Original Article

Measuring the impact of drivers of innovation strategies on the company's innovative activities: Tidd and Bessant model expansion (2009)

Seyed Farhad Hosseini[1], Meysam Tarighati Maram[2]*

[1]Department of Business Management and Accounting, Faculty of Management and Accounting, Razi University, Kermanshah, Iran. [2]Department of Executive Management, Faculty of Literature and Humanities, Islamic Azad University, Kermanshah branch, Kermanshah, Iran.

Correspondence: Maysam Tariqati Maram, Department of Executive Management, Faculty of Literature and Humanities, Islamic Azad University, Kermanshah branch, Kermanshah, Iran. mtarighati2@gmail.com

ABSTRACT

Innovation and the its effects on various aspects of life have led to the emergence of some fundamental changes in the relations between human societies and organizations, this phenomenon has affected human desires with an impressive speed and created new needs. The current research seeks to expand science and knowledge in the field of drivers of innovation strategies and their impact, therefore, in terms of goal-based research method, it is part of developmental research and in terms of information gathering method, it is descriptive-survey type and considering the investigation of the relationship between variables, it is correlational research. The statistical population of this research was 150 employees and managers of Abfen and Dasht Zahab tunnel companies. This population was sampled by a simple random method and the sample size was 98 people based on Cochran's formula; Standard questionnaires were used to collect data, and their validity was confirmed by professors and experts, and the reliability of the questionnaire was calculated and confirmed through Cronbach's alpha; To test the hypotheses of the research, the Kolmogorov Smirnov test, the structural equation test and the Friedman ranking test were used with the help of SPSS and AMOS software. The results of the test indicate that the drivers of innovation strategies are effective in innovative activities, and in the ranking it was also found that the most important driver of innovation strategy in internal factors, the factor of market-based activities, has the greatest effect (0.85) and The most important driver in the category of external factors is government support (0.78). The lowest impact is related to the variable factor of cooperation networking (0.57).

Keywords: Innovation, Drivers of Innovation Strategy, Internal Factors, External Factors, Tidd and Bessant Model.

Introduction

The competitiveness of emerging countries, basically due to lower labor costs, is combined with a greater penetration capacity in the product market of other advanced countries, mainly based on a more efficient production and marketing structure (Maia et al., 2022). In this framework, innovation, be it process, product or organization, is a strategic factor to reduce the company's production costs (MATOFI and TAJDINI, 2010). In the water and tunneling industry, innovation is one of the most important factors for a company to challenge the main competitors in the national and international markets (SAYADI et al., 2005).

Innovation is a source of value creation for companies and plays a key role in national competitiveness and productivity. Innovation creates consistent value through the introduction of new technologies and the exploitation of new markets. Innovations can be identified in four types of product, process, marketing and organizational innovation (ORTIGUEIRA SANCHEZ et al., 2022) Europe 2020 included five main goals, one of which (the second goal) was related to innovation (Hervas Oliver et al, 2021) therefore investment in research and development is a fundamental factor driving innovation, productivity and economic growth; Therefore, internal and external factors are effective in the company's innovation (SENOBAR et al., 2011; SATTARI et al., 2021; Moreira et al., 2012); Among the internal factors, attention has been focused on company size, entrepreneurial knowledge and company

experience, as well as some organizational characteristics related to the relationship between management and property and the structure of decision-making processes.

Company innovation may also depend on some external factors (CAPITANIO et al., 2009).

Innovation is known as a new way to create value and boils like blood in the veins of organizations that are looking at the growth, survival and development of their products and services; In fact, innovation plays a vital role in gaining competitive advantage and long-term success of companies (MOSTAFAVI, 2020; RAHMAN SERESHT, 2008). Rapid global changes that are the result of changes in people's knowledge, vision, and attitude, and extensive and comprehensive changes in technology, make organizations It is focused on innovation, because they will be able to survive only when they develop the ability to adapt to changes and adapt to the environment.

