

ARTICLE

THE IMPACT OF GREEN INNOVATION TYPES ON ORGANIZATION PERFORMANCE IN THE CONSTRUCTION INDUSTRY

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ABSTRACT

Today, product development for companies that want to compete in existing markets as well as in new markets, is critical. Therefore, companies can improve environmental performance, green image of your company to develop which in turn will create new business opportunities and helps improve competitive advantage. The purpose of this paper is to explore the relationship of green innovation to improve the performance of organization in the construction industry and they tried to measure the impacts of each green innovation elements to explain organizational performance. The study was a descriptive and objective survey. The population of this study consisted of experts and managers of construction companies registered at construction companies in Tehran which has been chosen by simple random sampling method based on Cochran formula. The criterion validity of the study was to test the Content Validity Ratio (CVR) and reliability with Cronbach's alpha coefficient was measured. Research findings show that there was a significant meaning between green innovation components and organizational performance. It also found that respectively, green marketing innovation (the highest), green process innovation, green product innovation and green management innovation (the lowest) has a direct and positive impact on improving organizational performance. Therefore, this results which clears the importance of different green innovation types on organizational performance, can be effective to provide competition advantages for innovator companies.

INTRODUCTION

The rapid of environmental issues throughout the world have increasing much concern from customers, buyers, communities and also government. For instance, both the local or international customers and buyers are now requiring their suppliers to make environmental friendly products [1]. The increasing awareness from communities on the environmental problems also has created this matter become more critical to companies. Nowadays, organizations are increasingly faced with dynamic and changing environments. When everything is changing and competitors are looking to increase market share through the acquisition of competitive advantage, organizations can be successful which have the ability to cope with changes that are due to the continuous innovation of new thoughts and ideas of their applications [2]. Since that today the environmental performance of firms and environmental compliance is as a competitive advantage for enterprises [3]. Therefore, being consistent for any innovation with environmental considerations is very important. Therefore, given the importance of this matter, a new concept emerged as green innovation with the statement that any innovation in production processes that save energy and natural resources and environmental pollution are reduced [4]. As a result, managers should provide conditions to support this scenario [5], the industry must be restructured and existing technologies to create a green and sustainable growth, must be applied more innovative [6]. So no manager can not be ignored in relation to this key resource, because in order to achieve competitive advantage and their survival in the future, is essential and should seriously consider green innovation and the obstacles in the way of its establishment to be studied. This attitude is also important in the construction industry and to the creation of new knowledge in architecture as the green architecture. It aims to reduce or minimize negative environmental impact such as pollution, waste of resources, and product dump [7]. Environmental degradation has been widely addressed as a worldwide issue. Construction industry is considered as making a major contribution to environmental pollution [8]. Given the importance of these assets for organizational survival, Understanding that how organizations are using different types of green innovation in improving organizational performance and what is the relationship between green innovations and its components with improved organizational performance, are key questions in the current study. In general, this article attempts to provide a model to examine the relationship between green innovation and organizational performance review and the relative contribution of each dimension of green innovation and impact on organizational performance. Accordingly, firstly, theoretical research was conducted. Theoretical foundations of green innovation and organizational performance that analysis was performed to extract components of research have been done. In the present study conceptual model, research methods and effective components were identified. Then, various statistical analysis has been done. Finally, conclusions and recommendation has been discussed.

Today, investment in the field of sustainability and environmental protection are becoming an issue for business is a competitive advantage and profitability. The concept of green innovation in action is widely used. Seman (2012) defined green innovation as a new environmental approach, idea, product, process or services that concern on minimizing negative environmental impact and also create differentiation of developed product among competitors [9]. Chen (2006) defined green innovation as hardware or software innovation in technology that is related to green products or process, consists of the innovation in technology like energy-saving, waste recycling, green product designs or corporate environmental [10]. Green innovation are categorized into four types of innovations including product innovation, process innovation, managerial innovation, and marketing innovation [11].

KEY WORDS

Green marketing innovation; green management innovation; green Product innovation;

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Chen (2010) introduced the concept of green core competencies as the collective learning and capabilities about green innovation and environmental management has a positive influence on a firm's ability to develop green product and process innovations [12]. Kemp and Pearson (2007) defined green innovation as new process for the production of a product or service, a method or a new policy or a new approach to business management that reduce environmental hazards, pollution and negative impacts of energy consumption [13]. Green innovation concept can support the implementation of GSCM by providing the new idea, approach or technology to manufacturers in developing new products.

