Innovation as a Mediating Variable of the Relationship between Technological Capability and Firm Performance: A Conceptual Approach

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Abstract

In recent decade, several researchers mention that innovation is important for organization’s sustainability and performance as well as to increase its competitive advantage; thus, an organization attempts to enhance its innovativeness. Generally, prior research finding argues that technological capability is the direct determinant of firm performance; yet, only few empirical investigations reveal the significance of innovation as the mediating variable to improve firm performance. By emphasizing on the relationship between technological capability and firm performance, this article aims to explain the role of innovation as a mediating variable of the relationship between technological capability and firm performance.

Keywords: Innovation, technological capability, firm performance

1. Introduction

In late 1990’s, innovation became an essential agenda for managers to discuss. Innovation commonly was perceived as an imperative requirement of successfulness and sustainability of an organization; furthermore, it turned into an interesting topic due to its role in explaining sustained competitive advantage. It reflects the importance of innovation for organization in recent business environment to help an organization facing both internal and external environment’s turbulence (Damanpour, 1991; Hult et al., 2004). Innovation is critical since it makes an organization able to adapt to market change and meet new demand. Innovation also helps an organization to respond its environmental changes (Garcia-Morales et al., 2007).

Innovation as the development and use of new ideas or behaviors in organizations can be instigated in a new product, service, method of production (technical innovation) or a new market, and organizational structure or administrative system (Damanpour and Wischnesky, 2006); meanwhile, according to Hurley and Hult (1998), they define innovation as a firm’s mechanism to adapt to its dynamic environment. Innovation aims to retain firm’s sustainability since the existing product is vulnerable toward a change on the needs and the preference of consumers. Product life cycle even becomes shorter; in fact, the competition in global and domestic product is also intensive. Innovation will increase the value-added of a product; also, it must be able to make a product different from other products in consumer’s perspective to make the consumer feels more attracted to purchase the product compared to the competitor’s product.

Based on Calantone et al. (2002), Rhee et al. (2010); Ar and Baki (2011); Jimenez-Jimenez and Sanz-Valle (2011); Lopez-Nicolas and Merono-Cerdan (2011); Rosenbusch et al. (2011); Jabeen et al. (2013), they assert that innovation has positive and significant influence on firm performance. Furthermore, Li’s et al. (2010) mentioned that product innovation which is created from the product variation, quality, and new product manufacturing technology improvement has positive effect on firm profitability. Hence, innovation is the driving force of firm’s success in long term, particularly in a dynamic market condition (Baker and Sinkula, 2005).
Ju (2012) expresses that technology is one of the critical factors influencing innovation. Innovation is one of the strategic key prerequisite; hence, an organization should be able to improve its technological capability and knowledge, as well as to exploit its capacity to achieve the market (Swamidass, 1986; Ellitan, 2006). During recent decade, technological capability has been perceived as a strategic resource that enables an organization to achieve competitive advantage (Kim, 1997). Based on the RBV theoretical framework, resources and capability can be a sustained competitive advantage if only those are valuable, rare, cannot be imitated, and difficult to be substituted (Barney, 1991). In this term, technological capability can be perceived as one of the important resources and as a source of sustained competitive advantage (Irwin et al., 1998; Afuah, 2002; Coombs and Bierly, 2006).

Technological capability as one of the most important elements in competitive strategy should be preeminent in business performance. According to Ortega (2010), technological capability is an ability to conduct each of technical function in a firm including to develop new product and process, as well as to operate the facilities effectively. A firm with a superior technological capability is able to improve efficiency by pioneering innovation in responding market environmental changes (Teece et al., 1997; Verona, 1999). Technological capability enables a firm to create valuable innovative product and service for its customer so that it will define the performance of a firm (McEvily et al., 2004).

A change in technology is often used as a reference related to innovation. The importance of innovation is a reflection of environment uncertainty and lack of technological capabilities to develop new product, cost effectiveness, operation efficiency, arising market niche, and process innovation (Appiah-Adu and Singh, 1998). Technological capability is known as the foundation of a firm to achieve long term competitive advantage and as force to encourage firm’s innovation. Technological capability is the ability of a firm to develop and design new product and process, as well as to improve knowledge; thus, technological capability is an important resource of an organization to achieve innovation.

Referring to the description above, this article attempts to provide further evidence which integrates the role of innovation on the relationship between technological capability and firm performance into a comprehensive model.

1. Theoretical Background
1.1. Technological Capability
Technology has become one of the business aspects. According to Twiss and Goodridge (1989) technology is an important resource to achieve competitive advantage. Technology is knowledge, skill, and art (Layton, 1974) which is perceived to have specific conceptual framework and ideas, to where the relationship develops time by time and this framework is reflected in organization’s innovativeness. Based on Aw and Batra (1998), technology comprises all skills, knowledge, and procedures that are needed to create, utilize, and conduct useful thing. Technology advancement makes a firm should continuously develop the product that the firm produces since technology sophistication will increase consumer’s need on the value and the benefit of a product. Hence, innovation and technology advantage are critical components in competitive strategy (Hurley and Hult, 1998). It is important to attain technological resources and ability to build technological capability base.