Since predicting market changes is difficult and complex, company managers should continuously try to produce innovation and quickly meet the needs of customers and attract them (Walter et al., 2021). By adopting innovation strategies, reducing and eliminating unnecessary activities, allocating and concentrating organization resources, and improving the features and activities that are the real desire of customers, we should provide the value expected by customers and as a result, increase our market share. (TADAYON, 2012). Various researches have emphasized the importance of innovation strategies as a mediator between organizational learning and performance improvement (BEN REJEB et al., 2022); According to the global innovation index, the Islamic Republic of Iran has the fastest growth in innovation performance and has become the second most innovative country in the Central and South Asian region and is in the 53rd place in the world, which shows the increasing attention to innovation strategies.

Kermanshah is a vast province in the west of Iran with an area of 25,000 square kilometers. It is considered one of the most important provinces in terms of agriculture and natural resources. Agriculture is the axis of sustainable development of Kermanshah and one of the important parts of this border and four-season province, which in addition to providing food needs within the province, also provides and guarantees a large part of the needs of the country. In this regard, the tropical project is one of the largest national projects of the country and one of the tropical super projects of the country is the tropical project in the border town of SARPOL ZAHAB. Also, the water transfer tunnel of DASHT ZAHAB is one of the water projects in the west of the country, the length of which is more than 48 km (SAYADI et al., 2005), which was carried out in order to complete the tropical project.

Due to the importance of innovation in today's world, most of the researches have paid attention to it, but less research has investigated the drivers of innovation, so this research aims to identify the factors affecting innovation strategies from the point of view of the managers and employees of ABFAN and DASHT ZAHAB Tunnel companies identify the strategies to strengthen innovation and the degree of importance of each of those components.

Theoretical foundations of research

Drivers of innovation strategy

A generally accepted definition of innovation in the fourth edition of the Oslo Manual is as follows (ORTIGUEIRA SANCHEZ et al., 2022): "Innovation is a new or improved product or process (or combination thereof) that can be Attention is different from previous products or processes of the unit; innovation is often thought to occur randomly, a flow that comes with one wave and goes with another. are considered; recent research focuses on identifying and studying the characteristics of companies and driving factors of innovation.

Past research on the impact of internal organizational factors such as strategy (FERREIA et al., 2015), processes, management and organization (Maia et al., 2022), learning, cooperation network and market-related activities (SENOBAR et al., 2011; Moreira et al., 2012) and factors outside the organization such as government support (Hervas Oliver et al. 2021) and competitive pressure (DZIURSKI & SOPINSKA, 2020) have been emphasized; in this research, among the variables that are effective on innovation, according to the Teed and Besant (2009) model The factors of strategy, process, management and organization, learning, creation of cooperation network and activities related to the market (Moreira et al., 2012) were selected as internal factors (Ferreira et al., 2012) and the variables of government support and competitive pressure were also selected as external factors.

In the following, these stimuli have been examined:

Strategy

Several researchers have studied strategic innovation. When studying strategic innovation, researchers consider innovation simultaneously as market-oriented and strategic. Researchers consider strategy as a source of inspiration for innovation. To meet customer needs, companies deploy internal resources and encourage new ideas. Some studies indicate that new ideas, which are necessary for the innovative capacities of the company, depend on the creation and production of knowledge. The practical results of these factors will be to encourage employees in innovation processes as a stimulus for more innovations (Maia et al., 2022; Ferreira et al., 2012).

Processes

Various studies consider innovation as the sum of innovative performance in related stages and sequential processes. From a systemic point of view, innovation is described as a process that connects diverse resources and capacities. The B&T model describes innovation as a process that requires reorganization, improvement of products and services, and production and

distribution tools. Therefore, all companies try to organize and manage processes related to innovation to identify and create optimal solutions. The innovation process includes innovation in products, meeting specific and different needs of consumers and obtaining specific technology (RAHMAN SERESHT and Hashemi, 2008).