Green innovation is believed to provide continuous seeking ways to innovate each stage of supply chain in order to gain competitive advantage and decrease the environmental problems in industry [14].

Green innovation in terms of product life cycle assessment includes the modification of an existing product design process to reduce the negative environmental impacts described and its factors in four categories: management, product development and aspects of the production process is classified [3]. Green innovation can be classified into four main categories: green managerial innovation; green product innovation; green process innovation; and green technological innovation [3].

Thus, the study of green marketing innovation, green management innovation, green Product innovation based on Seman, et al (2012) and Tseng (2012) because of the comprehensiveness of the model, were used as the basis for study) [3], [9] were chosen to measure green innovation. In the following brief definition of pay.

Green management innovation

Management Innovation is presented that the firm should be oriented towards continual improvement. For this, the management should be clearly defined an innovation strategy for the firm. The formulation of green objectives and strategies for achieving green innovation should be aligned with daily operations and a specific budget for green innovative thinking [3].

The management is guided by process design and innovation and enhances R&D functions. The management should go beyond the analysis of recycle, reuse material and life cycle assessments. Management innovation is signifying a firm's ability to formulate green projects and all the green projects with suitable programming and resources of budget allocation such as redefine operation and production processes to ensure internal efficiency that can help to implement green supply chain management and redesigning and improving product or service to obtain new environmental criteria or directives. Hence, the firm must be able to evaluate and install environmental management system and ISO 14000 series, Redefine operation and production processes to ensure internal efficiency that can help to implement green supply chain management, Redesigning and improving product or service to obtain new, environmental criteria or directives, Install environmental management system and ISO 14000 series, Providing environmental awareness seminars and training for stakeholders [15].

Moreover, the planning of technical knowledge, skills, operations and commercial feasibility of green innovation is to reduce the risk of innovation [3], [12], [16].

Green Product innovation

Green product innovation understood as a strategic weapon for obtaining competitive advantages and as something more complex than a green product alone [3]. The research and development unit should always evaluate the degree of new green product competitiveness and understand customer needs. Moreover, the evaluation of technical economic and commercial feasibility of green products should be addressed. Recovery of company's end-of-life products and recycling presented the accumulation of knowledge and the improvement of product knowledge is required. The product knowledge and information is always team solving becomes transparent in the organization. An interdisciplinary approach to cope with Innovation of green products and design measures and knowledge should be fostered. However, if a firm only focuses on green innovation without Using eco-labeling, environment management system and ISO 14000, the action and plan might be miss alignment [10].

Green process innovation

The green process innovation is significance to green practice firm. Improving existing processes and developing new processes can be understood in terms of the level of knowledge and uncertainties regarding the reward-to-risk ratios [3]. The consolidation of green know how guides the process innovation activities [17]. The product knowledge and information is always team solving becomes transparent in the organization. An interdisciplinary approach to cope with Innovation of green products and design measures and knowledge should be fostered. However, if a firm only focuses on green innovation without Using eco-labeling, environment management system and ISO 14000, the action and plan might be miss alignment [10].

Green marketing innovation

Green marketing innovation is one of the concepts (theories) is emerging in the field of marketing and what it means in action is widely used. Green marketing is a broad concept that all marketing activities to

stimulate and reinforce attitudes and behaviors favorable to the consumer's environment [12]. Green Marketing includes all activities designed to create and facilitate the exchange, in order to satisfy human needs and desires, which satisfies the needs and desires with the least damage and harm done to the environment. The first attempts to determine the relationship between marketing and its environment was Marketing at the start of the first stage, various forms of green marketing into practice and to follow their green marketing activities, consumers expect a positive response and the subsequent increase in the commercial reputation, market share and the company had sales [18].

Organizational Performance

Performance measurement is one of the critical issues that were affecting a wide range of disciplines and experts on the various articles and a report on different aspects is written.

