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Innovation Strategies, Performance Diversity and Development: An Empirical Analysis in Iran Construction and Housing Industry

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Abstract

Innovation strategy is the basis of success in innovation and performance improvement. This paper represents a model related to the most important innovation strategies which have a significant impact on performance of industries. Then, it examines the relationships between innovation strategies and diversity and development of the performance. So, the empirical research was carried out in Iranian construction industry and practical data were gathered out of7main industry institutions and 93 construction SMEs by questionnaires to examine paper objectives. The findings show that innovation strategies such as proactive, analyzer, futuristic and aggressive strategies influence on the performance development of the industry. Also, strategies such as proactive, risk taking and futuristic ones are the most effective innovation strategies in the performance diversity. Results of this study suggest that to achieve performance diversity and development, construction industry's policy makers and top managers should implement and promote pro active and futurity strategies, simultaneously, across the industry.

Keywords:

Innovation strategy, Performance diversity, Construction industry, Iran.

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Introduction

The importance of innovation for an industry to achieve competitive advantage is ever increasing (Tsai, Hsieh, and Hultink, 2011), because innovation is the engine of competition and determiner of competitive positions of industries (Laperche, Lefebvre, and Langlet, 2011). Due to the complex and dynamic nature of environments, it is difficult to find an industry that has not been engaged in continuous or periodic innovation and reorientation (Tamayo-Torres, Ruiz-Moreno, and Verdu, 2010). In other words, in order to enjoy a durable competitive advantage in dynamic environments, the firms must reinforce their innovative capabilities (Sharif & Huang, 2012). Since innovation is a main strategic tool in order to gain a competitive advantage in such complex environments (Akman & Yilmaz, 2008). Also, innovation is a basic precondition for long-term success, growth, performance continuance, and firms' survival. For these reasons, the industries and firms accept that innovation is considered as a strategic necessity, not a strategic choice (Akman & Yilmaz, 2008). Because researchers have identified and classified the key and important objectives of innovation as follows: developing the radical innovative products, introducing the niche products or technologies, improving the production process, maintaining or increasing the market share, exploiting the new domestic and international markets, improving the production quality, improving the existing technology to reduce reliance on imported equipment or technology, reducing consumption of raw materials and energies, improving working conditions and reducing production costs (Guan, Yam, Tang, and Lau, 2009).

However, the researchers believe that a successful innovation needs top management team's (TMT) support, because TMTs are likely to have greater influence on a firm's innovation orientation, when the environment is dynamic, unpredictable, changing, and competitive (Marshall & Vredenburg, 1992; Talke, Salomo, and Rost,

2010). Additionally, without a strategy for innovation, performance improvement is not possible (Lawson & Samson, 2001; Akman & Yilmaz, 2008).

Innovation strategy reflects industry's tendency to engage and support the new ideas, novelty, experimentation and creative processes that may result in new products, services or technological processes and finally performance improvement (Tamayo-Torres et al., 2010). Therefore, innovation strategy is fundamental to the success of innovation in manufacturing industries and related firms (Guan et al., 2009) and is a basic tool that determines the innovation direction of the business (Lendel & Varmus, 2011, 2012). It also guides them in adapting, integrating and reorienting their technological capabilities to gain, maintain and improve sustainable competitive advantages (Guan et al., 2009). Talke, Salomo and Rost (2010) found out that TMTs via facilitating an innovation strategy could enhance firm performance. Other researchers proposed that selection of an innovation strategy could enhance business performance or reduce performance gap merging from changes in the market environment (Wei & Wang, 2011). In addition, innovation strategy helps industries and firms to find new opportunities for their development and growth (Lendel & Varmus, 2011, 2012).

The selected context for surveying the effects of innovation strategies on performance is the construction industry, because construction sector not only plays a critical role for human settlements (Ofori & Han, 2003) but also serves as growth engine for a country's economic development (Ofori, 2001; Wong, Ng, and Chan, 2010), and is one of the most important section in modern economies (Blayse & Manley, 2004). In other words, the industry plays an important role in terms of the economic, social and cultural developments of countries (Pamulu, 2010), and expansion of this industry is considered as a manifestation of growth and development in countries (BHRC, 2009).

According to the report of the Ministry of Housing and Urban Development (MHUD) of Iran in 2008, the construction industry employs more than (11%) of the working population. Therefore,

approximately 3.9 million people have been involved in the industry and over the past decade, nearly (40%) of total annual investment was also in this sector (Tabassi, Ramli, and Abu Bakar, 2012), and housing and construction industries' contribution to GDP in Iran was more than (5%). However, this industry is an emerging industry and is still spending its early stages in Iran (Construction And Housing Industrialization Roadmap, 2010), which in comparing with the other developed or even developing countries, performance of Iran construction industry is low, because of the lack of strategic, dynamic and innovation orientations, whereas construction industry is now a highly dynamic sector (Chan & Chan, 2004), and its operating environment, industry structures and product characteristic are changing at an ever-increasing pace. Also, activity in the industry is subject to the influences resulting from the pace of technological change in other sectors of the economy, inherent uncertainties and issues like company's fluctuating profit margin, weather change, productivity on site, the political situation in a country, inflation, market competition, and clients demands (Sexton & Barrett, 2003; Dansoh, 2005; Karimi Azari, Mousavi, Mousavi, and Hosseini, 2011). Therefore, the construction industry presents a valuable context to explore issues related to the innovation and strategic studies, because the industry has a very high growing potential and its performance scope is very considerable.