In several years, the comprehension on technological capability is different. Conceptually, Bell and Pavit (1993) define capability as the needed resources to produce and manage change on
technology. The resources consist of skill, knowledge, experience, and institutional structures as well as the relationship between those factors that are needed to manage feedback for technology change. Technological capability is also defined as the resources that are needed to improve and manage enhancement on the organizational processes, product, equipments, and engineering activities. It is accumulated and located in an individual (skill, knowledge, and experience) and in organizational system (Figueiredo, 2002). Further, Dosi and Teece (1993) also clarify the definition more operationally as the ability to develop and design product and process, as well as to operate the facilities effectively.

Technological capability can help an organization to improve the ability of the organization in achieving and implementing new knowledge from the outside to develop the competence. Based on Lall (1992), the common approaches to differentiate the three types of technological capability are: investment capability, production capability, and linkage capability. Archibugi and Coco (2005) describe that technological capability is a possession on capital, equipment, infrastructure, skills, experts and technical workers. According to Romjin and Albaladejo (2002), technological capability on SME sector consists of investment capability, production capability, and innovation capability.

1.2. Technological Capability and Firm Performance
The role of technological capability to build competitive advantage largely has been documented in RBV theory which states that resources ownership and superior capability will improve firm performance (Wernerfelt, 1984; Barney, 1991; Pateraf, 1993). Technological capability of a firm is an important strategic resource to achieve competitive advantage in the industry. To attain better performance for achieving sustained competitive advantage, a firm must utilize its capability and valuable resource. Related to this description, García-Munía and Navas-Lopez (2007) examine the relationship between technological capability and firm success of bio-technology organizations in Spain; the result reveals that technological capability is focused on retaining competitive advantage. Commonly, the research result mention that technological capability takes significant role on firm’s competitiveness; however, there are only a few empirical studies on the relationship between technological capability and firm performance. Tsai (2004) has empirically examined a set of data gathered from 45 manufacturing industries during 7 years in electronic industry in Taiwan; the result confirms that technological capability significantly affects productivity; thus, it becomes the determining factor of firm performance. In addition, Aw and Batra (1998) analyze the relationship between technological capability of a firm and its efficiency in manufacturing industry in Taiwan by using the total expenditure on R&D and on-the-job training as the proxy variables for technological capability; the result concludes that firm efficiency has positive correlation with firm efficiency. Furthermore, Acha (2000) uses R&D expenditure, publication, and patents as the proxies of technological capability; it concludes that technological capability has positive correlation with firm’s operating performance in upstream petroleum industry. Schoenecker and Swanson (2002) use a number of indicators to measure technological capability such as R&D expenditure, patent, and new product introduction in chemical industry, electronic industry, and pharmaceutical industry. They conclude that the intensity of R&D activity as the proxy indicator to measure technological capability of a firm has positive effect on sales and profit growth of the business. Jonker et al. (2006); Wang et al. (2006), and Ortega (2010) also state that technological capability has positive effect on firm performance. In addition, other empirical studies confirm that technological capability has positive correlation with firm performance (Madanmohan et al., 2004; Zahra et al., 2007).
Next, Cohen and Levinthal (1990) express that technological capability can be utilized to analyze the relationship between external resources and firm capacity which then are exploited as innovation. Only a firm which has knowledge and critical capability that are able to utilize technology opportunity to improve innovativeness. Technological capability takes its role in helping a firm to achieve competitive advantage. First, innovation foundation of a firm is mainly on its technological capability; thus, through process innovation or ability to redesign a product, better technology will help the firm to achieve greater efficiency. Second, a firm with excellent technological capability will be able to accelerate new product development so that it will elevate the profit; therefore, organization should take effort to improve its technological capability and innovativeness for enhancing its competence which then it will provide positive result on organization performance (Hurley and Hult, 1998).

2. Model Development
Recently, innovation development gets greater attention as the success key to achieve sustained competitive advantage. Commonly, innovation is interpreted as a new product or service that is introduced by an organization before other organizations imitate. Innovation has been studied in several contexts, including its relationship with technology, commercial, social system, and economics development. Several definitions have been developed to explain the meaning of innovation; yet, innovation itself basically involves improvement, development, and adaptation of new ideas. The positive role of innovation on firm performance has been supported by several theories and empirical studies about the development of new product, adoption and diffusion of technology, process improvement, and innovation (Calantone et al., 2002).

Innovation has been conceptualized as an important way to achieve superior performance of a firm. Innovation tends to be strategic activities of a firm to face the change on internal and external environment. According to some researchers, a firm cannot avoid innovation if the firm wants its market develop and retains its competitive advantage as well as enters new market (Stock et al., 2002). Innovation is often related to organization’s ability to survive and surpass the competitors; thus, innovation becomes critical determiner of firm performance. If a firm has a capacity to innovate, then the capacity will enable the firm develop its competitive advantage and achieve greater result (Hurley and Hult, 1998; Damanpour et al., 2009).

