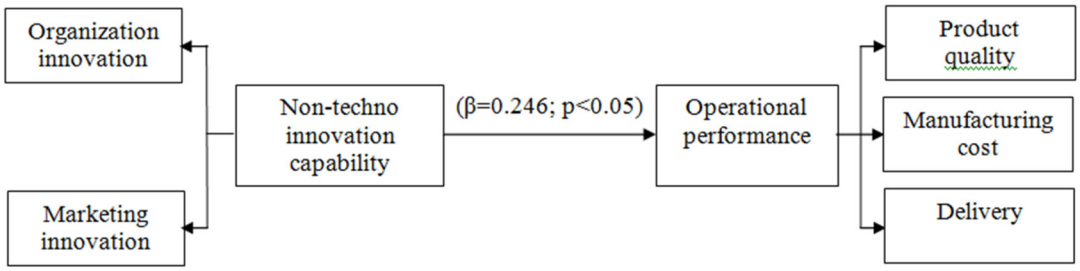

Figure 3
Multidimensional relationships between non-technological innovation capability and operational performance

As has been hypothesized in this research (H2), non-technological innovation capability was found to have a positive effect on operational performance, as measured by product quality, manufacturing cost, and delivery ($\beta = 0.246$; $p < 0.05$). The findings, underline the important role of non-technological innovation in enhancing operational performance of manufacturing SMEs.

4.3 Technological innovation and business performance relationship

This subsection is concerned with the multidimensional relationship between technological innovation and business performance. The results of CFA confirmed that technological innovation is a construct consisting of two significant dimensions, namely product innovation and process. Meanwhile, two dimensions were verified as valid to reflect the business performance construct, namely marketing and financial performance. This

research hypothesized that technological innovation has a positive effect in fostering business performance (H3). Figure 4 presents the multidimensional relationship between technological innovation and business performance. As hypothesized in this research, the results provided evidence that technological innovation is positively and significantly associated with business performance ($\beta = 0.274$; $p < 0.05$). The findings support the notion provided by researchers pertaining the positive effects of technological innovation in fostering business performance.

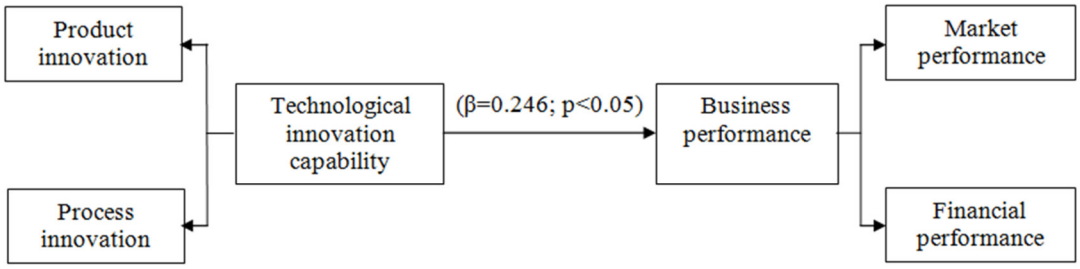

Figure 4
Multidimensional relationships between technological innovation capability and business performance

4.4 Non-technological innovation and business performance relationship

The forth objective of this research was concerned with the relationship between non-technological innovation and business performance. This research considers non-technological innovation and business performance as two different construct consisting a distinct set of dimensions. The results of CFA confirmed that two dimensions proposed in this research, namely marketing innovation and organizational innovation was significant to reflect the multidimensionality of non-technological innovation capability. Meanwhile, the CFA verified that two dimensions were valid to reflect business performance construct, namely market and financial performance. Figure 5 presents the multidimensional relationship between non-technological innovation and business performance. As hypothesized in this research, the results provided evidence that non-technological innovation is positively and significantly associated with business performance ($\beta = 0.385$; $p < 0.01$). The findings support the notion provided by researchers pertaining the positive effects of non-technological innovation in fostering business performance.

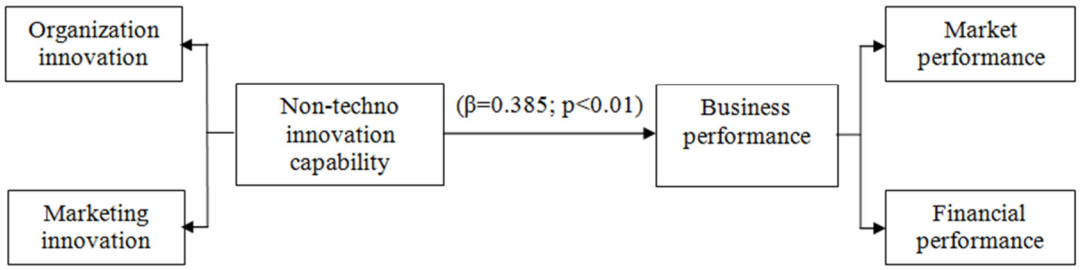

Figure 5
Multidimensional relationships between non-technological innovation capability and business performance

