J. Basic. Appl. Sci. Res., 3(11)332-338, 2013
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ISSN 2090-4304
Journal of Basic and Applied Scientific Research
www.textroad.com

Moderating Effect of Environmental Management Accounting on Innovation and Firm Performance: Review of Contemporary Literature

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Received: February 20 2013
Accepted: March 17 2013

ABSTRACT

This paper reviews the effect of EMA on relationship amid innovation and firm performance. Review of literature demonstrates that enhancement and improvement in cost information system through recognition of environmental cost lead to innovate new ways in production, and concurrently increases the sale and number of customers. Based on the findings of literature review, increasing number of customers leads to higher level of financial performance for firms. Therefore, this paper posits a framework that links the moderating effects of EMA on relationship amid innovation and firm performance for future empirification.
KEY WORDS: Innovation, Environmental Management Accounting, Firm Performance

I. INTRODUCTION

Recently, firms are operating in a business environment which is characterized by rapid change and increasing competitiveness [1]. Increased market share and competitive advantage edge are depending on the different employed strategies and practices by firms. One of these strategies is innovativeness which is fundamental tool to enter firm to the new markets. Severe global competition and rapid changes in technologies regarding new products and services are keeping firms motivated to understand and accept the important role of innovation in business. Gradually, innovation became a crucial strategy in firm success. This is because, innovation helps firms to have better performance in the market, to be more proactive in manufacturing new products and services, to seek high level of reputation in the society, and consequently, to improve the overall performance. In fact, innovativeness acts as a strategy that helps firms to gain higher level of performance through overcoming problem in the way of achieving sustainable competitive advantage [2, 3, 4, 5].

It is argued that the improving performance through innovation is moderated by some other employed strategies and activities. One of these activities might be implementing Environmental Management Accounting (EMA). According to Ferreira *et al.* [6] and Jasch [7] implementing EMA with a cost orientation as a new tool in management accounting acts as a motivation for firms to get them to find new ways, and strategies to control and reduce costs and environmental impacts of company activities, and consequently improve their financial performance. Correspondingly, this paper proposes a conceptual framework based on the review of existing accounting literature, which establishes relationship of EMA as moderator between innovation and firm performance. In addition, this framework serves as a guide for the future empirical investigation and the interpretation of its results.

II. LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

A. Innovation and Firm Performance

Innovation has been conceptualized in different ways in the literature [8, 9, 10, 11, 12, 13]. Innovation mostly has been identified as adopting a new behavior or idea. Different kinds of innovation have been distinguished in the literature. Classification of innovation proposed by Damanpour [14] has most advocates among scholars. According to his classification, administrative and technical are two main types of innovation. Whereas new products, new process and new services are included in technical innovation; and new policies, new procedures, and new organizational forms are in administrative innovation [15, 16, 17, 18, 19, 20].

The first economist who highlighted the importance of innovation is Joseph Schumpter. In the 1930, he proposed five types of innovation as: "(1) introduction of a new product or a qualitative change in an existing product; (2) process innovation new to an industry; (3) the opening of a new market; (4) development of new sources of supply for raw materials or other inputs; and (5) changes in industrial organization" [12]. In a comprehensive survey carried out in Australia, the following definition of innovation has been proposed by the ABS:

" innovation is any new or substantially improved good or service which has been commercialized, or any new or substantially improved process used for the commercial production of goods and services. "New" means new to your business." [12].

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A wide conception of innovation including the adoption of any new administrative, process, and product innovation is adopted in the current study. Basically, innovation is the key factor which assists the firm to deal with the flustered external environment. Consequently, to gain long-run success in business, mainly in dynamic markets, innovation is considered as the main driver [21, 22, 23, 24, 25, 26, 20, 27, 13]. Still, more broadly, innovation is recognized as the essential factor in achieving economic and social prosperity. In recent years, the interests in the idea that innovation comprises the foundation for obtaining sustainable competitive advantages over time, has been significantly increasing. In a competitive advantage, the firm places itself in such a way that the competitors might not be able to duplicate its success strategies and the firm will enjoy the durable advantage of this approach [28, 29, 30]. Competitive advantage, according to some researchers, helps a firm in creating a better value for the customers. Thus, it contributes to firm performance [31, 32].