Performance measurement is tool that can help to organizations for better understand the situation and coordinate with the organization situation. Historical perspective, without the use of performance measurement can not be realized that program design and implementation in the specified period has been a success or a failure to fully. Accordingly, in this paper we consider performance as the dependent variable that is shown as a result of efforts to improve and develop due to the various aspects of the innovation process, product, structure, etc. Most of the research that has been done in the field of organizational performance measures more focused on financial outcomes such as cost and profit and Ignored Soft non-financial outcomes such as non-operating costs, reduce time to do the work, creating new products, the ability to attract, train, develop and preserving the resources talented people [18]. Accordingly, in this study a combination of financial and non-financial metrics for measuring the performance-based model of Sher&Lee (2004), is used, and that these three dimensions are:

Financial Performance: this includes market performance, such as profitability, growth and customer satisfaction.

Process performance: this includes the quality and effectiveness of the process is doing.

Internal performance: this related to individuals skills such as ability, satisfaction and employee creativity.

Research Background

Several researchers investigated green innovation on organizational performance using various methods and statistics in different communities (various organizations). In this section, different ideas and theories of internal and external theorists are examined in the field of green innovation on organizational performance:

Chiou et al (2011) in their study in Taiwan presented an empirical evidence to promote manufacturers to implement green supply chain and green innovation in order to improve environmental performance and increase their competitive advantage in the market. This study found that GSCM practices in term of greening the suppliers have the positive influence on green product innovation, green process innovation, and green managerial innovation. This study also suggested to extend to other GSCM practices in examining more detail about the effect on green innovation [1].

Triguero et al (2013) studied " Drivers of different types of eco-innovation in European SMEs" in 27 European countries and showed that those entrepreneurs who give importance to collaboration with research institutes, agencies and universities, and to the increase of market demand for green products are more active in all types of eco-innovations. Supply-side factors seem to be a more important driver for environmental processes and organizational innovations than for environmental product innovations. also shown that market share only has a significant positive influence on eco-product and eco-organizational innovations, while cost-savings are solely significant for eco-process innovations[19].

Tseng, et al (2013) studied "Performance drivers of green innovation under incomplete information" to evaluate the green innovation for environment management, with a particular focus on managerial, process, product and technological aspects in Taiwanese printed circuit board manufacturing firm's. This study shown theoretical and empirical evidence of green innovation drivers in the domains of environmental management and had interesting implications for operations management research and practices [3].

Costantini & Mazzanti (2012) studied " On the green and innovative side of trade competitiveness? The impact of environmental policies and innovation on EU exports". These results shown that public policies and private innovation patterns both trigger higher efficiency in the production process through various complementarity mechanisms, thus turning the perception of environmental protection actions as a production cost into a net benefit. According to theoretical and empirical studies conducted in the field and examine them and refer to expert opinions, it became clear conceptual framework According to the conducted theoretical and experimental studies in the related field and examining different models, the framework of the conceptual model of research was determined[20].

Finally, based on four variables including organizational, green process, green product, green marketing and green management innovations, the conceptual model [Fig. 1] is designed. After designing the conceptual model about the generality of the model components, relevant professionals and experts from academia, professional and experienced people with at least 15years experience in the relevant fields have been surveyed and any needed corrections have been applied based on these ideas. After applying experts' ideas and approving the conceptual model, survey questionnaire had been formulated from the community (sample) for the purposes of statistical research, hypotheses and research questions. Then,

Analysis of Data

Descriptive analysis (one variable) population characteristics:

The age distribution of the study population reflects the fact that the average age is in the age group of 40 to 49 years. Also the highest accumulation of respondents is seen in the age group of 40 to 49 years and the lowest accumulation is seen in the age group of 50 years and older.

Of the respondents under investigation in this study, respectively; 81/6 percent were male and 14/2 percent was female which were selected using a stratified sampling method.

In relation to the education level of the respondents, respectively; 1/8 percent has Associate degree, 56/1 has bachelor degree, 30/2 percent has master degree, and 10/6 percent has PHD degree. Distribution of The educational level of statistical society reflects the fact that each respondent on average for has a bachelor's degree. From the respondents under investigation in this study, respectively; 63/9 percent was middle managers and experts and 36/1 percent was supervisor, chairman and senior manager. From the respondents of this study most of the respondents have working experience between 11 to 20 (56 percent), and the lowest accumulation of respondents had working experience between 21 to 25 (3 percent).