Product innovation will be the source of competitive advantage and the determiner of firm success. Teece (1986) notes that more than 70% of empirical study find that there is positive relationship between product innovation and firm performance. Thornhill (2006) mentions that innovation positively affects firm performance as measured from income growth. Varis and Littunen (2010) also confirm that SME growth in Finland is associated to the introduction of product innovation, process innovation, and market. Furthermore, some research conducted by Calantone et al. (2002); Keskin (2006); Li et al. (2010) Rhee et al. (2010); Ar and Baki (2011); Jimenez-Jimenez and Sanz-Valle (2011); Lopez-Nicolas and Merono-Cerdan (2011); Rosenbusch et al. (2011); Eris and Ozmen (2012); Atalay et al., (2013); Sok et al., (2013) conclude that innovation has positive and significant influence on firm performance.

According to McEvily et al. (2004) technological capability is the core capability of a firm to develop new product. Organization which has superior technological capability tends to be more innovative; thus, it will result in better performance of the organization as well. Camison and Villar-Lopez (2014) also mention that technological capability affects process innovation and product innovation. Prahalad and Hamel (1990) say that a successful firm is a firm which focuses on competence
improvement or capability improvement by using new and innovative ways to achieve its objectives. Vega-Jurado et al. (2008) analyze the role of internal and external factors of a firm toward novelty of product innovation on 6,094 manufacturing organizations in Spain; the result shows that technological capability determines product innovation. Also, Wang et al. (2006) reveal that technological capability positively influences new product development. Next, Kylaheiko et al. (2011) and Kim et al. (2012) add that technological capability has positive correlation with innovation. Cohen and Levinthal (1990) explain that organization with superior technological capability has more efficient and better chance to develop the ideas of new product development. Other researchers such as Coombs and Bierly (2006) and Huang (2011) mention that technological capability affects innovation so that it results in better performance of an organization. Hsieh and Tsai (2007) conduct a study on circuit industry in Taiwan which reveals that technological capability has positive relationship with product innovation strategy. It implies that technological capability is the important source of competitive advantage if it is utilized to develop innovation.

Based on the description above, the concept develops the relationship between technological capability and firm performance by using innovation as its mediating variable. Innovation which is used as the mediating variable on the relationship between technological capability and firm performance is based on Camison and Villar-Lopez (2010) research which mentions that innovation mediates the relationship between manufacturing flexibility and firm performance. Manufacturing flexibility is the source of competitive advantage which affects firm performance; it is utilized to develop innovation. The ability to identify demands and consumer’s preference as well as to improve the existing product or replace obsolete product will affect business performance. New product introduction enables a firm to anticipate the change on consumer’s preference so that the firm will obtain greater profit. It indicates that innovation mediates the relationship between manufacturing flexibility and firm performance.

Next, Bolivar-Ramos et al. (2012) add that technological distinctive competencies positively affect organization performance both directly and indirectly through organizational innovation. Thus, technological distinctive competencies are not only as the direct determinant of business performance but also as the significant determinant of innovation to achieve enhancement or improvement of business performance. Innovation is an important source of competitive advantage since innovation can improve firm performance. The direct influence of technological distinctive competencies toward firm performance will get improved through organizational innovation.

![Figure 1. The Mediating Role of Innovation on the relationship between Technological Capability and Firm Performance.](image-url)
3. Conclusion
Technological capability is one of the important resources and as a source of sustained competitive advantage. Referring to RBV theory, technological capability directly affects firm performance; however, firm performance can be further enhanced if there is another relevant variable to control the relationship between the two variables which is called as innovation. Innovation is generally considered a prerequisite for firm’s success and survival. Innovation is a critical determinant of firm performance so that innovation is a strategic factor that can improve growth. It is becomes an important issue since it enables a firm to develop its competitive advantage through several aspects of innovation such as product, process, market, organizational structure which can help improving firm performance.

A firm with a preeminent technological capability can improve its efficiency by creating innovation; thus, the firm will be able to achieve better differentiation in responding to market environment change. In the proposed model, innovation is the mediation variable of the relationship between technological capability and firm performance. Superior technological capability of a firm will result in greater innovation capability which then causes better performance of the firm. If technological capability is able to improve firm performance, the firm should apply technological capability to create innovation since innovation is an ability that can create competitive advantage. Hence, technological capability is to help improve firm performance, managers should generate innovation capability which ensures firm’s competitiveness.

Though the relationship between technological capability and firm performance has been developed in this model, this article has some limitations. First, further research should develop a model from contingency perspective, such as environment turbulence and learning orientation which moderate the relationship between technological capability and firm performance. Second, technology innovation management is very complex so that we need to explore other factors which broaden our insight on innovation management. Third, technological capability has dynamic components that are not yet able to be developed in this model.

References


