

## Investigating the relationship between environmental innovation and strategic competitive advantage (Case study: Pars Oil Company)

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<b>Keywords:</b> <i>Process innovation, product innovation, competitive advantage</i>	<b>Abstract</b>
<b>Article Type:</b> Research Article	<b>Background and purpose:</b> Today, institutions compete in a competitive environment; the requirement to survive in such environments is to create a suitable and durable relationship with the surrounding environment to improve organizational performance and productivity. Of course, communicating with the external environment requires formulating a strategy and coordinating other departments to implement it; Therefore, this study examines the relationship between environmental innovation and strategic competitive advantage. <b>Methodology:</b> This research is applied and descriptive. The statistical population of this research is the employees of Pars Oil Company in Tehran province, whose number is about 2800 people. Using Morgan's table, the sample size was determined as 361. A simple random sampling method was used to select the sample size, and finally, 361 questionnaires were selected for analysis. <b>Findings:</b> Based on the results of the structural equation modeling test and the partial least squares method, process innovation and product innovation based on environmental protection have a positive and significant effect on the competitive advantage resulting from differentiation and low costs. <b>Conclusion:</b> The results show that organizational innovation impacts environmental strategies and gaining a competitive advantage, and environmental strategies also impact gaining a competitive advantage.
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*How to Cite:*

Darbani, S. (2021). Investigating the relationship between environmental innovation and strategic competitive advantage (case study: Pars Oil Company). *Journal of Innovation in Management and Organizational Behavior*, 1(3), 41-51.

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## **Introduction**

In recent years, competitive advantage has been at the center of competitive strategies, and many discussions have been raised about competitive advantage. However, it is challenging to provide a precise definition of competitive advantage. On the one hand, competitive advantage is considered to mean more than normal returns, and on the other hand, competitive advantage has been linked to capital market performance and expectations. However, the most common definition of competitive advantage in the field of competition strategy and in the context of value creation is manifested in whatever causes the income to increase more than the cost. The 21st century is associated with complex, dynamic, and changing organizations, and the rapid rate of technological changes, short product life cycles, and intense global competition have quickly transferred to the competitive environment of most companies. Meanwhile, one of the challenges facing most industries, regardless of its type, is gaining and maintaining a competitive advantage (Chan and Chan, 2004). One of the important ways to gain a competitive advantage is to use innovation. Innovation and doing new things and actions based on new ideas are one of the things that maybe no one has doubts about its principle. Innovation is a determining factor for the competitiveness of nations (OECD, 2007) and is one of the main factors underlying the international competitiveness of countries and their productivity (Ashim and Isaacson, 1997). It is at the core of output and productivity growth (Oslo Manual, 2005), a key driver of labor productivity growth, and a major source of social prosperity (Canadian Council of Academics, 2009). Innovation is also considered a key factor in industry dynamics in terms of composition and organization (Malaria, 2005). Innovation is a vital component to enhance productivity and is a determining factor for economic success (Kettles, 2003) and competitiveness of companies.

Porter et al. (2003) define innovation as the creation and commercialization of new knowledge and the introduction of new ways of doing work through which individuals and organizations change themselves and the environment. Innovation is not an isolated movement; it begins with an idea or an event. Jimenez et al. (2008) consider innovation to include the components of product innovation, technical design process, research and development, production management, and activities necessary for marketing new (improved) products/services, or selecting and developing a new product. Innovation can bring advantages to the organization. Processes related to product innovation and new product development, on the one hand, increase flexibility and, on the other hand, lead to a significant decrease in the duration of product delivery to the market (Mousavi, 2016). Environmental innovation (based on environmental conservation) refers to processes, equipment, products, technology, and management systems that are created to prevent or reduce environmental degradation (Kemp et al., 2002). In this regard, it is very important to innovate in the production of equipment and processes that, in addition to reducing the

company's costs, have less pollution for companies that deal more with environmental pollution, such as oil companies and similar companies such as petrochemicals. If such companies maintain it, it is considered a strategic competitive advantage for them; this research seeks to answer the basic question of how is the relationship between environmental innovation and competitive advantage in Pars oil company?

