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ROLE OF SPECIALIZED NETWORKS ON PRODUCT INNOVATION IN HI-TECH INDUSTRIES

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ABSTRACT

The aim of this study is to identify the role of specialized network on product innovation in hi-tech industries in addition to promote studies related to the field of network and innovation, the status and impact of different variables of specialized networks and their impact on product innovation to be determined by this approach. Hence, in the present study, the impact of specialized networks dimensions - including research and development (R & D) and market research - on product innovation has been identified by considering factor of "trust" as a moderator in the organization existing in the hi-tech industries. Statistical population of the study includes of 350 employees, experts, senior executive managers in the organization existing in hi-tech industries that 162 persons were selected by Cochran sampling. The purpose of this research is functional and has been conducted by correlation. In the present research, a Likert Scale questionnaire was used to collect data. The analysis of research data has been done using SPSS 19 software and Smart PLS software. The research findings confirm the significant impact of specialized network on product innovation in hi-tech industries but the moderator role of trust variable and its impact is not confirmed.

Keywords: *Network, Specialized Network, Research and Development, Market Researches, Trust, Innovation, Product Innovation.*

INTRODUCTION

Today the key feature of the business environment is rapid and deconstructive changes. Industrial and service agencies are interacting with the competitive environment that complexity, dynamism and unpredictability are its main features. Due to the rapid technological changes and intensified increasing competition, economic context of the business environment have had major developments. A short life cycle of new products, the products with the same platform but with different and diverse performances and capabilities, supply of new generation of hi-tech products and services continuously and uninterruptedly and so on indicate rapid and deconstructive changes.

Porter(2001) facing with this persistent and widespread changes states that agencies and companies must simultaneously be able to create and commercialize a stream of new products and processes that expand the technology area.

Since issue of the role of specialized networks on product innovation despite its growing importance in industries and organizations has not been studied a lot in Iran, it can be a strategy

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for other students and faculty members to study all its aspects by investigating it more detailed. So they can be a pioneer in this field and use synergistic capabilities in specialized networks of product with the use of this importance and thus targeted benefit from the knowledge entrepreneurship can be realized through this way.

Today the use of knowledge and expertise of any of specialist is significantly important. But when this expertise is gathered within a team of specialists with determined and specific expertise, it can lead to synergy, progressive development of knowledge, and ultimately innovation and creativity. Various work projects that require different expertise confirms the need to create networking.

Given the importance and abundant use of the concept of innovation, and applying it within organizations, especially new and hi-tech organizations or industries, can be said that processing to this issue had been always considered by researchers. However, in recent years, various researches have been conducted on the factors influencing innovation, including factors such as networking and role of the network, but these studies have focused particularly and exclusively on the relationship between innovation and social network, human network, and inter-organizational networks and so on. But fewer studies have yet emphasized on the relationship between product innovation and specialized networks. This study intends to proceed to the role of specialized networks on product innovation by considering the moderator variable of trust in hi-tech industries and studies and examines the factors affecting it.

Definition of concepts

Specialized Network: specialized networks are networks such as focus, joint and risk-taking investments in specialized areas of market, technical, engineering, and development and so on, which includes joint and inter-company investment of stock ownership laws. These networks are more focused on how to create and exchange knowledge, and internal knowledge is important in networking ability of the companies(Pittaway et al, 2004).

Research and Development: is a creative work which is regularly done to increase the storage of scientific and technical knowledge, as well as using this knowledge in the invention and design of new usages (Freeman, 1974).

Market Researches: Marketing research is a key to the evolution of successful marketing strategies and programmes. It is an important tool to study buyer behavior, changes in consumer lifestyles and consumption patterns, brand loyalty and forecast market changes. Marketing research is systematic problem analysis, model building and fact finding for the purposes of important decision making and control in the marketing of goods and services (Kotler, 1967).

Trust: a person is facing with cognitive outcomes in trust and he depends on the other at his disposal to feel safe. Also he has no not fear because of the things that are not done as he desires but he feels relative safety and comfort in this term (Saunders et al, 2003).

