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Product, process and combined green innovations on firm's competitive advantages

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ABSTRACT

Greening of industry relates to the greening of the process of producing and the product as most pollution occurs due to process of raw materials. In this article, we propose that green product innovation, green process innovation and combined green innovation will be positively influencing manufacturing firms to achieve corporate competitive advantages in the marketplace. This is in line with a suggestion in the literature whereby firms that implement green technology and show high environmental performance to be prone towards being profitable compared to those that are not. If this is true, then the proposed model is expected to show positive results, indicating that green innovation investment is indeed beneficial to manufacturing firms to as a business strategic tool to compete in the marketplace. Thus, the importance of green innovation practices in corporation should be implemented by firms.

Introduction

The rapid growth of industries is influencing the advancement of mankind and their standard of living worldwide. The advancement may be positive from the aspects of economy and social but not so for the natural environment. This has since created immense interest amongst researchers to study, debate and understand various management theories related in the area of sustainable development as well as the business system that are set within the industries, non governmental organization and public policy institutions (Banerjee, Iyer & Kashyap, 2003).

In line with the Bruntland Report (1987), Scipioni, Mazzi, Zuliani and Mason (2008) defined sustainable development concept as the balancing of three different goals, i.e. the need for economic performance improvement, enhancing social development and the ecological integrity for environmental development. In Brundtland Report (1987), sustainable development refers to the development that is able to meet the needs of people today without impacting on the ability of future generations to meet the future needs. It also conceptualizes today's need as the needs of the world's poor which should be given overriding priority; and that limitation on the state of technology and social organization must be imposed to ensure that the environment is able to meet present and future needs. In addition, the framework for sustainable business strategy known as Managing Sustainable Companies – MaSC (2002) refers sustainability as a balanced approach that does not seek profitability at the expense of environment or society's needs but taking account of the need to sustain in an organization business.

The importance of caring for the environment has since influence the business community. Today, environmental performance is considered a strategic issue in business due to the development of the recent ISO 14000 standards. The ISO standards pressure many companies in improving their environmental performance to meet the standards' requirements, especially for those who are exporting to other countries. A developing country like Malaysia is also affected (Sumiani, Haslinda & Lehman, 2007). Historically, the country's economy that was heavily based on agriculture in the 1970s was diversified into industry based on manufacturing with focus on electronics and heavy industries in the 1980s as a result of its Prime Minister's leadership and policy. Following the change, the contribution of the manufacturing sector towards the country's Gross Domestic Product (GDP) grew from as low as 13.4% of the total GDP in 1970, to 30.3% of the total GDP in 2007 (Mokhtar, Goh & Murad, 2009). Today, although the importance of manufacturing based industry is still acknowledged, the shift of business paradigm towards green and safe environment related issue, it is vital for Malaysian businesses to adopt sustainability development within the day-to-day operation of the firms to ensure that the firms are able to meet present and future needs or challenges of the marketplace.

Although firms may be both "green and competitive", the norm in most corporations is that corporate environmental management is viewed as an unnecessary investment (Porter & van der Linde, 1995). Investment in environmental management is often misled into the obstruction on any corporation's development. To date, the view seems to be different. For instance, King and Lenox (2001) note the proponents of the positive suggestion in the literature on which they propose that firms with green technology and high environmental performance are expected to be prone towards being more profitable than those who do not share such characteristics. An example is that the environmental related investment(s) will provide financial benefits to the firm implementing it/them. Others argue that it is the discretionary improvements in the firm's environmental performance that will benefit the firm financially (Hart, 1997).

Given the change in views with regards to the benefits and importance for green technology to the industries, there is a need to investigate whether green technology, such as green product innovation and green process innovation's plays a vital role as key determining factors on firm's competitive advantages. In

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this article, we model the influences of environmental innovations of the firm's product and the manufacturing process on the achievement of firm's corporate competitive advantages.