This paper aims to evaluate the relationship between innovation strategy and the performance of construction industry and examines the influence of innovation strategies on performance. Although, numerous studies have been carried out with respect to innovation strategy and the relationship between innovation strategy and performance (Venkatraman, 1989; Li & Atuahene-Gima, 2001; Therrien, 2003; Poon & Mac Pherson, 2005; Akman, & Yilmaz, 2008, Guan et al., 2009; Wei & Wang, 2011), there are inadequate researches related to the effects of innovation strategy on performance of construction industry. Thus, this article is organized as follows: First, innovation strategies and its advantages and various

classifications of them are defined. Second, performance and its key criteria in construction industry are reviewed and after brainstorming, classified into performance development and diversity. Then, a theoretical model is proposed that states the effects of innovation strategies on diversity and development of performance. The model of the study and its hypotheses are tested. Statistical analysis methods, such as factor analysis, correlation analysis, regression analysis are used. Results and their managerial implications are interpreted in the discussion section, and suggestions for future research are made in the last section.

Literature Review

Innovation Strategy

Innovation strategy determines to what degree and in what way a firm attempts to use innovation to execute its business strategy and improve its performance (Gilbert, 1994). Some researchers defined the innovation strategy as the extent to which a firm values and promotes innovation across the organization (Wei & Wang, 2011). Lendel and Varmus (2011) defined the innovation strategy as an innovative guide for firms in order to select objectives, methods and ways to fully utilization and development of innovative capacity of the enterprise.

An innovation strategy guides decisions on how resources are to be used to meet a firm's objectives for innovation and, thereby deliver value and build competitive advantage. Furthermore, it helps the firms to decide in a cumulative and sustainable manner, which type of innovation best matches the corporate objectives (Dodgson, Gann, and Salter, 2008; Lendel & Varmus, 2012). Also, innovation strategies could result in new technologies, products or processes that are intended to (a) minimize the costs of the environmental impact of business activities, and (b) improve the efficiency in the usage of materials and energy (Mariadoss, Tansuhaj, and Mouri, 2011). Some authors classified innovation strategy. These classifications are summarized in Table 1.

Table1. Classification of innovation strategies

Author(s)	Classifications
(Miles & Snow, 1978)	Prospector, defender, analyzer, reactor
(Gilbert, 1994)	Reactive innovation strategy and proactive innovative strategy
(Hultink & Robben, 1995)	Technological innovator, rapid copier, cost reducer
(Manu & Sriram, 1996)	Product innovator, process innovator, late enterer, non-innovator, original initiators
(Burgelman, Maidique, and Wheelwright, 2001)	Technological leadership or followership, market position, timing of market entry
(Hickman & Raia, 2002; Gundry&Kickul, 2007)	Improving core business, exploiting strategic advantages, developing new capabilities, creating revolution change
(Massini, Lewin, and Greve, 2005)	Innovators, imitators
(Venkatraman, 1989; Akman & Yilmaz, 2008)	Aggressive, analyzer, defensive, futuristic, proactive, risk taking
(Guan, Yam, Tang, and Lau, 2009)	Leading innovator, follower, imitator, defender, technology importer
(Kylaheiko, Jantunen, Puumalainen, Saarenketo, and Tuppura, 2011)	Domestic and international innovator, domestic and international replicator

As mentioned above, Venkatraman (1989), Akmanand Yilmaz (2008) in their studies explained six types of innovation strategies, namely aggressive, analyzer, futuristic, proactive, risk taking and defensive strategies.

Aggressive strategy emphasizes on a combative posture in exploiting environment opportunities, and is related to advances of the firm by (1) being the first-mover in the marketplace; (2) developing the radical innovations before competitors even at the expense of profitability and (3) giving priority to innovation projects that involve high levels of risks and returns (Akman & Yilmaz, 2008). *Analyzer* strategy refers to the trait of overall problem solving posture. It provides managers with information about events and trends in their relevant environments that facilitates opportunity recognition (Entrialgo, Fernandez, and Vazquez, 2000; Akman & Yilmaz, 2008). *Futuristic* strategy helps the industry and firms to make long-term plans by means of forecasting future innovation opportunities (Chandy & Tellis, 1998). A high level of futurity provides managers with an extensive variety of views and opinions and informs them to consider changes in the markets (Akman & Yilmaz, 2008).

Proactive strategy refers to seek new opportunities created by the changes and developments in the environment, creating new opportunities, and making innovations by exploiting these opportunities (Droge, Calantone, and Harmancioglu, 2008). *Risk taking* strategy refers to the extent to which the top managers are willing to take the risks related to business (Gupta, MacMillan, and Surie, 2004). *Defensive* strategy refers to defensive behavior and concerns the firms' need to defend its current position in the marketplace (Morgan & Strong, 1998; Akman & Yilmaz, 2008). This strategy is applied in those organizations which have limited product-market domains (Miles & Snow, 1978).

Construction Industry Performance Criteria

As mentioned, performance scope of construction industry is very extensive, so gathering and determining of all performance criteria of construction industry is not an easy work. In this paper, we have tried to gather most of the performance criteria that were identified by researchers. These criteria are summarized in Table 2.