Product innovation: Product innovation means the introduction of a product or service that is new or has significant improvement in terms of its conscious features or usages. This innovation includes significant improvements in technical characteristics, constituent materials and components, software binding to it, user convenience, or other applied characteristics of it (Oslo, 2005).

Research empirical background

Summary of domestic and foreign investigations with obtained results have been brought in the Table below:

Table 1: Summary of reviewed papers

Row	Author Name / publication year	Purpose	Research methodology	Conclusion
1	Watson, 2007	Investigate the relationship between networking and the company's performance	Quantitative	Networking has significantly positive relationship with survival and growth of company.
2	Segarra et al,2008	Investigate the relationship between company decisions based on innovative activities and its obstacles	Quantitative	Cost barriers and knowledge barriers have been presented as the most important barriers of innovation that have had the greatest influence on the process of innovation.
3	Bakan,Yildiz,2009	Investigate strategies of innovation and barriers of innovation	Quantitative	Successful utilization of new ideas, whether in the form of new products and services or new business processes and marketing methods that can give required competitive power to the companies.
4	Zali et al,2012	Investigate the effectiveness entrepreneurs networks size on innovation	Quantitative	The overall size of networks has a positive impact on innovation of the company, and the impact of social networks on innovation is moderated by role pattern to the negative side.
5	Holzl,Janger,2014	Investigate different perceptions of innovative and non-innovative companies from barriers of innovation	Quantitative	As much as the distance from the frontier of technology is increased, the share of innovators is declined and increases the share of obstacles related to innovation.
6	Talebi, 2006	Explanation and determination of gradual and radical innovations	Library	The emergence of radical and gradual innovations requires networks with different densities level.
7	Fakoor et al, 2009	Study motivational and inhibiting factors of innovation	Semi-structured - Library	Meeting needs of customers and market and enhancing the competition of the market product specifications are the first and second motivational factor for innovation.
8	Neghabi et al., 2012	Investigate the relationship between the behavior of networking and	Quantitative	Social skills such as networking behavior help persons to find better access to resources, information and legitimacy in their network.

		entrepreneurial behavior		

Reviewing the literature and articles on specialized networks revealed that variables of specialized network have various types including outsourcing, research and development, experience, size, size of market, market researches and so on. Its two important components include: factors relating to the **market and market researches** (Hanna and Walsh (2002), Parker and Ericolech (2013), Hale et al(1996), and **Research & Development** of Hanna and Walsh (2002), Salman and Saives (2005), Sandberg (2015). Also actual conditions of the studied industry existing in hitech industries and the existence of departments and specialized networks related to Market researches and Research & Development networks also confirms choosing these two components of specialized networks.

In this research, product innovation component has been selected according to studies such as Coles et al. (2003), that have examined product development, and the relationships between people in the defense industries, Najafian and Kelabi (2014) who argue that most studies focus on the field of innovation and network related to product innovation, and considering the conditions and being quantifiable of product innovation of case study in hi-tech industries.

Moderator factor of trust has been considered according to the conditions of environment and the studied industry that has specific and defined relationship in this industry, as well as according to the studies, such as Ojasaloo (2008), Pittaway et al(2004), Najafi and Kelabi (2014).

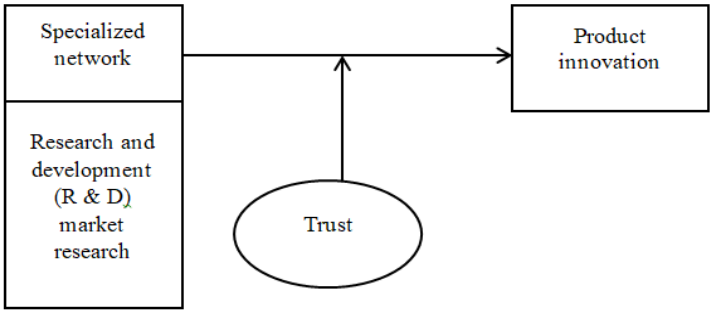

Figure 1: Research Conceptual Model

METHODOLOGY

The present study is functional in terms of purpose, and in terms of method to conduct the research is quantatitive. Statistical population in this research is consisted of experts, senior and executive managers and specialists of the companies working in the field of hi-tech industries with innovations, and is 350 persons.