### **Methodology**

The current research is correlational, applied in terms of purpose, and descriptive-survey research in terms of nature and method. The population studied in the current research is the Pars Oil and Gas Company employees in Tehran province. The statistical population in this research is the employees of Pars Oil and Gas Company in Tehran province, whose number is about 2800 people, and using Morgan's table, the sample size was determined as 361. From the simple random sampling method (in this method, first, the total number of personnel of Pars Oil Company was estimated, and then the sample size was determined using Morgan's table. Then randomly, the members of the sample size were determined to respond to the questionnaire) in order to Selection of sample size was used. After distributing the questionnaire, finally, 361 questionnaires were collected for analysis.

### **Materials**

**1- Standard researcher-made questionnaire.** The questionnaire in this research is a standard questionnaire consisting of 12 items. Therefore, the questionnaire of this research includes subscales of product environmental innovation (items 1 to 3), process environmental innovation (items 4 to 6), the advantage of differentiation (items 7 to 9), and the advantage of low cost (items 10 to 12). Also, a five-point Likert scale (completely disagree = 1, disagree = 2, have no opinion = 3, agree = 4 and completely agree = 5) was used to score the items. Therefore, to check the hypotheses, we compare the obtained average with the number 3. In this research, Cronbach's alpha method was used to determine the reliability of the test. After distributing the questionnaire among 30 people, the reliability of the questionnaire was calculated using Cronbach's alpha method, the value of which is 0.887 for the whole questionnaire, which can be evaluated as good. In addition, the validity of this questionnaire was checked by calculating the CVI and CVR index, and the value of CVR and CVI for this number of participants is at least 0.33 and 0.79, respectively. In this study, the value of CVR for all indicators is higher than the minimum value (0.33). Also, CVI for all indicators is greater than the minimum value (0.79). By using SmartPLS software, confirmatory factor analysis (CFA), convergent validity, including calculation of average variance extracted (AVE), composite reliability (CR), and divergent validity were calculated.

## Results

The information collected from the subjects was analyzed by a researcher-made standard questionnaire using appropriate statistical tests, and the research hypotheses were tested. For this purpose, to describe and classify the data collected from the sample, Pearson's correlation test was first performed using descriptive statistics indicators and in the inferential statistics discussion. Then the normality test of the data was performed. Then, using SmartPLS version 2 software, the test of research hypotheses was analyzed, and after that, the relationships between variables and research hypotheses were investigated using structural equation modeling.

**Table 1: Frequency distribution of the statistical sample based on gender**

Gender	N	Percentage
Male	96	26.578
Female	265	73.422
Total	361	100.000

According to table 1, women make up 73% of the sample. This figure is 26.5% for men.

**Table 2: Age frequency distribution**

Age	N	Percentage
20-30	238	65.781
30-40	68	18.937
40-50	55	15.282
Total	361	100.000

As seen in the table above, the age range of 15% of the statistical sample is between 40 and 50 years, while 19% are between 30 and 40 years old and 66% are between 20 and 30 years old.

**Table 3: Distribution of frequency of education**

Education	N	Percentage
Master's degree	85	23.588
Bachelor's degree	155	42.857
Diploma	121	33.555
Total	361	100.000

The above table shows that most of the respondents have a bachelor's degree (43%), master's degree (23.5%), and diploma (33.5%).

**Table 4: Frequency distribution of work experience**

Work experience	N	Percentage
< 5	121	33.67
5-15	203	56.12
> 15	37	10.20
Total	361	100

According to the above table, most respondents have work experience between 5 and 15 years.

**Table 5: Descriptive index table of research variables**

Components	Mean	Standard deviation	Standard deviation
Competitive advantage of low cost	2.84	0.855	0.045
Competitive advantage of differentiation	3.02	0.913	0.048
Environmental Product Innovation	3.19	0.951	0.050
Environmental Process Innovation	3.15	0.998	0.053

The descriptive statistics of this research include central (mean) and dispersion (standard deviation and standard error) indicators, which are presented in Table 5.

Before using the statistical tests of the research, the normality test of the data should be done first. When checking the normality of the data, the null hypothesis based on the fact that the distribution of the data is normal is tested at the 5% error level. Therefore, if a larger significance value equal to 0.05 is obtained, there will be no reason to reject the null hypothesis. In other words, the data distribution will be normal. The assumption of normality of the data has been tested at the significance level of 5% with the Kolmogorov-Smirnov technique.