Organization

Organization includes the introduction of new methods for managing the company's internal and external relations; Innovation in organizational environments involves new methods, redistributing responsibility and making decisions about division of labor and organization into new activities. The internal capacity of the organization, including technology, has important consequences for the innovation of the company. The program of knowledge production and culture dissemination among employees enables the company to solve problems and create synergy (RAJABI et al., 2021).

Learning

Management theories emphasize the vital relationship between innovation and learning in achieving and maintaining competitiveness. Reports indicate that learning dominates all innovation-based activities and increases the flexibility of companies regarding innovation processes. In fact, innovation occurs when employees share their knowledge with the company (Arora and GAMBARDEL, 1994). Sharing experiences, using external information and collective implementation of formal processes expand knowledge storage and thus enable innovation. Other authors consider investing in internal research and development, outsourcing, or being involved in research-based networks as other factors that increase innovation capacity and drive it.

Cooperation networking

The resource-based perspective in justifying the cooperation of firms acknowledges that cooperation between firms is necessary to use complementary resources because interdependence is the most common motivation and driver for their relationships. The cooperation and activity of companies in the field of creating networks represents an important factor in innovation (Ahuja 2000).

Market-based activities

The ability to successfully produce a variety of new products and services and find new ways to communicate and distribute is vital for many organizations, supporting marketing activities is a key factor for companies to keep them in tune with the market, environmental changes, new technologies and forecasting. Competitors' actions adapt (Moreira et al., 2012).

Government support

By helping the growth and development of innovation capability in enterprises, governments can provide the basis for the growth and profitability of these enterprises and as a result the economic development of the country. Usually, governments help to improve the level of innovation capability by "strengthening motivation" and "creating opportunities" (KARAMIPOUR et al., 2015; Maia et al., 2022). Also, the government supports research and development and allocates funds for this matter. It can help the development of innovation (SATTARI et al., 2021; Hervas Oliver et al., 2021).

Competitive pressure

Today's rapidly changing market, advanced technology, and accelerated cycle of innovation have created a very competitive and chaotic environment for companies (DZIURSKI & SOPINSKA, 2020). In order to survive in such conditions, it is necessary to innovate in companies that want to develop and maintain a competitive advantage or to enter new markets, to be promoted (Maia et al., 2022); The innovation performance of the company is the result of the innovative activities of the organization in the field of improving the processes, products and services provided. Considering the competitive pressure prevailing in the market, measuring the innovative performance of the organization has become particularly important (AZIZI and AZMA, 2017).

Materials and Methods

In this research, the role of drivers of innovation strategy in innovative activities in two companies, ABFAN and DASHT ZAHAB, was examined and analyzed; The current research seeks to expand science and knowledge in the field of organizational innovation strategies, therefore, in terms of dividing the research method based on the goal, it is part of developmental research, and in terms of the method of collecting information, it is descriptive and survey type, and according to the investigation of the relationship Between the variables, the research is correlation. For Examining and analyzing the variables related to the research, the standard questionnaires of Tidd and Bessant(2009), Moreira et al. (2012), Hervas Oliver et al. (2021), DZIURSKI & SOPINSKA, (2020).

Therefore, the formal and content validity of the final questionnaire was confirmed by examining the opinions of professors and experts in the field of business management. Also, the internal consistency of the tools used was evaluated using Cronbach's alpha coefficient which is reported in table number 1. As can be seen, Cronbach's alpha is 0.76, which is a good value.

Table 1. The distribution of questions and the reliability of research variables

Variables	Questions	Cronbach's Alpha
Strategy	1 - 8	0.72
Process	9 - 16	0.88
Organization	17 - 24	0.73
Learning	25 - 32	0.87
Network	32 - 40	0.72
Market-based activity	41 - 45	0.76
Government support	46 - 49	0.82
Competitive Stress	50-54	0.79
Overall Questionnaire	54	0.76

Also, the statistical population of this research was the employees and managers of ABFAN and DASHT ZAHAB Tunnel with 150 people, and according to Cochran's formula, the sample size was 98 people. According to table number (2), at first, the drivers of the company's innovation strategy were reviewed in the past researches and the factors that had the most repetition were selected as the main drivers. According to the previous researches, two categories of internal and external factors are effective on innovation, the internal factors affecting the company's innovation strategy were extracted from Tidd and Bessant 's model (2009) and the market activities factor of Moreira et al. (2012), which were combined with other drivers of government support and competitive pressure as external factors mentioned in previous research. The conceptual model of the research is shown in figure -1.