Competitive Advantages

Manufacturers began to recognize that having better environmental performance could lead to new market opportunities (Bonifant, Arnold & Long, 1995). Imitation will be difficult for competitors if the firm has sustainable competitive advantage which effectively positions the firm against its competitors (Porter, 1985). Three key methods have been identified by Porter (1985) that built the definition of sustainable competitive advantage. These are, (1) Cost leadership – on which the firm has advantage over the competitors by delivering same services and products but with lower cost; (2) Differentiation – where the firm can provide better services or product that is not available in the market but with the same price as its competitors; and (3) Focus - where the firm has high concentration on exclusive competitive segment and achieving market niche and greatly increased competitive advantage.

Firms that have achieved competitive advantage over their competitors not only has better performance than its competitors but also delivers better values to their customers, and hence strengthening their market position (Bani-Hani & AlHawary, 2009). The most vital value of a corporate competitive advantage is that the firms have the capability that is impossible for competitors to imitate or replicate (Sinha, 1998). Superior profitability can be realized with competitive advantage where the firm is able to command a premium price than competitors or enjoying lower cost (Porter, 1991).

Corporations can gain competitive advantage by adapting environmental technologies. With environment technologies, corporations can adapt to new management approach to minimize ecological impacts of economic production while in the meantime strengthening the competitive advantage of the firms (Shrivastava, 1995). For the firm to perform superiority against competitors, they need to be able to exploit its environmental opportunities, to be rare among their competitors, to be difficult to be imitated and able to eliminate close strategic substitutes in the marketplace (Barney, 1991).

Green Innovation

Chen et al. (2006) noted the use of green innovations to significantly improve the performance of environmental development and management of a firm, which in part carried out to fulfill the requirement of environmental regulations. Green innovation known as a sustainable innovation is a process where sustainability considerations such as environmental, social financial are integrated into company systems from the stage of idea generation through to research and development (R&D) and commercialism. This process of sustainability considerations impacts to products, services, technologies, and new business and organization models (Charter & Clark, 2007). Klemmer (1999) defined green innovations as techno-economic, organizational, social and institutional changes which results in improvement on the quality of the environment. Through the entire life cycle of green innovation, the environmental improvement should result in a reduction of environmental risk, pollution and other negative impacts of resources used compared to relevant alternatives (Kemp, 2006).

Green innovation's ideas on processes and products should not only includes on solving environmental demands, shortage of resources, new environmental legislation, public pressure, but also customer's requirements, acceptance of environmentally-friendly products , and competitor's actions (Nunes & Bennet, 2010).

The difference between green and other innovations lie mainly in cost and conservation of the environment. For example, green innovations produce positive externalities in and of themselves, such as reducing external environmental costs of production and products apart from producing the positive typical research and development (R&D) effort. This characteristic is known as a "double externality effect" (Rennings, 1998).

The original perceptions on any innovation related subjects are defined in the Oslo-Manual of the OECD (2005) which distinguishes principally between product, process, marketing and organizational innovation. The manual defined product innovation as improved or new good or service which is introduced with regards to the attributes or initial usage of the product. On the other hand, process innovation is defined as improved or new process manufacturing or method of delivery. As for marketing innovation, it is defined as improved or new methods in marketing which involves in drastic changes of the product design, packaging, placement of product, promotion of product and or pricing. Lastly, organizational innovation is defined as improved or new organizational method of the business practices in the firm, as well as workplace organization and external relations.

Although product, process, marketing and organizational innovations are all equally important, the model we propose only include green product innovation and green process innovation as influencers of corporate competitive advantages. This is because both product and process innovation are expected to have the ability to help contribute directly towards solving environmental pollution by introducing enhancement in the product and processes while achieving competitive advantages at the same time.