4.5 Operational performance and business performance relationship

The fifth objective of this research addressed the relationship between operational performance and business performance. Two different goals were pursued. In this regard, operational performance consists of three dimensions, namely product quality, manufacturing cost, and delivery performance. Meanwhile, operational business performance comprises of two dimensions, that is, market and financial performance. The results of CFA confirmed that the three dimensions proposed in the operational performance construct were found to be significant dimensions. Likewise, the results verified that the two dimensions included in the business performance construct were valid. Figure 5 presents the multidimensional relationship between operational performance and business performance constructs. This figure has been excerpted from the full model of this research. Hypothesis 5 theorizes that operational performance was positively and significantly associated with business performance. As seen in Figure 5, the results of CFA provide evidence for supports the hypothesis ($\beta=0.401$; p 0.01). The results confirm that manufacturing SMEs with higher operational performance and business performance are expected to have higher business performance as measured by market and financial performance.

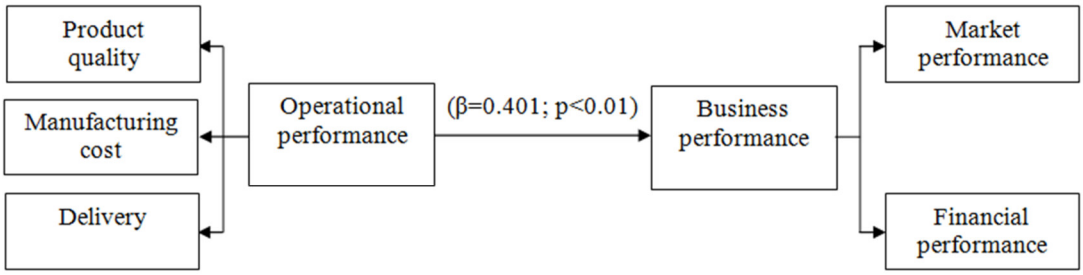

Figure 5
Multidimensional relationships between operational performance and business performance

5. Conclusion

This study contributed to technological innovation literature in several ways. First, this study examines the effects of technological innovation capability on business performance by utilizing two dimensions in technological innovation capability and two dimensions in business performance. The results advance the current knowledge concerning simultaneous effects of product and process innovation capability on market and financial performance. Second, this study evaluates the multidimensional relationship involving technological innovation and operational performance. The results of this study provide more insights regarding the simultaneous effects of product and process innovation capability towards product quality, manufacturing cost, and delivery performance. Therefore, this study provides more comprehensive analysis on the relationship between technological innovation and operational performance based on empirical data.

Furthermore, this study advances the current knowledge on non-technological innovation. First, this study evaluates the effects of non-technological innovation on operational performance and business performance. The results advance the current knowledge concerning the simultaneous effects of marketing innovation capability and organizational innovation capability on market performance and financial performance. It is disclose in this study that marketing innovation capability and organizational innovation capability contributed positively to product quality, manufacturing cost, and delivery improvement. Therefore, this study provides more insight concerning non-technological innovation and operational performance relationship based on empirical data. Lastly, this study extends the current knowledge of operational performance. this study has examined the effect of operational performance towards business performance as two different constructs. The empirical findings contribute towards understanding about the simultaneous effects of product quality, manufacturing cost, and delivery improvement on business performance as measured by market and financial performance.

References

Alegre-Vidal, J., Lapiedra-Alcami, R., Chiva-Gomez, R. (2004). Linking operations strategy and product innovation: an empirical study of Spanish ceramic tile producers. *Research Policy*, 33(5), 829-839

Armbruster, H. et al. (2008), "Organizational innovation: The challenge of measuring non-technical innovation in large-scale surveys", *Technovation,* Vol. 28 No. 10, pp. 644-657

Battor, M. and Battor, M. (2010), "The impact of customer relationship management capability on innovation and performance advantages: testing a mediated model", *Journal of Marketing Management,* Vol. 26 No. 9, pp. 842-857

Bigliardi, B. and Dormio, I.A. (2009), "An empirical investigation of innovation determinants in food machinery enterprises", *European Journal of Innovation Management,* Vol. 12 No. 2, pp. 223-242

Calantone, J.R. et al. (2002), "Learning orientation, firm innovation capability, and firm performance", *Industrial Marketing Management,* Vol. 31 No. 6, pp. 515-524

Camison, C. and Lopez, V.A. (2012), "Organizational innovation as an enabler of technological innovation capabilities and firm performance", *Journal of Business Research,* In Press, Corrected Proof, Available online 22 June 2012

Chang, S.C., Yang, C.L., Cheng, H.C., Sheu, C. (2003). Manufacturing flexibility and business strategy: An empirical study of small and medium sized firms. *International Journal of Production Economics*, 83(1), 13-26