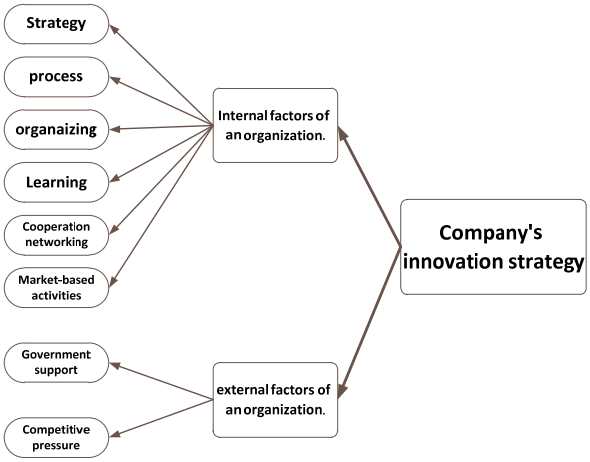

Figure 1. Conceptual model of innovation drivers research (adapted from studies by Tidd and Bessant, 2009; Moura et al., 2012; Heras-Saizarbitoria et al., 2021; Zorski and Supińska, 2020).

Table2. Mentioned Innovations Stimulators in pervious researches

Organizational strategy	Process	Human capital	Organisation and management style	capacity of technology	Environmental turbulence	Competitive space	Market-based activity	New Science and Knowledge (Learning)	R&D	Collaboration	Researchers
		*		*						*	Artigas Sanchez et al, 2022.
								*	*	*	Hervase Aliyor and colleagues, 2021
*			*				*	*	*	*	Jenahi and colleagues, 2021
					*	*	*	*	*		Zeroski and Supinska, 2020
*	*	*	*					*		*	Ferrera and colleagues, 2015
				*			*		*		Mohreera and colleagues, 2012
							*		*		Captain and colleagues, 2009

Results

Inferential statistics using SPSS and Amos statistical software have been used to analyze the findings. To test the research hypotheses, the Kolmogorov Smirnov test was used to check the normality of the variables; the binomial test and the Friedman test were used for ranking.

Sample size adequacy test

In conducting factor analysis, first, it must be ensured that the available data can be used for analysis. To ensure this, the KMO index is used. Using this test, it is possible to ensure the adequacy of sampling. The KMO criterion for sampling adequacy and Bartlett's test for the appropriateness of the correlation between observations show the use of factor analysis. Considering the high value of the KMO index and the significance of Bartlett's test, the number of samples is sufficient and suitable for factor analysis.

Table 3. The "KMO" index and "Bartlett

statistics	Condition
KMO index	0.901
Bartle Test	1601.164
df	97
p-value	0.000

Kolmogorov-Smirnov test

Using the Kolmogorov Smirnov test, the assumption of normality of the research variables is checked. If the significance level of the test is greater than 0.05, the hypothesis H0 is accepted and it is concluded that the distribution is normal; As can be seen in Table 4, the significance level for all variables is greater than 5%, therefore, it can be concluded with 95% confidence that all research variables have a normal distribution. As an example: the strategy variable has a normal distribution according to the Kolmogorov-Smirnov test because the significance level obtained from this test is equal to 0.328 and this value is greater than 0.05.