Table2. Key performance criteria in construction industry from various viewpoints

Authors	Criteria
(Love & Irani, 2003)	Construction and design methods (process innovation)
(Chan & Chan, 2004; Swan & Khalfan, 2007; Ahadzie, Proverbs, and Olomolaiye, 2008)	Design and technological innovation, time, cost, quality, environmental condition
(Sha, Yang, and Song, 2008)	Productivity, profits, economic efficiency, quality and safety, social benefit
(Chan, 2009)	safety, growth, labor productivity, innovation, training, construction demand
(Shouke, Zhuobin, and Jie, 2010)	Cost, time, society and environment
(Toor & Ogunlana, 2010)	On time, under budget, meets specifications, efficiently (use of resources), doing the right thing (effectiveness), safety, free from defects, conforms to stakeholders' expectations, minimized construction aggravation, disputes, and conflicts
(Construction And Housing, 2010)	Innovation, cost, quality, ROI, working conditions, time (executive speed), maintain or increase market share, environmental impact, production process and technologies, raw materials and energy consumption
(Eriksson & Westerberg, 2011)	Cost, time, quality, environmental impact, work environment, product and process innovation
(Cheng, Ryan, and Kelly, 2012)	Cost, time, profit, quality and scope of work
(BHRC, 2009; Meng, 2012)	Time, cost or other economic indicators, quality

After identifying these criteria in construction industry, we classified the most important criteria in two categories: performance development and performance diversity. Criteria such as cost, quality, time, return on investment, conservation in raw materials and energy consumption (environmental impact) are placed in the category related to the performance development because primary researchers in their research implied them as criteria which could ensure sustainable development of construction performance. Other criteria such as product innovation and process innovation were classified as performance diversity. The reason for selection of innovation was that the construction sector has been seen as a low-tech industry, with little innovation compared to other industries, traditionally. In recent years, however, innovation in construction has received increasing interest in an explicit manner, both among practitioners and academics (Eriksson & Westerberg, 2011).

Conceptual Framework and Hypotheses

Industries with innovation strategy are more successful in rapid response to their environment, and making innovations that provide high performance and competitive advantage(Guan et al., 2009) because innovation strategy determines how an organization uses innovation to adapt or change its environment (Manu & Sriram, 1996) and in which degree, and how an organization uses innovation to develop performance (Gilbert, 1994). As a result, an innovation strategy is an essential tool for performance improvement even in difficult times (Cooper & Edgett, 2010).

As mentioned, the construction industry is dynamic in nature (Chan & Chan, 2004) because its operating environment, structure and product characteristics are changing at an ever-increasing pace (Dansoh, 2005). On the other hand, performance scope of this industry is very extensive. So, talking about improving performance of the industry is impossible without having appropriate and strong strategy for innovations (Lawson & Samson, 2001).

The research model, shown in Figure 1, indicates the relationships

between innovation strategy and performance diversity and development. It proposes that applying the innovation strategies in construction industry influences on performance of the industry. Hence, we can articulate and develop relevant hypotheses.

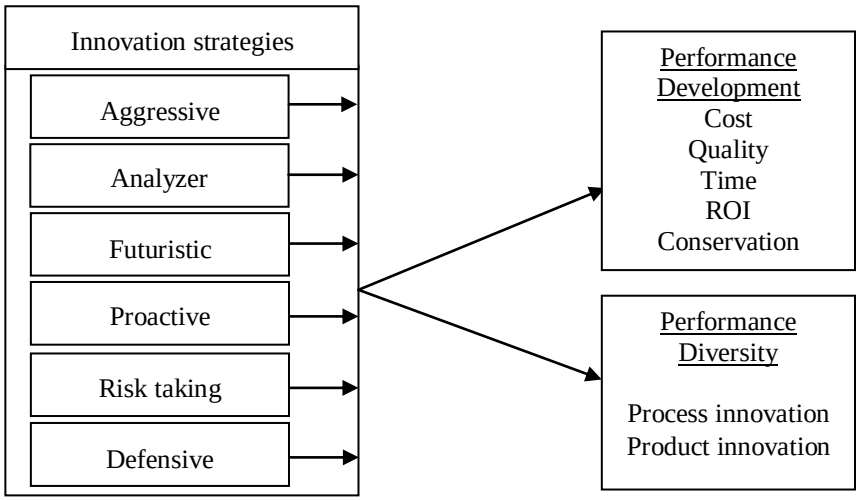

Figure 1. Innovation strategy and performance diversity and development

Aggressive

Aggressiveness allows a firm to allocate its resources to improve market share and competitive position and to achieve profit through cost reduction, quality improvement and on-time delivery of products and services at a relatively faster rate in comparison to its competitors (Venkatraman, 1989). But, if the firms apply aggressive strategy to make radical innovations without analyzing their environment sufficiently, without evaluating threats and opportunities adequately, without taking into account their own capabilities, they may face great financial losses and failures. In contrast, aggressiveness provides firms to direct and allocate their resources, rapidly and truly. It leads firms to be first-to-market with their products and to exploit new opportunities rapidly from competitors and to create innovations (Akman & Yilmaz, 2008). So the hypotheses are:

H1a. Aggressive strategy has a positive impact on performance development.

H1b. Aggressive strategy has a positive impact on performance diversity.

Analyzer

Firms require a high level of information gathering and analysis, because firm's top managers can use the information to identify shortcomings in their activities and therefore take the appropriate action to improve their management practices in future projects and consequently to develop performance by cost savings, quality breakthroughs and preventing time waste (Love & Irani, 2003). Analysis is a very critical factor for the firms to make correct innovation decisions (Entrialgo et al., 2000). However, if a firm's innovation strategy focuses solely on the use of sources of information and existing internal resources, it finds it difficult to develop breakthrough innovations in product, process and technology (Guan et al., 2009). Hence:

H2a. Analyzer strategy has a positive impact on performance development.