Innovation which refers to the process of introducing new ideas to the firm tends to generate various organizational capabilities in gaining competitive advantage. Consequently, innovation is highly considered as a crucial factor in a improving firm performance [12]. This means that to stay alive in the Schumpeterian environments, firms must be able to fulfill the high-speed change and the increasing complexity [33]. In such dynamic contexts, the innovative companies, those with the ability to innovate, are probably able to cope with the challenges easier and faster. Moreover, compared to non-innovative organizations, the innovative organizations will be able to generate new products and make a better use of market opportunities [33, 34]. The results of many empirical studies witness that the relationship between innovation and performance is positively significant [35, 33, 36, 14, 9, 37, 38, 39, 40, 41, 42, 43].

It worth nothing that innovation also has been considered as a risky and expensive activity which might have negative effects on the firm performances. The negative outcomes are such as increased costs, increased exposure to market risk, unwarranted changes or employee dissatisfaction [44]. Moreover, the results of studies applying innovation show some conflict. For example, the study carried out by Wright *et al*. [45] who investigated the role of innovation on a sample of small businesses. Surprisingly, the results revealed that product innovation does no effect on performance in benign environments, but has affect positively on performance in hostile environments. In another study, Mansury and Love [46] also found that the extent and presence of service innovation do not affect on productivity, but has a positive effect on the firm growth. In this respect, the results of Damanpour *et al*.'s study [47] showed that it is detrimental to adopt a specific type of innovation annually (administrative, and technological, service process) in public service organizations in the UK; in other words, consistent adopting of the same pattern of types of innovation over the years is not effective, and adopting types of innovation in which divergence from the industry norm is considered, positively affects performance. Finally, the findings of a study carried out in a southeast region of Spain with a sample of 1600 firms including more than 15 employees (among which 55% belonged to the manufacturing sector and the rest 45% to the service sector) showed that innovation has a significantly positive effect on performance. These results are in line with the common idea that innovation is a key factor in company success [26].

Although the results of some research show negative effects of innovation on firm performance, the positive effect has been received many supports theoretically as well as empirically. Nevertheless, reviewing the literature indicates that the relationship between innovation and performance is not simple and need more studies to be carried out on this relationship. Therefore, from the discussion so far, it is hypothesized that:

H_1. *There is a positive and significant relationship between innovation and firm performance.*

$H1_a$. *There is a positive and significant relationship between product innovation and firm performance.*

$H1_b$. *There is a positive and significant relationship between process innovation and firm performance.*

$H1_c$. *There is a positive and significant relationship between* administrative *innovation and firm performance.*

B. EMA and innovation

Cost reductions, reputational improvements, improved product pricing, and attraction of human resources are numerous potential benefits linked to the usage of EMA [48, 49, 50, 51, 52]. Further, according to some studies, since EMA provides organizations with various information for decision-making, it is profitable for the firms [53, 48, 49].

Basically, hidden opportunities such as reduced material and energy consumption and better waste management processes, might be disclosed by such information. Further, this information from an environmental perspective is likely helpful in the development of an effective manufacturing process which in turn leads to innovation. Hansen and Mowen [52], for instance, indicated that organizations such as Interface Inc. and Baxter International enjoyed from economic benefits gained by EMA use which gave them savings of approximately $12 and $14 million per year, respectively.

It seems that approximately 20% of organization's total operating costs are consisted of environmental costs [54, 52]. Further, in conventional accounting systems, manufacturing overhead cost is an account that environmental costs usually tend to be hidden in [49]; thus, actual environmental costs are faced difficulties to be observed to the related particular activities by managers. However, by using EMA, these costs are identified,

classified and allocated which makes it possible to carry out an advanced cost analysis and possibly reduce the costs [48, 51].

The perceived benefits originating by EMA, encouraged organizations to use this practice to maintain or enhance their competitive advantage. However, this cannot be achieved without innovation. Innovation is usually defined as the adoption of new policies, systems, programs, services, products, or processes, which can be externally or internally generated. It should be mentioned that there is a distinction between process and product innovation which is of particular interests of many researchers. Utterback and Abernathy [20] for instance, suggested that during several steps of business development, the rates of utilization of process and product innovations are not the same. In helping organizations to increase profitability, process and product innovation are often complemented by each other [55]. In addition, the flexibility of product and process is highly determining in finding out how organizational costs are influenced by the product designs changes and the processes of production.