Table 4: Results of the Kolmogorov-Smirnov test for assessing the normality of questionnaire variables.

variable	Count	Mean	Standard Deviation	Z-Score	sig
Strategy	98	4.036	1.217	0.949	0.328
Process	98	3.97	1.441	0.774	0.587
Organization	98	4.166	1.231	1.476	0.260
Learning	98	4.141	1.659	1.342	0.055
Networking	98	3.835	1.789	1.120	0.163
Market-based activity	98	4.266	.939	1.532	0.180
Government support	98	4.272	1.021	1.312	0.064
Competitive pressure	98	4.263	1.171	1.291	0.071

Test of research hypotheses

In the table below, the average of the research variables is given, and the average of all the variables is more than 3. Therefore, it can be concluded that most of the respondents have marked the completely agree and agree option, for example, the average of the strategy factor is 4.036 more than the value of test 3, and this is the first step to check the research hypothesis.

Table 5. Average innovation incentives

	Count	Mean	Standard Deviation	Standard Error of Mean
Hypothesis 1:Strategy	98	4.036	1.217	0.1229
Hypothesis 2: Process	98	3.97	1.441	0.1456
Hypothesis 3:Management and Organization	98	4.166	1.231	0.16760
Hypothesis 4:Learning	98	4.141	1.659	0.16760
Hypothesis 5 :Collaboration Network	98	3.835	1.789	0.0918
Hypothesis 6: Market Activity	98	4.266	0.939	0.1528
Hypothesis 7: Government Support	98	4.272	1.021	0.1426
Hypothesis 8: Competitive Pressure	98	4.263	1.171	0.1017

Confirmatory factor analysis test of innovation strategy drivers

In the present research, second-order confirmatory factor analysis was used with the help of Amos Structural Equations software to identify the effectiveness and confirm the components. Figure 2 shows the structural model of the research with a non-standard coefficient. In this model, all the data, even the outliers, have been included in the model, and this model has a standard error rate.

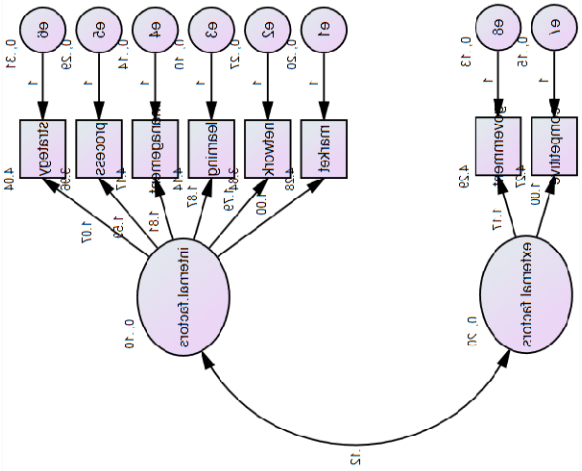

Figure 2. second-order confirmatory factor analysis model of research structure with non-standard coefficients

In the following, the structural model of the research is shown with the standard coefficient.

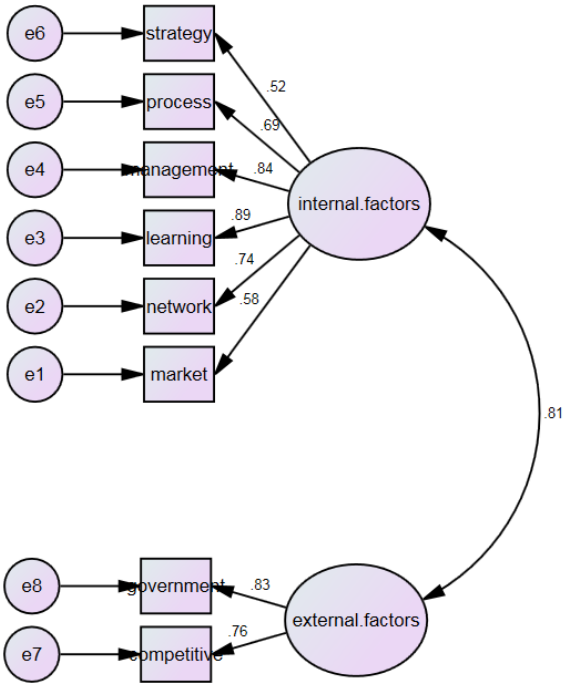

Figure 3. Structural model of research with standard coefficient (initial model)

Figure 3 shows the structural model of the research with the standard coefficient; The most important driver of innovation strategy in internal factors is learning and investment in research and development, and the most important driver in the category of external factors is government support.