H2b. Analyzer strategy has a positive impact on performance diversity.

Futuristic

The firms should have a long-term view about their customers, competitors and environments (Vazquez, Santoz, and Alvarez, 2001). Futurity can help firms to manage these uncertain events and to respond these demands in future. It also constitutes a long-term horizon and provides a possibility to transform new and creative ideas and opportunities to innovations (Jaworski & Kohli, 1993). Futurity is necessary to remain flexible in facing today's environmental variations and on-time dealing with unpredictable and rapid dynamics of construction sectors (Kazaz & Ulubeyli, 2009). So:

H3a. Futuristic strategy has a positive impact on performance development.

H3b. Futuristic strategy has a positive impact on performance diversity.

Proactive

Firms pursuing a proactive strategy may pay close attention to novel products and new services in the marketplace. They may also proactively discover new approaches and methods to achieve superior performance (Wei & Wang, 2011). Zhou' findings (2006) showed that being pioneer may be a better choice to enhance new product

performance focusing more on exploration, innovation, growth, and R&D, than on exploitation, cost control, economies of scale, capacity utilization, and efficiency (Menguc & Auh, 2008). So the hypotheses are:

H4a. Proactive strategy has a positive impact on performance development.

H4b. Proactive strategy has a positive impact on performance diversity.

Risk Taking

In order to be successful, the firms should tolerate risks and accept occasional failures (Jaworski & Kohli, 1993). Therefore, it is almost impossible that a firm achieves performance development without taking risk (Akman & Yilmaz, 2008). Proposing new products, process, methods and programs often run a high risk and might not be successful (Jaworski & Kohli, 1993; Akman & Yilmaz, 2008). So the hypotheses are:

H5a. Riskiness has a positive impact on performance development.

H5b. Riskiness has a positive impact on performance diversity.

Defensive

In general, defensiveness is manifested in terms of emphasis on product quality, cost reduction and efficiency seeking methods (Venkatraman, 1989). A defensive innovative strategy together with a proactive innovation strategy affects the performance of the firm, but its effect is not strong as much as proactive strategy (Akman & Yilmaz, 2008). So the hypotheses are:

H6a. Defensive strategy has a positive impact on performance development.

H6b. Defensive strategy has a positive impact on performance diversity.

Methodology

Research Scope

Research has been conducted on construction industry because the construction sector is a highly dynamic and advanced technology sector. It has been characterized by high rate of product and process innovation, increasingly velocity of technological change, and its

internal and external environment, industry structures and product characteristic are changing at an ever-increasing pace (Sexton & Barrett, 2003; Dansoh, 2005). Furthermore, today, construction industry is in a new period of a challenging socio-economic, cultural, political, and business environment (Toor & Ofori, 2008). Therefore, construction sector was selected to achieve goals of the study easily.

Population and Sample

Population consisted of high-ranking people whose titles were "CEO," "non-CEO[1]," in Iranian construction and housing industry. So, according to the extent of research scope, population size was assumed infinite.

For sampling from infinite population, we used simple random sampling in this study and the infinite population formula was used to determine the sample size as follows.

$$n = \frac{z_{\frac{\alpha}{2}}^2 .p.q}{\varepsilon^2} = \frac{0.5 \times 0.5 \times (1.96)^2}{0.06^2} \cong 267$$

According to the widespread and dispersal population, it was possible that some of the questionnaires have not been returned. So, 300 questionnaires randomly were distributed among high-ranking managers in seven main institutions such as Building and Housing Research Center of the Ministry of Road & Urban Development (BHRC), Bonyad Maskan, Mass Production Association of Housing and Construction, Management of Iran Construction Projects (MAPSA), State Organization of Schools Renovation, Development and Mobilization, Rah Shahr International Group, Construction Engineering Disciplinary Organization and 93 small-medium sized construction firms. Returned questionnaire number is 257and the answer rate of the questionnaire is (85.6%), which was suitable to the sample size. Therefore, questionnaires were evaluated by SPSS 19.0. Characteristics of the sample are summarized in Table 3.

1. Middle managers, project managers, member of the board and industry's experts and consultants

Table3. Characteristics of sample

Characteristic	Frequency	Percent	**Cumulative Percent**
Practical research scope			
Small firms	78	78	**78**
Medium firms	15	15	**92**
Institutions	7	7	**100**
Respondents sex			
Male	202	79	**79**
Female	55	21	**100**
Respondents age			
23-33	112	44	**44**
34-43	78	30	**74**
44-53	49	19	**93**
53<	18	7	**100**
Respondents education			
BA	156	61	**61**
MA	85	33	**94**
PhD	16	6	**100**
Respondents Job title			
CEOs	100	39	**39**
Non-CEOs	157	61	**100**

Measurement

The questionnaire used in this study consists of three parts: (1) innovation strategy; (2) performance development and (3) performance diversity. The survey instrument is composed of 41items. Respondents were asked to indicate the extent to which they agreed or disagreed with each item by using five-point Likert scales from 1 = strongly disagree to 5 = strongly agree.