Deductive analysis (variables Analysis)

In two variables analysis, Kendall tau coefficient of correlation is used in order to generalize to the larger statistical population. Also, in order to examining the correlation, Somers d coefficient is used. [Table 1] shows Distribution coefficients, the value and significance of various aspects of green innovation and organizational performance:

Table 2: Distribution of coefficients, the value and significance of various types of green innovation and organizational performance

variable	Coefficient	Amount of Coefficients	Significance level
There is significance relationship between green innovation and organizational performance in construction companies	Kendall's tau	0.79	0.000
	Somers d	0.67	0.000
There is significance relationship between green management innovation and product innovation in construction companies	Kendall's tau	0.56	0.000
	Somers d	0.43	0.000
There is significance relationship between green management innovation and process innovation in construction companies.	Kendall's tau	0.45	0.000
	Somers d	0.41	0.000
There is significance relationship between management innovation and marketing innovation in construction companies	Kendall's tau	0.43	0.000
	Somers d	0.37	0.000
There is significance relationship between process innovation and product innovation in construction companies	Kendall's tau	0.39	0.000
	Somers d	0.31	0.000
There is significance relationship between marketing innovation and product innovation in construction companies	Kendall's tau	0.41	0.000
	Somers d	0.35	0.000
There is significance relationship between green innovation and product innovation in construction companies	Kendall's tau	0.31	0.000
	Somers d	0.30	0.000
There is significance relationship between green innovation and process innovation in construction companies	Kendall's tau	0.45	0.000
	Somers d	0.31	0.000
There is significance relationship between green innovation and marketing innovation in construction companies	Kendall's tau	0.34	0.000
	Somers d	0.33	0.000
There is significance relationship between green innovation and management innovation in construction companies	Kendall's tau	0.41	0.000
	Somers d	0.35	0.000

According to the findings of [Table 2] there is a significant relationship between organizational innovation and organizational performance in Statistical population under study with error level of 0/01. Kendall's tau coefficient with the amount of 0/79 represents the Strong correlation between two mentioned variables. Also degree and intensity of this relationship according to Samers d coefficient was 0/67 that shows direct and relatively Strong relationship. In the other hypothesis the relationship between the variables Due to the coefficient d au-Kendall Summers and the coefficients to represent direct and relatively moderate relationship.

Therefore, according to the two variables analysis and test of the research hypothesis in the first step, all of the research hypotheses are confirmed.

Inferential analysis (Multivariate Analysis: Regression analysis)

[Table 3] represent Multivariate regression model of organizational performance. In addition [Table 4] determines Indicators and statistics of regression analysis.

Table 3: Multivariate Regression Model For organizational performance

Variables were entered into the equation					
Variables	Non- standardized coefficients		Standardized coefficients	The amount of t	Significant level of t
	B	Standard error	Beta		
Green product Innovation	1.460	0.166	0.087	24.296	<u>0.000</u>
Green marketing Innovation	3.000	0.184	0.667	9.177	<u>0.000</u>
Green management Innovation	3.287	1.215	0.066	2.713	0.007
Green process Innovation	3.223	0.121	0.275	2.524	0.012

Table 4: Indicators And Statistics of Regression Analysis of organizational performance

Entry method variables	Method : Enter
Individual correlation coefficients	M.R = 0/911
The coefficient of determination	R ² = 0/89
The coefficient of Real determining	R ² <u>adj</u> = 0/88
Deviation or standard error	S.E = 9/356
Analysis of Variance	ANOVA = 325/040
Significance level of F	Sig = 0/000

As can be seen In [Table 4], the coefficient of multiple correlation is M.R=0/911, The coefficient of determination is equal to R2=0/89, and The real coefficient of determination equal to 0/87 and This indicates that almost 88% of the variance and changes of the variable in implementation of organizational performance By components exist in the equation, i.e., green product Innovation, green marketing Innovation, green management Innovation, green process Innovation and green innovation can be explained and predicted. 12% of the changes of dependent variable linked to remaining variance is due to the influence of external variables and unknown factors emerged.

The data in Table 4 indicates the fact that the component of green marketing innovation with the foundation of 0/67 most impact and green management innovation with the foundation of 0/07 have the least amount of affection in variable on improving organization performance. System in organization.

The results of multiple regression analysis of the above variables can be written in standardized mathematical form as follows

Formula (1)

$$Y = \beta_1 Z_{1i} + \beta_2 Z_{2i} + \dots + \beta_k Z_{ki} + E_i$$

Y= 0.67 (green marketing Inn : Innovation)
+ 0.07 (green management Innovation) + 0.07(green Innovation) + 0.12E

Therefore, according to multivariate regression, all assumptions are approved.