According to table number (6), the fit indices of the model are given; The chi-square ratio of the structural model to the degree of freedom is 1.998 and is appropriate.

Comparative fit indices are all greater than 90% and suitable. The RMSEA index is smaller than 5% and is appropriate, and the economic indicators are all above 50% and are appropriate, so there is no need to modify the model, and the designed model was included as the final model of the drivers of the company's innovation strategy.

Table 6: Indices of structural model fit

Grouping Indexes	Abbreviation	value of the model	Acceptable feces.
Absolute fit indices	GFI	0.904	0.9>
	RMR	0.024	<0.05
Comparative fit indices (CFIs)	TLI	0.936	0.9>
	NFI	0.989	0.9>
	CFI	0.903	0.9>
	IFI	0.916	0.9>
Economic fitness indicators	PNFI	0.513	>0.5
	PCFI	.0599	>0.5
	RMSEA	0..34	<5%
The ratio of chi-squared to degrees of freedom.	CMIN/DF	1.998	<3

confirmatory factor analysis test of innovation strategy drivers

The results of the factor loadings in the standard estimation mode showed that all the factor loadings between the items and components are greater than 0.4, which indicates the strength of their relationship, also the factor loadings of each component showed that the values are quite favorable and the t values also indicate the confirmation of their relationship. with innovative strategies. In general, all hypotheses related to the drivers of organizational innovation strategies were accepted at the 95% confidence level; Also, the most important driver is the factor of market-based activities, which has the highest factor load (0.85) and the factor of networking and cooperation with other companies is the least effective.

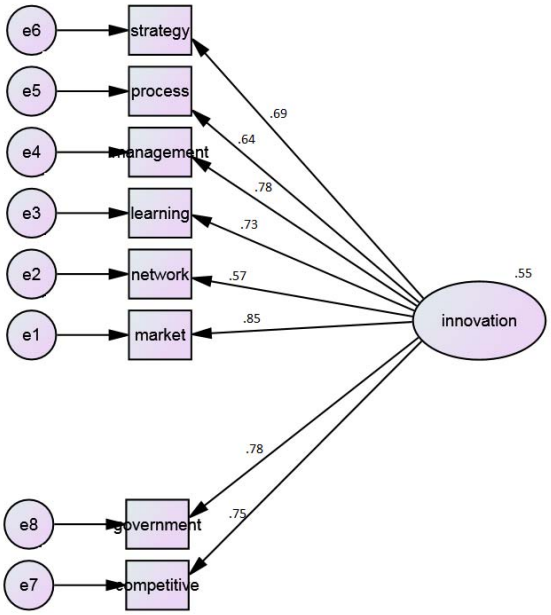

Figure 4. Structural model of research with standard coefficient (final model)

According to table number (7), the chi-square ratio of the structural model to the degree of freedom is equal to 1.842 and is suitable. The comparative fit indices are all more than 90% and appropriate. The RMSEA index is less than 5% and is suitable. Economic indicators are all above 50% and are appropriate.

Table 7: Indices of structural model fit

General model	X^2 /df	RMSEA	NFI	CFI	IFI	RFI	Pratio	PNFI	PCFI
Acceptable level	3<	0.05 <	0.9 >	0.9 >	0.9 >	0.9 >	0.5 >	0.5 >	0.5 >
Calculated values	1.842	0.044	0.920	0.938	0.949	0.921	0.600	0.523	0.608

4-6- Friedman's test

Also, to rank innovation strategy drivers, Friedman's non-parametric test was used as follows.