Out of 41 items, 20 items have been used for innovation strategies. Items for the innovation strategy scale were adapted from the Akman and Yilmaz's personality inventory test, which its reliability and validity have been validated (Akman & Yilmaz, 2008). The remained items for performance diversity (7items) and performance development (14 items) were adapted from different sources and then integrated by the researcher to apply to this study. For example, the questions related to the performance diversity including product innovation and process innovation were adapted from Chong, Chan, Ooi, and Sim (2011) and Eriksson and Westerberg (2011); and the questions related to the performance development consisting of cost (three items), quality (three items), time (three items) were adapted from Chew,

Yan, and Cheah (2008) and Construction and Housing (2010), ROI (three items) adapted from Construction and Housing (2010), and conservation in energy and materials (two items) were adapted from Sha, Yang, and Song (2008), Construction and Housing (2010) and Eriksson and Westerberg (2011).

Factor Analysis and Scale Reliability

At first, the content validity of the questionnaire was assessed by a panel of management experts. Then, factor analysis was conducted to test the questionnaire validity. All items and the results of factor analyses are presented in Appendix A. The factor loading ranged from (0.501) to (0.906), which are well exceeded the generally recommended minimum value of (0.5), and all items in each scale loaded on a single factor. This suggested that each factor was valid as a construct (Nunnally, 1978).

The reliability of the measurements in the survey was tested using Cronbach's alpha (α). As we show in Appendix A, the reliability coefficients (α) of each of the variables were as follows: aggressive (.735), analyzer (.738), futuristic (.703), proactive (.811), risk taking (.69), defensive (.750), performance development (.820) and performance diversity (.740). As the Cronbach's alpha (α) values ranged from (0.69) to (0.82), all factors are accepted as being reliable as suggested by Nunnally (1978).

Analysis and Results

Correlation Analysis

Table 4 specifies means, standard deviations (descriptive statistics), and correlations of the study constructs. The correlation matrix provides initial support for the hypothesis that performance development and diversity are strongly related to six types of innovation strategy. All types of innovation strategies including aggressive, analyzer, futuristic, defensive, proactive strategies and risk taking positively correlate with diversity and development of performance at significance level of (0.01).

Table4. Descriptive statistics and correlations of the study constructs.

	Mean	St. D	1	2	3	4	5	6	7	8
1. **Performance diversity**	3.226	0.878	1							
2. **Performance development**	3.291	0.896	0.625**	1						
3. **Aggressive**	3.084	0.931	0.307**	0.455**	1					
4. **Analyzer**	3.143	0.852	0.483**	0.567**	0.323**	1				
5. **Defensive**	3.236	0.951	0.490**	0.477**	0.416**	0.549**	1			
6. **Futuristic**	3.172	0.815	0.468**	0.556**	0.368**	0.581**	0.517**	1		
7. **Proactive**	3.259	1.039	0.609**	0.585**	0.344**	0.510**	0.551**	0.465**	1	
8. **Risk taking**	3.013	1.102	0.435**	0.343**	0.311**	0.382**	0.390**	0.321**	0.302**	1

** Correlation is significant at the 0.01 level (2-tailed)

Multiple Linear Regression Analysis

To verify the effects of independent variables on dependent variable, a multiple linear regression analysis was used. Results have been shown in Table 5 and 6. Also, the results of Variance Inflation Factor and Tolerance support the independence assumption between the indicators of each construct. So, there is no multi co-linearity between the independent variables. The results are explained as follows.

Table5. Regression results belonging to performance development

Independent variables	Standardized beta	Sig.	Co linearity statistics	
			Tolerance	VIF
Aggressive	0.195**	0.000	0.769	1.300
Analyzer	0.219**	0.000	0.536	1.866
Futuristic	0.210**	0.000	0.580	1.725
Proactive	0.305**	0.000	0.614	1.629
Risk taking	0.047	0.345	0.786	1.273
Defensive	-0.018	0.761	0.532	1.878
R^2	0.515			
Adj. R^2	0.503			
F	44.183	0.000		

* $p < 0.05$, ** $p < 0.01$, VIF: Variance Inflation Factor< 2 or 5, Tolerance>0.1or 0.2

Table6. Regression results belonging to performance diversity

Independent variables	Standardized beta	Sig.	Co linearity statistics	
			Tolerance	VIF
Aggressive	-0.002	0.970	0.769	1.300
Analyzer	0.081	0.196	0.536	1.866
Futuristic	0.127*	0.037	0.580	1.725
Proactive	0.404**	0.000	0.614	1.629
Risk taking	0.212**	0.000	0.786	1.273
Defensive	0.076	0.230	0.532	1.878
R^2	0.474			
Adj. R^2	0.461			
F	37.490	0.000		

* $p < 0.05$, ** $p < 0.01$, VIF: Variance Inflation Factor< 2 or 5, Tolerance>0.1or 0.2

Innovation strategy and performance development

The empirical result confirms H1a and indicates that aggressive strategy has a significant and positive impact on the industry performance development (β=0.195; p<0.01). Other results indicate that analyzer strategy has a significant and positive impact on the industry performance development (β=0.219; p<0.01). Thus, the data supported H2a. The results also approve hypothesis H3a and show that futuristic strategy significantly increases development of performance (β=0.210; p<0.01). Lending support to H4a, we find that proactive strategy significantly develops the industry performance (β=0.305; p<0.01). Therefore, according to β parameter, proactive (0.305), analyzer (0.219), futuristic (0.210) and aggressive (0.195) strategies have significant positive effect on the industry performance development, respectively. Other hypotheses, that are, H5a and H6a were not significant.