Green Product Innovation

Conventional product innovation does not truly focus on environmental improvement, while green product innovation purpose is to reduce and avoid environmental burdens. Green product innovation can combine business targets by not only reducing cost cutting efforts but producing benefits to the environment as well (Triebswetter & Wackerbauer, 2007). According to Kammerer (2009), green product innovation is beneficial to customer because besides having public environmental friendly benefits, green products will also generate private environmental benefits for the customer, such as energy savings, hence this will indirectly creating more demand and the company will be motivated to implement more on this innovations. In addition, Dangelico and Pujari (2010) suggested that, the product's total life-cycle impact on the environment may be reduced from greener product innovation effort made on it. For instance, reduction of hazardous and excess materials in product, improvement of energy efficiency and pollution output, as well as extended use or recycling schemes for obsolete products.

Green product innovation helps the firm to gain competitive advantages by differentiating their products from competitors which does not practice green product innovation (Reinhardt, 1998). Some researchers suggested that green innovation on the firm's products provide individual benefits for consumer (Ottman, 1998; Reinhardt, 1998; Belz & Bilharz, 2005). Some of the benefits may include cost and energy savings because of

more efficient equipments, improvement on quality and durability, less electromagnetic field generation and toxic free products to reduce health hazard. These benefits will not only create better values for consumers but also uplift the corporate image of the company as promoting sustainability development. With this, consumer's demand for the firm's product will increase significantly and thereby generating a positive return of investment (ROI) on innovative environmental products leading to corporate competitive advantages (Ottman, 1998; Reinhardt, 1998; Belz & Bilharz, 2005).

Green Process Innovation

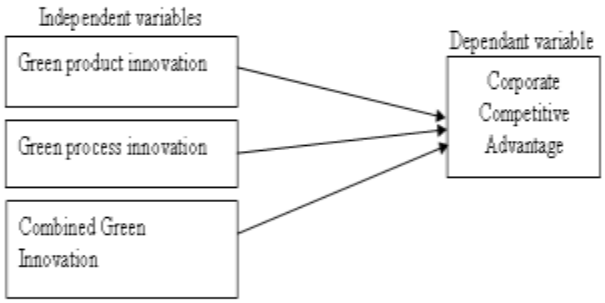
Green process innovation does not only include traditional process engineering related issues such as process design but also the associated ecological and social aspect of processes (Diwekar & Shastri, 2010). The key characteristics for green process are that the end product manufactured contains non hazardous substance and processed without hazardous chemicals. Besides that, green process also uses the energy and resources during production efficiently and sensibly. This will reduce the chances of environmental incidents and resulting in quality improvement and more profitable business (Kuo, 2007). Green processes innovations are also known as environmental process innovation which it is an introduction of a more environmentally friendly composition of one or more firm-internal processes (e.g., water recycling or fuel gas desulphurization) in this period, irrespective of the realization of environmental product innovations (Zieglera & Nogaredac, 2009).

A study by Chen et al. (2006) found that green process innovation has a positive impact on corporate competitive advantages. The main reason for this is that with greener process, waste could be reduced and recycled as well as energy is used in a more efficient way. Kuo (2007) claimed that by implementing green manufacturing, business will be achieve better competitive edge from having improved quality and efficient usage of energy and resources during production. Firms can also achieve higher profits with lower number of environmental incidents because finished products contain more natural materials and processed without toxic materials.

Proposed Model and Hypotheses

From the discussion of key variables literature review, a proposed model is developed. The model is depicted as follows:

Figure 1: Proposed model on the relationship of the variables



Based on the literature on the issues of both green product and process innovations earlier, hence, it is hypothesized that:

H1: Firm's implementation of green product innovation will be positively related to its corporate competitive advantages.

H2: Firm's implementation of green process innovation will be positively related to its corporate competitive advantages.

H3: Firm's implementation of a combined green innovation (product innovation and green process innovation) is positively related to its corporate competitive advantages.

Methodology

The proposed model is based on a relationship investigation of both independent (green product innovation and green process innovation) variables and dependent variable (corporate competitive advantage). For this type of investigation, a survey type of research is suggested to be carried out. The following subsections will propose the necessary procedures for it to be implemented.