**Table 6: Data normality test**

Items	Results			
	Environmental product innovation	Environmental process innovation	Advantage of differentiation	The advantage of costs
N	361	361	361	361
Average	3.19	3.15	3.02	2.84
standard deviation	0.951	0.998	0.913	0.855
Kolmogorov-Smirnov	0.101	0.090	0.114	0.096
meaningful	0.000	0.000	0.000	0.000

Based on the results listed in Table 6, in all cases, a significant value of less than 0.05 has been obtained. Therefore, the distribution of measurement data is not normal. Therefore, SmartPLS software can be used.

**Table 7: Hypothesis test results**

Research hypotheses	Independent variable	Dependent variable	$\beta$	t-value	Result
H1	Product innovation based on environmental preservation	Competitive advantage from costs	0.387	7.081	Confirmed
H2	Process innovation based on environmental preservation	Competitive advantage from costs	0.240	4.164	Confirmed
H3	Product innovation based on environmental preservation	Competitive advantage from differentiation	0.394	6.979	Confirmed
H4	Process innovation based on environmental preservation (Iproc)	Competitive advantage from differentiation	0.387	6.788	Confirmed

As shown in Table 7, the strength of the relationship between product innovation based on environmental protection and competitive advantage resulting from low costs has been calculated as 0.387. The test statistic is also 7.081, which is greater than the critical value of t at the 1% error level (2.58), and shows that the observed correlation is significant. Therefore, with 99% certainty, product innovation based on environmental protection has a significant relationship with competitive advantage resulting from low costs.

Also, according to Table 7, the strength of the relationship between process innovation based on environmental protection and competitive advantage resulting from low costs has been calculated as 0.240. The test statistic is also 4.164, which is greater than the critical value of t at the 1% error level (2.58), and shows that the observed correlation is significant. Therefore, with 99% certainty, process innovation based on environmental protection has a significant relationship with competitive advantage resulting from low costs.

In addition, according to Table 7, the strength of the relationship between product innovation based on environmental protection and the competitive advantage resulting from differentiation has been calculated as 0.394. The test statistic is also 6.979, which is greater than the critical value of t at the 1% error level (2.58), and shows that the observed correlation is significant. Therefore, with 99% certainty,

product innovation based on environmental protection has a significant relationship with the competitive advantage resulting from differentiation.

Finally, as seen in Table 7, the strength of the relationship between process innovation based on environmental protection and the competitive advantage resulting from differentiation has been calculated as 0.387. The test statistic is also 6.788, which is greater than the critical value of  $t$  at the 1% error level (2.58), and shows that the observed correlation is significant. Therefore, with 99% certainty, process innovation based on environmental protection has a significant relationship with competitive advantage resulting from differentiation.

### **Discussion and Conclusion**

This research investigates the relationship between environmental innovation and strategic competitive advantage in Pars Oil Company.

The results of this research show that product and process environmental innovation positively affects competitive advantage, especially for companies such as oil and petrochemicals, where pollution is one of the main issues. So that one of the most important issues that differentiate products in the oil industry is attention to the environmental aspects of the products of this industry, which has a very wide variety of products. According to the results, another thing that can be mentioned about the oil company's products is the attention to the waste of the products and reusing them as recycled materials. Since the products made by the oil company have much harm to the environment if left in nature, it is essential to pay attention to the maximum recycling of these products. If most of the oil company's products can be recycled, the losses caused by releasing them into nature will be greatly reduced. Indeed, due to the widespread use of environmentally friendly products, producing such products can create an excellent distinction compared to competitors. From the large sales of these types of products, production costs can be reduced, and the profitability of the company can be guaranteed.

The findings indicate that product innovation based on environmental protection has a significant relationship with competitive advantage resulting from low costs. In fact, the results showed that product innovation and competitive advantage resulting from low cost are more important in environmental behavior in relation to protection technologies. In other words, the more protective technologies associated with product illumination and the competitive advantage of low costs, the higher the acceptance and use of technologies in protecting the environment will be. This is in line with the research results of Mortazavi et al. (2016) and Zhou et al. (2009).