Values related to the regression model in Table 5 were determined as (p<0.01, F=44.183, $Adj.\ R^2$= 0.503). When these values are investigated, it is seen that variables included in the model explains performance development very well. Figure 2 shows regression results belonging to performance development.

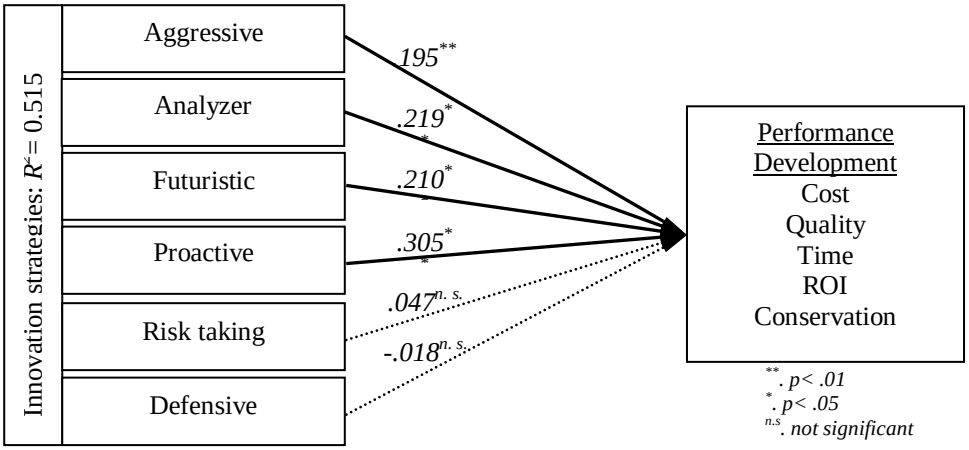

Figure 2. Relationship between innovation strategy and performance development

Innovation strategy and performance diversity

Table 6 depicts regression results belonging to performance diversity. The results show that futuristic strategy has significant and positive impact on diversity of performance (β=0.127; p<0.05). This finding supports H3b that suggested futurity directly affects diversity of performance. As seen in Table 6, the attractive finding is that proactive strategy has a strong and positive effect on performance diversity (β=0.404; p<0.01). This result supports H4b. The results also confirm hypothesis H5b and show that risk taking strategy significantly increases diversity of performance positively (β=0.212; p<0.01). Thus, according to βparameter, proactive (0.404), risk taking (0.212) and futuristic (0.127) have significant positive effect on the industry performance diversity, respectively. But, aggressive, analyzer and defensive do not have any significant effects on diversity performance. This means that H1b, H2band H6bhypotheses are not supported.

Values related to the regression model in Table 6 were determined as (p< 0.01, F=37.490, Adj. R^2= 0.461). When these values are investigated, it is seen that variables included in the model explains performance diversity very well. Figure 3 shows regression results belonging to performance diversity clearly.

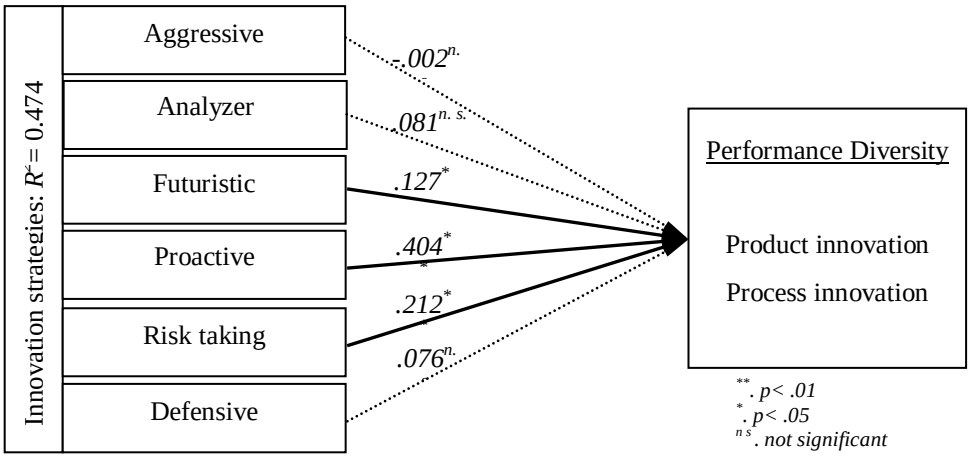

Figure 3. Relationship between innovation strategy and performance diversity

Discussion and Conclusion

Discussion

In this paper, the effects of innovation strategies such as aggressive, analyzer, futuristic, proactive, risk taking and defensive strategies on performance diversity and development were investigated andit was determined that the effects of these strategies on construction industry performance are very strong. In this section, some arguments from other researchers are brought for verifying our findings.

One of the most important findings of this paper was that proactive strategy simultaneously develops the industry performance and improves its diversity. This result is consistent with similar findings reported by Entrialgo et al. (2000), Akmanand Yilmaz (2008), Guan et al. (2009). They believed that proactive strategy provides flexibility in industry structure that facilitates innovations, and being more innovative. They also found out that proactive strategy provides industries to perceive new opportunities, to estimate changes in market beforehand, and behave more rapidly than competitors. Also, Guan et al. (2009) found that innovation rate and innovation sales were the highest for firms that adopted a proactive innovation strategy. Such a phenomenon is logical and proves that the proactive innovation strategy is effective in achieving better innovation performance.