Experts: Members of organizations that have at least a bachelor's degree (BA/BS) or have work experience related to the occupational status for at least 5 years.

Managers: members of organizations who are usually located in the middle and upper ranks of the organizational structure.

Specialists: prominent and efficient people that their effectiveness on Production and development of science and technology and culture-making and organization management is visible due to their genius, education or experiences.

Statistical sample of the present research is consisted of 162 experts, specialists and senior executive managers working in hi-tech industries that have the necessary expertise in the studied field.

The questions were designed to measure the research variables. This research questionnaire has been designed and localized achieving from reviewing valid questionnaire of the theses, and scientific-research articles, and the views of respected supervisors and academic advisors, as well as specialists. This questionnaire has been designed and used in related to the research and development, market researches, trust and product innovation in organization.

The concept of validity answers this question that the measuring instrument to what extent measures the desired features. At this step, with taking specialists' opinions, the necessary amendments have been done; and thus ensure that the questionnaire measures the same feature desired by the researcher.

In this study, three criteria have been examined in order to measure the reliability (questionnaire reliability) and its measurement:

1. Coefficients of factor loadings
2. Cronbach's alpha
3. Composite reliability

Structural equation modeling was used in this study. Partial Least Squares method is one of the structural equation modeling approaches that was innovated by Walad (1973). 3SmartPLS software has been used to implement this method in the present research.

FINDINGS

Descriptive indicators of research variables

In this research, main variables levels of the issue have been examined by questions that have been asked from the experts. This issue accommodates multiple dimensions in variables' line.

Main variables status is as following Table:

Table 2: Research main variables status

Raw	Variable title	Mathematical notation	confidence interval of 95% of Average	The importance degree of variable average equality test with value of 3 at confidence level of 95%
1	Product innovation	I	(3.2587, 3.4635)	00.0
2	Research and Development	$R.D.$	(3.3856, 3.5650)	00.0
3	Market research	M	(3.1459, 3.3403)	00.0

Value obtained for the degree of importance of average test is less than 0.05 for each three variables. This means that the average of Research and Development variable cannot be number of 3. Given the 95% confidence interval calculated for this variable, can be said average value with this degree of confidence is higher than 3. Positive questions of the measurer of these

variables and calculated value of more than 3 shows the appropriate place of Research and development in organization in terms of the employees' view.

For calculating reliability fitting criterion of the indicator, the overall model containing all the research structures, dimensions and questions was performed using SmartPls3 software. The result contains standardized coefficients that have been brought in following Figure. As this figure shows, the coefficients of factor loadings is higher than 0.4 in all the questions.