Due to limited access to finance, a trade-off often happens between process and product flexibility which proves investments in both process and product flexibility are not independent [56, 57]. Previous studies highlight the fact that organizations in which social and environmental information are produced tend to expand better internal control systems due to their better decision-making [53]. As a matter of fact, development of new products including cost structures improvement and more advanced technological processes are encouraged by the new information. In other words, both process and product innovation tend to be linked with the use of EMA and the competitive position of organizations might be consequently improved. The result resembles the findings noted for activity-based costing, a technique providing additional and more accurate cost information for management [57]. Eventually, this can bring about a raise in the number of process growth [58].

Ferreira *et al*. [6] investigated if the relationship between EMA and firm performance. The outcome shows that EMA implementation doesn't have a positive relationship with product creativity. In a another study of production managers in 588 German companies, Rennings *et al.* [59] reported a weak positive impact of ISO 14001 and EMAS on green product innovations. Frondel *et al*. [60] revealed that green creative operations are not linked with EMS adoption nor any other single course of action.

These findings are not consistent with the report of US Environmental Protection, Agency [61], and Hansen and Mowen [52] which emphasized that the implementation of EMA leads to product innovation. Additionally, Ferreira *et al*. [6] suggested that the adoption of EMA has a positive impact on the process of performance improvement. However, this finding is in line with the researcher's opinion that EMA adoption most often lead to the recognition of opportunities, such as advancement in manufacturing procedures [62, 52, 54] and reduction of expenses [63]. As put forward by Mario [64] distinguishing produced products through creative efforts leads to competitive edge. On the same note Chang [65] emphasized that environmental product creation mediates positively the relationship between institutional ecological ethics and competitive edge, while environmental procedures creation does not same effect on this relationship.

On the basis of the previous argument and lack of study on administrative innovation in EMA field, the following hypotheses are proposed:

H2: ***There is a positive relationship between usage of EMA and innovation.***

$H2_a$. *There is a positive relationship between usage of EMA and product innovation.*

$H2_b$. *There is a positive relationship between usage of EMA and process innovation.*

$H2_c$. *There is a positive relationship between usage of EMA and administrative innovation.*

C. Moderating effect of EMA on Innovation and Firm Performance

This paper proposes a framework, which links recognition of EMA as a moderator on the relationship between innovation and firm performance. The utilization of EMA has been appreciated to have rewarded businesses by making available varying reports for effective decision-making [49, 48, 53]. Bennett and James [66] and Qian *et al.* [67] argued that a significant goal of EMA is to support companies with excellent data in attaining durable growth through better environmental decision making. Molina-Azorín, *et al.*, [68] opined that EMA enables organization to recognize and scout for opportunities for expense savings through the identification, evaluation and allocation of environmental expenditures. An instance of this is in the replacement of resources that have huge poisonous wastes; and setting up new apparatus and machineries for product lines so as to lower material wastes [7]. Moreover, considering am environmental angle this data could further be adopted in the building of more compact procedures and therefore result to innovation [6].

In a study by Masanet-Llodra [69] it was shown that efficiency in the use of raw materials, operating materials, and energy can reduce main part of environmental costs. In another study, Jasch [7] stated that employing EMA increases material efficiency; reduces risk, cost of environmental protection, and environmental impact through identifying total annual costs of inefficiency [69, 70, 71]. Therefore, managers try to find and innovate new ways to reduce these kinds of costs and improve their financial performance as well as improving non-financial performance through increasing their reputation on consumers eyes through offering environmentally friendly products.

In order to elaborate the pivotal role of EMA on innovation and firm performance, this paper proposes a framework that suggests that moderating role of EMA theoretically establishes a positive link amid innovation and firm performance. Therefore, following hypothesis is proposed to examine this claim empirically as well:

H3. ***The relationship between innovation and firm performance is moderated by EMA application.***

$H3_a$. *The relationship between product innovation and firm performance is moderated by EMA application.*

$H3_b$. *The relationship between process innovation and firm performance is moderated by EMA application.*

$H3_c$. *The relationship between administrative innovation and firm performance is moderated by EMA application.*

III. RESEARCH FRAMEWORK AND HYPOTHESES MEASUREMENT

The objectives of the paper are concerned about determining the relationship between innovation and firm performance, and recognition of EMA as a moderator on this relationship.