Futuristic strategy was other innovation strategy that simultaneously in fluences the diversity and development of industry performance. Similar results are obtained by Dansoh (2005) and Akman and Yilmaz (2008). Danosh (2005) believed that futuristic strategy is not just seen as a strategy for improvement over the past, but could be a tool for successful management of risks and uncertainties. So, futurity would be most effective tool to control or manage the effects of future changes, particularly in the construction industry's operating environment. Akmanand Yilmaz (2008) said that firms must be prepared in advance for situations, opportunities and threats in the future and firms must have a long-term view to be successful and develop their capabilities in the future. Moreover, they found out futurity affects performance positively and significantly by helping firms to perceive opportunities in the future, create new ideas and transform these ideas into innovations.

Other important result of this research is that analyzer strategy influences performance development positively and very strong. On the contrary, H2b was determined that analyzer strategy does not have significant impact on performance diversity. Although it was expected that the H2b would be accepted, it was rejected. Entrialgo et al. (2000) believed that analysis is not only crucial to the performance development, but also a firm in a turbulent environment must continually be innovative and apply various methods to remain competitive, which requires extensive analysis to recognize and exploit environmental change. So they found that there is a significant and positive relationship between diversity of performance and analyzer strategy. Also, Akmanand Yilmaz (2008) believed that new activities of firms require a continual analysis activity because, today's business environment changes rapidly and continually.

Further important results of this research are that aggressive strategy influences performance development positively and very strong but its effect on performance diversity is not significant. Therefore, we do not find support for Hypothesis 1b. To implement aggressiveness successfully, industries should provide flexible structures and required investment, undertake risky conditions and also apply analysis strategy as a supplement.

The other attractive findings are that risk taking strategy has strong impact on diversity of performance but even though there is a positive relation between riskiness and performance development, the effect of riskiness on development of performance is not significant. This result shows that respondents did not reveal riskiness for sustainable development. Similar findings also showed that riskiness requires significant investments and shared participation for resolving uncertainty and possibly organizational resistance. Also, riskiness without analysis (analysis facilitates the risk-taking) and futurity would not be successful. However, innovation, in turn, involves risk, as it consists of the application of something new, different from what currently exists. Innovative firms are risk-taking and proactive but firms which do not seem to be very innovative, are unwilling to take risks. This result is consistent with similar findings reported by Entrialgo et al. (2000) and Akmanand Yilmaz (2008). Although risk taking strategy could create innovation and new methods and lead to performance diversity but, it could not lead to desired consequences and sustainable performance development.

Other interesting finding is that defensiveness has no significant effect on both diversity and development of performance. Therefore, H6a and H6b are rejected. This finding shows that defensiveness is not useful strategy for those industries seeking greater growth, development and radical innovations. The finding is in direction with the observations of Akmanand Yilmaz (2008) and Guan et al. (2009).

In summary, our research reviewed literature related to innovation strategy and performance criteria in construction industry. Of the twelve hypotheses, seven hypotheses have been accepted and five of them have been accepted rejected. In various results, our findings were in direction with observations of other researchers, and in a few results, our findings were different from other researchers' findings and arguments. Finally, results show that out of the six innovation strategies, proactive and futuristic ones are the most effective strategies for simultaneous developing and making diversity in the industry performance.

Managerial Implications

We provide at least three insights of managerial relevance. First, it is crucial for management to realize the importance of innovation strategy as a fundamental key to the success of innovation in a highly dynamic environment particularly in construction industry. So, an innovation strategy should be closely linked to the industry's vision and overall strategy, and based on comprehensive and relevant information, both from inside the industry and from the market and the environment. Second, we believe that a successful innovation strategy must be based on knowledge and facts, supplemented with learning and creativity to cope with the concepts of change and the ability to expand an institution's creative capacity. Third, the results of the study suggest that in order to be proactive in product, process and technology, and to provide conditions for exporting the technical and engineering services to international markets and move away from reliance on imported technology and equipment, industries' top managers and policy makers should place pro activity and futurity in their policies.

Limitations and Future Research

The limitations of this study offer fertile avenues for further research. First, we have focused only on one classification of innovation strategy. Further research should investigate other classifications of innovation strategy such as leading innovator, follower, imitator, defender and technology importer (Guan et al., 2009) in construction industry and other industries. The second limitation is that, we selected seven performance criteria in construction industry and classified them in two categories whereas there are other criteria in this industry for investigating such as net profit, work condition and safety, environment impact and so forth. Our analysis is restricted to one industry, that is construction. Further research is needed to validate the findings for other industries (manufacturing or non-manufacturing). Finally, according to Chan and Chan (2004), "the construction industry is dynamic in nature because its environment has become more dynamic due to the increasing uncertainties in technology, budgets, and development processes", and Karimi Azari, Mousavi, Mousavi, and Hosseini (2011), "Construction industry faces a lot of environmental uncertainties and issues such as

company's fluctuating profit margin, competitive bidding process, weather change, productivity on site, the political situation in a country, inflation, contractual rights, market competition, and so on". Thus, the environment is a moderator of the innovation strategy-performance link. Future research could investigate the influence of the moderating role of environmental dynamism and uncertainty on innovation strategy and performance of construction industry.