Table 8. Friedman test results

Resources	The average of the data	The average rating.	rating
strategy	4.036	5.11	Sixth
processes	3.97	4.51	Seventh
management and organization	4.161	6.49	Third
learning	4.141	5.29	Fifth
collaboration network	3.835	4.23	Eighth
market-based activity	4.266	7.26	First
government support	4.272	6.78	Second
competitive pressure	4.263	5.52	Fourth

Table 9: Friedman test results

"variable	Count	Statistic test	df	sig
"Innovation strategy drivers"	98	88.463	4	0.000

According to this value of chi square (88/463) is statistically significant at the level of P>5% and hypothesis H1 is accepted with 95% confidence, that is, the mean and rank of the drivers of the company's innovation strategy are different. Based on the information in table number (7), the average ratings of each stimulus are given, which are respectively: market-based activity variable with an average of (4.266), government support with an average of (4.272), management and organization variable with an average of (4.166), competitive pressure variable with an average of (4.263), learning with an average of (4.141), strategy variable with an average of (4.036), processes with an average of (3.97) and cooperation networking variable with an average of (3.835).

Discussion and Conclusion

The purpose of this research is to investigate the effect of innovation strategy drivers on the company's innovative activities, for this purpose, eight hypotheses were tested. In the first hypothesis, the effect of strategy on employees' views on innovative activities was investigated, which was accepted at the 95% confidence level. The hypothesis was based on the results of research by ZAND and FARAJOLLAH, 2015; Maia et al., 2022; Ferreira et al., 2015 and JENAHI et al., 2021 are consistent, which indicates that strategy is one of the effective indicators and drivers in measuring innovation capacity.

The second hypothesis emphasized the influence of process stimulator on innovative activities; The hypothesis with the results of research by ZAND and FARAJOLLAH, 2015; BASHIR BABAIM, 2015 and Ferreira et al., 2015 are consistent, which indicates that the success of the company depends on thinking correctly and executing correctly, one of the most important reasons can be the hiddenness of the company's process from the eyes of competitors.

In the third hypothesis, the influence of organization on innovative activities was accepted, which is consistent with the research results of Maia et al., 2022 and JENAHI et al., 2021, which states that during the research, the manager can determine the amount and content of people's participation in decision-making in an orderly manner. that it is in accordance with the real conditions and experiences in the work environment, and in fact, in order to apply participatory management, contingent organization is needed; Also, the fourth hypothesis emphasized the impact of learning on innovative activities, which is based on the results of the research of MATOOFI et al., 2010; TAGHVA et al., 2016; DZIURSKI & SOPINSKA, (2020), and Hervas-Oliver et al., 2021 are consistent, which shows the positive and significant effects of commitment to learning on innovation; The fifth hypothesis also examined the effect of networking on innovative activities, which is consistent with the research results, which indicate that the success of a company does not depend only on its internal activities, and that business partners also play a role in the success or failure of a company.

In the sixth hypothesis, the effect of market-based activities on innovative activities was accepted, which is based on the results of Hosseini's research, 2015; Capitano et al., 2009 and JENAHI et al., 2021 are aligned; The seventh hypothesis emphasized the influence of the government support factor and the ninth hypothesis emphasized the influence of the competitive pressure factor, which is consistent with the previous research results of Maia et al., 2022; DZIURSKI & SOPINSKA, 2020 and JENAHI et al., 2021 are consistent.

In the following, suggestions are given to the managers of ABFAN and DASHT ZAHAB Tunnel and other companies that put innovation at the top of their work:

- Innovation is a determining factor in the development of the company; therefore, they should develop mechanisms for fostering innovation and systematic analysis of new technological developments and their effects on their position and position in the market.

- The most important driver of innovation strategy is market-based activity, so companies should pay special attention to customer needs and changes in the tastes of institutional and household customers in order to succeed.
- The most important driver of the innovation strategy in terms of external factors is the material and spiritual support of the government, and the government can take steps in this direction by participating in the new plan and encouraging the companies financially and spiritually.
- Adopting innovative strategies according to the competitors' situation not only helps to improve performance but also plays an important role in future success.
- The least impact belongs to the cooperation foundation network, so Iranian companies should turn to cooperation with each other, especially cooperation with scientific institutions of the country such as universities and other research centers of the country, and create a strong cooperation network, because success in the field of innovation alone is difficult and difficult.

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