Based on the findings obtained in this research, the process innovation based on environmental protection has a significant relationship with the competitive advantage resulting from low costs. In fact, the results showed that the innovation of the process and the competitive advantage of low cost are more important in the emergence of

environmental protection behavior. Therefore, process innovation provides a tool to maintain and improve quality and save costs (Jimenez et al., 2008) and includes adopting new or improved production, distribution, or service delivery methods that have an interactive effect on environmental protection.

According to the results, the process innovation to what extent the organization uses new technologies to preserve the environment and puts new work methods to the testing stage. These changes are considered to reduce unit production or delivery costs, increase quality or produce and provide new and improved products to protect the environment (Lopez Nicholas and Moreno Kordan, 2011). In addition, the process innovation strategy seeks to reduce costs and tries to achieve more market share by reducing costs compared to competing companies. Therefore, the organization is trying to increase efficiency without fear. Also, in implementing this strategy, maintaining stability and sustainability is prioritized, and the company does not think about innovation and risk-taking; Rather, it seeks to supply products and services at competitive prices. Of course, it does not reduce the quality of the products and allows a reasonable profit (Liao, 2016). A company that uses this management method must refrain from standing up to competing companies with high-quality products at a high price because customers will find cheaper products (Hajipour and Kord, 2011).

In addition to these findings, product innovation based on environmental protection has a significant relationship with competitive advantage resulting from differentiation. In fact, the results showed that product innovation, along with the competitive advantage resulting from differentiation, is useful and effective in the emergence of environmental protection behavior. The confirmation of this hypothesis is consistent with the results of Jafari Postaki et al. (2016), and Abrishamkar and Abdulahi (2015).

According to the findings of the present research and the consistent results and looking at human innovations in the matter of generating ideas and ultimately producing innovative products and behind the scenes of product innovation, it was concluded that as the final consumer of the organization's products, the customer should use the organization's products to meet his personal needs. Research shows that if a new product wants to be successful in the market, it must respond to customers' needs first (Hippel and Katz, 2002). On the other hand, customers know their wants and needs for the product. 2. Most importantly, customers' needs and problems can be the main sources of innovative ideas (Rase et al., 2015). As a result, every organization should consider the ideas and opinions of customers in the innovation process to produce innovative product ideas. Most theoretical and empirical studies show that customer cooperation is a valuable way to achieve innovation and economic success. The benefits of this collaboration include creating new product ideas, increased effectiveness in product development, reduced time to market, and increased new product success rates (Campbell and Cooper, 1999). Also,



concerning product innovation, human power plays a very important role in providing an innovative product, which attention to it and its proper use guarantee the success of any organization. One of the symbols of the proper use of human resources is the growth of employees' performance. In general, it is one of the key indicators in company performance growth and achieving innovation (Organization for Economic Cooperation and Development, 2010).

Based on the findings, process innovation based on environmental protection has a significant relationship with competitive advantage resulting from differentiation. In fact, the results showed that process innovation, along with the competitive advantage resulting from differentiation, is useful and effective in the emergence of environmental protection behavior. The confirmation of this hypothesis is in line with the results of Eskandari et al.'s research (2011). The results of this finding showed that to achieve a competitive advantage, an organization must pay attention to its external position and internal capabilities. Therefore, competitive advantage is a factor, or a combination of factors making an organization more successful than other organizations in a competitive environment, and competitors cannot easily imitate it (Feurerer, 1995). The organization should think of internal capabilities and competitive position in the market not separately but mutually as sources of achieving competitive advantage and formulating marketing strategy (Holly et al., 2003). Also, considering the organization's external and internal position, it originates from the organization's resources. Due to the ability to use these resources correctly, capabilities are created that use these capabilities to bring competitive advantages to the organization (Feurerer, 1995).

Study limits include the financial problems in the research, the lack of proper cooperation of some participants and managers, and the time-consuming process of distributing the questionnaire due to many questionnaires.

### **Ethics**

This research observed ethical standards, including obtaining informed consent and ensuring privacy and confidentiality. Also, while completing the questionnaires while emphasizing completing all the questions, the participants were free to withdraw from the research at any time and provide individual information. They were assured that the information would remain confidential, which was strictly adhered to.

### **Acknowledgement**

The cooperation of all participants in the research is thanked and appreciated.

### **Conflict of Interest**

According to the authors, this article has no financial sponsor or conflict of interest.

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