Sample

Following the objectives of investigation, the unit of analysis for this research is manufacturing organizations. Thus, the population frame should be drawn from an existing, formal list of industries such as the Directory of Malaysian Industries (41^{st} edition) 2010 published by Federation of Malaysian Manufacturers (FMM) dated January 2010. FMM directory of Malaysian Industries 2010 is Malaysia's most established directory which provides a comprehensive profile of leading Malaysian industries. The directory for instance, separate the industries in Malaysia into several categories namely (1) manufacturers, (2) services, and (3) associations. In this case, the researchers can easily ignore services and associations as the focus is on manufacturing firms only. Since the directory provides company profile and contact information, the suitability of the firms as respondents can be decided. As for Penang manufacturing organizations, they are good representation for manufacturers alike. All of them are located within the free trade zone area in the state that are specifically set up by the Malaysian government for the past three decades to cater to the industry's needs as well as to encourage foreign investments and Penang had led over other states in Malaysia for capital investment in year 2010 with RM12.2 billion invested. To date many multi-national companies (MNC)s have invested significant manufacturing and R&D organizations in Penang. Manufacturing companies in Penang focuses on various industries namely, semiconductor, hardware, automation, optoelectronics, electrical components, oleo chemicals and consumers' electronics, manufacturing services, supply chain management and shared services hubs. A total number of 2349 organizations are listed in FMM Directory 2010 as manufacturers in Malaysia and to date, there are about 256 organizations listed as manufacturers in state of Penang Malaysia. These 256 companies of manufacturers constituted the sampling frame

Item Measurements

The predictor variables in this study are green product innovation and green process innovation. Questionnaire items to gauge green product innovation can be derived from past literatures such as Chen et al. (2006) and Kammerer (2009). For green process innovation, items can be adapted or adopted from Chen et al. (2006), Kuo, (2007) or Diwekar and Shastri, (2010). The measurements of corporate competitive advantage are available from Chen et al. (2006) or from Abdullah (2011).

Goodness of measure

The main criteria to describe and measure the goodness of measure are validity and reliability. Factor analysis should be performed on all the factors of green product innovation and green process innovation to study the factor structure of this scale to measure the validity of the measurement model for each construct. Reliability analysis should be carried out to check for

inter-item consistency. The consistency of the measurement scale used to measure competitive advantage, green product innovation and green process innovation should be measured using Cronbach's Alpha. In addition, correlation analysis should be performed to measure the strength of the relationship between the variables on every variable in this study.

Discussion

The model propose that investments made in green product and green process innovations may be influencing firm's corporate competitive advantages performance better than the competitors that do not invest or implement them. When manufacturing firms practice green innovation, many benefits gained include reduction in emission of hazardous waste, efficient use of energy and resources, smart material choice where it produced lesser amount of pollution or consumed the least amount of energy or resources, as well as product development for ease of recycle, reuse and decompose. In short, firms that implement green innovations will not only benefit the environment but also themselves.

The firms may reap better profit with the offering of cost leadership product, product differentiation, and 'champions of the environment' corporate image. Chen et al.'s (2006) study for example show the positive influences of green product and green process innovation on corporate competitive advantage in Taiwanese companies. Support for the study or an extension of ideas can be identified if only we test the model using other companies, i.e. different countries, different types of ownership, different size, different market orientation, etc.

Product and process environmental development that were once viewed as additional burden, expense and trade-offs with the corporate goals of the company may now be found to be favorably viewed as an opportunity to reap external benefits, hence bring the firm to being "green and competitive" .

Theoretical and Managerial Implications

This research provides an understanding of green innovations that are currently influencing corporate competitive advantages of manufacturing organizations in the world.

The challenge then, from the management perspective would be to look into green innovation opportunities in their product development and process improvement phases.

Despite the enormous challenges faced by managers as the managers need to take account of return of investments (ROI), the rewards are high, where the company can gain advantages over their competitors on delivering same products but with lower cost, differentiation on better products that are not available in market, and grow at a faster rate (Porter, 1985).

Firm's managers should also be aware of investment in green technology and innovations promote sustainability and resulting in environmental gain such as pollution reduction, cleaner production, energy conservation and leading to benefits of mankind.

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