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Appendix A. Items, results of factor analysis and reliability analysis

	Part1: Innovation strategy	**Factor loading**
***Aggressive* (α= 0. 735)**		
AGGRES1	Price is decreased frequently to increase market share	0. 851
AGGRES2	Pricing below competitive price	0. 861
AGGRES3	We sacrifice profits in order to introduce a new product to the market earlier than our competitors	0. 705
***Analyzer* (α= 0. 738)**		
ANALY1	To be successful, we give importance to provide coordination between different department and experts	0. 708
ANALY2	While making a decision, information systems of the firm provide an efficient support	0. 791
ANALY3	We use analytical methods for decision-making	0. 678
ANALY4	We use various planning techniques	0. 747
***Futuristic* (α= 0. 703)**		
FUTURE1	We are future oriented	0. 778
FUTURE2	We seek continually for potential products that will provide competitive superiority in the future	0. 753
FUTURE3	We try to forecast beforehand future market trends	0. 711
***Proactive* (α= 0. 811)**		
PROACT1	We are an initiator for defining new product and ideas in the market	0. 638
PROACT2	We research new product opportunities continually	0. 799
PROACT3	Innovation activities are encouraged in our industry	0. 845
PROACT4	We use new product approach to compete its competitors	0. 797
***Risk* taking (α= 0. 69)**		
RISK1	Our managers support to develop new product that are successful and makes a profit most certainly	0. 723
RISK2	Our managers act with deliberation when make a decision about developing a new product	0. 578
RISK3	We take risk to develop new product	0. 635
***Defensive* (α= 0. 75)**		
DEFEND1	We make changes in product development method sometimes	0. 582
DEFEND2	We develop quality and performance of current products continually	0. 847
DEFEND3	We more than creating radical change, use modern management techniques	0. 817

	Part2: Performance development	
***Performance development criteria* (α= 0. 82)**		
Per-Dev1 (cost)	Access to low cost labor and low cost raw materials	0. 588
Per-Dev2 (cost)	Reducing cost in construction operation	0. 706
Per-Dev3 (cost)	Reducing cost in administration activities	0. 701
Per-Dev4 (time)	Reducing construction time and increasing construction speed	0. 501
Per-Dev5 (time)	Improving delivery speed or lead time minimization (on time)	0. 567
Per-Dev6 (time)	Reducing percent frequency of delayed projects	0. 708
Per-Dev7 (quality)	Reducing defective rates	0. 640
Per-Dev8 (quality)	Improving quality of construction process and products	0. 694
Per-Dev9 (quality)	Emphasizing strict quality control and total quality management in the construction process	0. 631
Per-Dev10 (ROI)	Reducing period of return on investment (ROI)	0. 827
Per-Dev11 (ROI)	Reducing risk of investment for investor sands take holders	0. 771
Per-Dev12 (ROI)	Improving rate of ROI	0. 906
Per-Dev13 (conservation)	Reducing consumption of energies	0. 601
Per-Dev14 (conservation)	Reducing consumption of raw material	0. 739
	Part3: Performance diversity	
***Performance diversity criteria* (α= 0. 74)**		
Per-Div1 (product innovation)	Use up-to-date, new and latest technology for new product development	0. 835
Per-Div2 (product innovation)	Produce products with novelty features	0. 640
Per-Div3 (product innovation)	We have new products which are first in market	0. 802
Per-Div4 (product innovation)	Making suitable improvements and innovations at products correspond to environmental changes and in the short time	0. 754
Per-Div5 (process innovation)	We are fast in adopting process with the latest technological innovations	0. 849
Per-Div6 (process innovation)	We use up-to-date/new technology in the process	0. 700
Per-Div7 (process innovation)	The process, techniques and technology change rapidly in our industry	0. 640

استراتژی نوآوری، تنوع و توسعه عملکرد: مطالعه تجربی در صنعت ساختمان و مسکن ایران

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چکیده

استراتژی نوآوری اساس موفقیت نوآوری و بهبود عملکرد است. مقاله حاضر، مدلی مربوط به مهم‌ترین استراتژی‌های نوآوری را که تأثیر بسزایی بر عملکرد صنایع دارند، ارائه می‌دهد. سپس، به بررسی روابط میان استراتژی‌های نوآوری و توسعه و تنوع عملکرد می‌پردازد. بدین منظور، یک مطالعه تجربی در صنعت ساختمان ایران انجام گرفت، و داده‌های میدانی جهت بررسی اهداف تحقیق از ۷ نهاد متولّی صنعت ساختمان و ۹۳ شرکت کوچک و متوسط فعال در صنعت، با ابزار پرسشنامه گردآوری شد. یافته‌ها نشان داد که استراتژی‌های نوآوری نظیر پیشرو، تحلیل‌گرانه، آینده‌نگرانه و تهاجمی به ترتیب بر توسعه‌ی عملکرد صنعت تأثیر می‌گذارند. همچنین، استراتژی‌های پیشرو، ریسکی و آینده‌نگرانه از اثرگذارترین استراتژی‌های نوآوری بر تنوع عملکرد هستند. نتایج این مطالعه پیشنهاد می‌کند که سیاست‌گذاران صنعت ساختمان و مدیران عالی شرکت‌ها بایستی استراتژی‌های نوآوری پیشرو و آینده‌نگرانه را بطور همزمان با چشم‌انداز صنعت و شرکت‌ها پیوند داده و زمینه را برای پیاده‌سازی آن‌ها در سراسر صنعت فراهم آورند.

واژگان کلیدی

استراتژی نوآوری، توسعه و تنوع عملکرد، صنعت ساختمان و مسکن، ایران.

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