CONCLUSION

With the growing importance of green innovations, green collaboration, green performance and firm competitiveness over the past decade, it is essential to improve our understanding of these matters and their associated interrelationships.

Based on this study, due to the strategic importance of green innovation for companies and the lack of a comprehensive model of green innovation that is tested empirically in this corporate, a model is presented for improve organizational performance in the construction companies.

Therefore, this paper investigates the relationship between different types of green innovation with organizational performance and Extraction of the relative impact of each of these components in improving of organizational performance based on regression analysis have been studied. The following results are obtained:

Improvement in the green management innovation on the green product innovation has significant and direct effect (confirm the first hypothesis)

Improvement in the green management innovation on the green process innovation has significant and direct effect (confirm the second hypothesis)

Improvement in the green management innovation on the green marketing innovation has significant and direct effect (third the first hypothesis)
 Improvement in the green process innovation on the green product innovation has significant and direct effect (confirm the fourth hypothesis)
 Improvement in the green marketing innovation on the green product innovation has significant and direct effect (confirm the fifth hypothesis)
 Improvement in the green product innovation on the improving of organizational performance has significant and direct effect (confirm the sixth hypothesis)
 Improvement in the green marketing innovation on the improving of organizational performance has significant and direct effect (confirm the seventh hypothesis).
 Improvement in the green management innovation on the improving of organizational performance has significant and direct effect (confirm the eighth hypothesis)
 Improvement in the green process innovation on the improving of organizational performance has significant and direct effect (confirm the Ninth hypothesis).
 In addition, in determining the relative contribution of each green innovation component in explaining and predicting of organizational performance logically, organizational performance respectively affected by "green marketing innovation", "green process innovation", "green product innovation" and "green management innovation". Therefore, green marketing innovation and green management innovation respectively have the highest and the lowest impact on organizational performance.
 The results obtained from the study of the relationship between different types of green innovation and organizational performance in this article are consistent with previous research findings and empirically reinforce them.

The main limitation of this research that the researcher encountered in this study can be mentioned as unconcern of respondents in providing information to complete the questionnaire and the a lack of time and lack of easy access to all members of population which pursued diligently and overcome through using behavioral techniques. According to the findings suggested that Accordingly, it is recommended that the more managers take care of organizational infrastructure in order to enabling the types of green innovation specially green marketing innovation (according to the findings of the study has the most effect in improving of organizational performance) and also all the basic infrastructure provided in the study scrutinize and review by the managers and applied in the organization. In addition, since the present study in construction companies which are private companies that have been conducted, it is suggested that in future research by doing research on public companies and comparative study between the results obtained from public and private companies reach to different results. Since the results of the research show that green management innovations have the low effects on organizational performance, it is suggested:

In a study, the impact of green management innovation on organizational performance in organization using another model should be investigated. Moreover, according to the importance of green innovation types in organizational performance improvement, the managers be suggested:
 In relation to green product innovation: the findings indicated that green product innovation third priority is the impact on organizational performance. The reason to impose short-term costs to the organization by purchasing green equipment, employee training and more rigorous monitoring for the development of green products noted. However, according to research findings green product innovation can long-term through reduced consumption of energy and raw materials, increases the overall performance of the organization. In relation to green process innovation: this dimension of green innovation, can also improve overall organizational performance. Since the green process innovation after green marketing innovation has the greatest impact on organizational, therefore the implementation and development it's in Construction companies should be considered. For this purpose the following practical recommendations: definition and process re-engineering
 To ensure the effectiveness of internal production, Recycle, reuse and remanufacture material, use of cleaner technology to make savings and prevent pollution (such as energy, water and waste), sending in-house auditor to appraise environmental performance of supplier, process design and innovation and enhances R&D functions. In relation to green marketing Innovation: Since the green marketing innovation has the greatest impact on organizational therefore, the following suggestions are offered: Change in advertising practices, changes in pricing practices of existing products, changes in activities of general marketing management . In relation to green management Innovation: According to the findings green management innovation has the least impact on organizational performance. Green management innovation in long-term can improve the overall performance of the organization. For this purpose the following practical recommendations are offered: redefine operation and production processes to ensure internal efficiency that can help to implement green supply chain management, install environmental management system and ISO 14000 series, providing environmental awareness seminars and training for stakeholders.

CONFLICT OF INTEREST

There is no conflict of interest.

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None

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