Forsman, H. (2011), "Innovation capacity and innovation development in small enterprises; a comparison between the manufacturing and service sectors", Research *Policy*, Vol. 40 No. 5, pp. 739–750

Freel, S.M. (2005), "Patterns of innovation and skill in small firm", *Technovation,* Vol. 25 No. 2, pp. 123-134

Guan, J. and Ma, N. (2003), "Innovative capability and export performance of Chinese firms", *Technovation,* Vol. 23 No. 9, pp. 737–747

Gunday, G., et al. (2011), "Effects of innovation types on firm performance", *International Journal of*

Production Economics, Vol. 133 No. 2, pp. 662–676

Hayashi, M. (2002). The role of subcontracting in SME development in Indonesia: Micro-level evidence from the metalworking and machinery industry. *Journal of Asian Economics,* 13 (1), 1-26

Hult, G.T.M. et al. (2004), "Innovativeness: its antecedents and impact on business performance", *Industrial Marketing Management,* Vol. 33 No. 5, pp. 429-438

INSEAD (2013). The Global Innovation Index; The Local Dynamics of Innovation. *Retrieved from http://www.asean.org/archive/5187-10.pdf http://ec.europa.eu/information_society/newsroom/cf/dae/document.cfm?action=display&doc_id=3799 on December 19, 2013*

Jimenez-Jimenez, D. et al. (2008), "Fostering innovation: The role of market orientation and organizational learning", *European Journal of Innovation Management,* Vol. 11 No. 3, pp. 389-412

Keskin, H. (2006), "Market orientation, learning orientation, and innovation capabilities in SMEs; An extended model", *European Journal of Innovation Management,* Vol. 9 No. 4, pp. 396-417

Ketokivi, A.M., Schroeder, G.R. (2004). Perceptual measures of performance: fact or fiction?., *Journal of Operations Management,* 22 (3), 247–264

Laforet, S. (2012), "Organizational innovation outcomes in SMEs: Effects of age, size, and sector", Journal of World Business, In Press, Corrected Proof, Available online 28 September 2012

Liu, C.H. (2011). The effects of innovation alliance on network structure and density of cluster. *Expert Systems with Applications: An International Journal,* 38 (1). 299-305

Massa, S. and Testa, S. (2008), "Innovation and SMEs: Misaligned perspectives and goals among entrepreneurs, academics, and policy makers". *Technovation,* Vol. 28 No. 7, pp. 393-407

McDermott, M.C. and Prajogo, I.D. (2012), "Service innovation and performance in SMEs", *International Journal of Operations & Production Management,* Vol. 32 No. 2, pp. 216 - 237

Nassimbeni, G. (2001), "Technology, innovation capacity, and the export attitude of small manufacturing firms: a logitrtobit model", *Research Policy,* Vol. 30, pp. 245–262

OECD (2005). *The Measurement of Scientific and Technological Activities. Oslo Manual. Guidelines for Collecting and Interpreting Innovation Data*, 3rd ed., *Organisation for Economic Co-operation and Development Eurostat, Paris*

Oke, A. et al. (2007), "Innovation types and performance in growing UK SMEs", *International Journal of Operations & Production Management,* Vol. 27 No. 7, pp. 735 - 753

Omachonu, V.K., Einspruch, N.G. (2010). Innovation in Healthcare Delivery Systems: A Conceptual Framework. *The Public Sector Innovation Journal,* 15(1), pp. 1-20.

Pagell, M., Krause, R.D. (2004). Re-exploring the relationship between flexibility and the external environment. *Journal of Operations Management,* 21(6), 629-649

Panayides, P. (2006), "Enhancing innovation capability through relationship management and implications for performance", *European Journal of Innovation Management,* Vol. 9 No. 4, pp. 466-483

Peng, D.X., Schroeder, R.G., Shah, R. (2011). Competitive priorities, plant improvement and innovation capabilities, and operational performance: A test of two forms of fit. *International Journal of Operations & Production Management,* 31(5), 484-510

Peng, et al. (2011), "Competitive priorities, plant improvement and innovation capabilities, and operational performance: A test of two forms of fit", *International Journal of Operations & Production Management,* Vol. 31 No. 5, pp. 484-510

Pullen, A., Nederhof, P.W., Groen, A.J. (2012). SME Network Characteristics vs. Product Innovativeness: How to Achieve High Innovation Performance. *Creativity and Innovation Management,* 21(2), 130–146

Raymond, L. and St-Pierre, J. (2010), "R&D as a determinant of innovation in manufacturing SMEs: An attempt at empirical clarification", *Technovation,* Vol. 30 No. 1, pp. 48-56

Varis, M. and Littunen, H. (2010), "Types of innovation, sources of information and performance in entrepreneurial SMEs". *European Journal of Innovation Management,* Vol. 13 No. 2, pp. 128-154