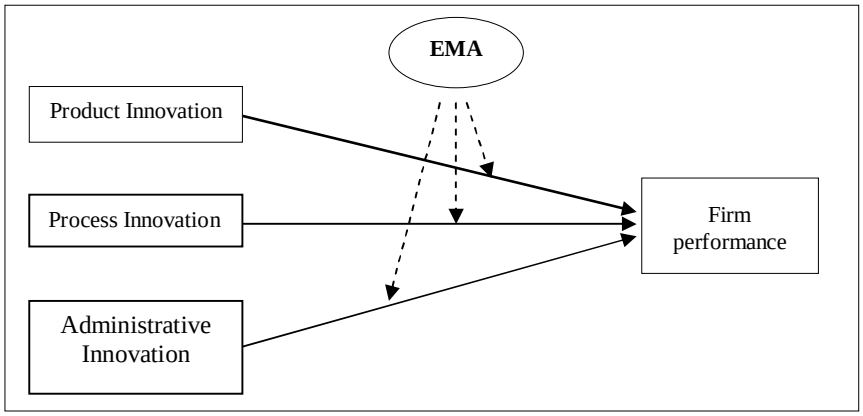

Figure 1. Conceptual framework

As illustrated by Figure 1, there are three groups of variables compiled from a literature review on innovation, EMA and firm performance. Accordingly, the research framework explains the linkages between independent variables, innovation and EMA and dependent variable, firm performance. Therefore, the proposed framework suggests variety of hypotheses, which require measurement criteria to be carefully employed. Based on the proposed framework, the hypotheses and the measurement suggestions are discussed:

The following model is used to test the hypothesis.

$$\mathbf{Y = b0 + b1\ X1 + b2\ X2 + \varepsilon}$$

Where

Y : is firm performance

X_1 : is innovation

X_2 : is EMA

ε : is an error term

H1. ***There is a positive and significant relationship between innovation and firm performance.***

$$\textbf{Firm Performance} = \boldsymbol{\beta_0 + \beta_1}\textbf{Innovation} + \boldsymbol{\varepsilon}$$

To test the effect of innovation on firm performance, the hypothesis is to broken in three sub-hypotheses:

Firm Performance = $\beta_0 + \beta_1$ Product Innovation + ε

Firm Performance = $\beta_0 + \beta_1$ Process Innovation + ε

Firm Performance = $\beta_0 + \beta_1$ administrative Innovation + ε

H2. ***There is a positive relationship between usage of EMA and innovation.***

$$\textbf{Innovation} = \boldsymbol{\beta_0 + \beta_1}\textbf{EMA} + \boldsymbol{\varepsilon}$$

To test the effect of EMA on innovation, the hypothesis is to broken in three sub-hypotheses:

Product Innovation = $\beta_0 + \beta_1$EMA + ε

Process Innovation = $\beta_0 + \beta_1$EMA + ε

Administrative Innovation = $\beta_0 + \beta_1$EMA + ε

H3. ***The relationship between innovation and firm performance is moderated by EMA application.***

$$\textbf{Firm Performance} = \boldsymbol{\beta_0 + \beta_1}\textbf{EMA} + \boldsymbol{\beta_2}\textbf{(EMA} \times \textbf{innovation)} + \boldsymbol{\varepsilon}$$

To test the effect of *EMA* on the relationship between *innovation* and *firm performance*, it is suggested that the hypothesis is to be further broken in three sub hypotheses:

$H3_a$) Firm Performance = $\beta_0 + \beta_1$EMA + β_2(EMA ×product innovation) + ε

H3$_b$) Firm Performance = $\beta_0 + \beta_1$EMA + β_2(EMA ×process innovation) + ε
H3$_c$) Firm Performance = $\beta_0 + \beta_1$EMA + β_2(EMA × administrative innovation) + ε

IV. CONCLUSION

Some researchers have stated that EMA leads to innovation over time. It is also claimed that innovation is a critical component in the design and manufacture of products which are considered superior to those of competitors. Thus, it could be claimed that enhancement and improvement of innovation through employing EMA leads to growth of competitive advantage, and consequently increases the firm performance. Accordingly, we conclude hereby based on the proposed framework that inclusion of EMA as the moderator on the relationship between innovation and firm performance would improve innovation and consequently increase the performance. It is strongly suggested that researchers, practitioners, and accountants should extend the horizon of research, which measures EMA.

Acknowledgment

The authors declare that they have no conflicts of interest in this research.

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