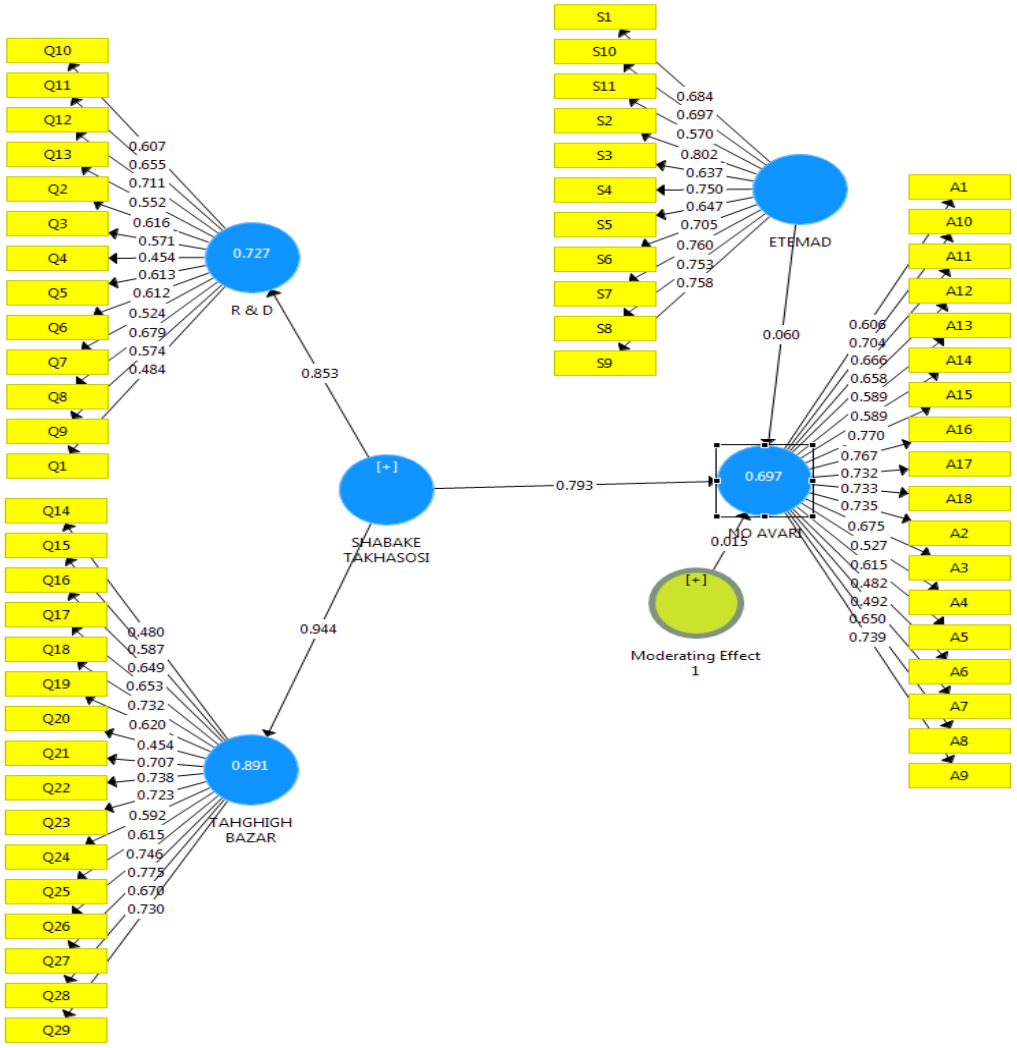

Figure 2: Research model with standardized coefficients

The results of software's output about the main structures of the model have been brought in the Table below for investigating the second and third criterion (Cronbach's alpha and composite reliability).

Table 3: Examination of research structures reliability

Research Structures	Cronbach's alpha	Composite Reliability
R & D	0.822	0.860
Market research	0.920	0.901
Specialized network	0.930	0.910

Innovation	0.911	0.910
Trust	0.899	0.901

According to the Table above and Cronbach's alpha coefficient composite above 0.7, the reliability of the main structures of the research is confirmed.
The values of variance average extracted for each structure have been brought in the Table below. As see in the Table, variance average extracted for each structure is higher than 0.5. This confirms appropriate convergent validity of the model.

Table 4: Values of variance average extracted

Variables	Convergent validity
Research and Development	0.765
Market research	0.822
Specialized network	0.764
Innovation	0.740
Trust	0.798

In the Table below, the numbers on the main diagonal is the square root of the extracted variance average, and the other numbers are absolute value of correlation coefficients.

Table 5: square root of the extracted variance average

Market researches	Specialized network	Research and Development	Innovation	Trust	Variables
				0.709	Trust
			0.657	0.639	Innovation
		0.593	0.732	0.645	Research and Development
	0.571	0.853	0.834	0.735	Specialized network
0.661	0.944	0.633	0.770	0.683	Market researches

As seen in the table above, the numbers have been placed on the main diagonal of the table are square root of the extracted variance average. Examination of each of these values for each structure compared to the correlation between the mentioned structures or other structures shows that the extracted variance average for all structures is higher than the correlation between the corresponding structures or other structures of the research. Therefore, it can be concluded that all research structures are validated (Divergent validity) in this term.

T Significant coefficients

The most basic criterion to measure the relationship between structures in model of structural part is T significant numbers. If the amount of these numbers are higher than 1.96, this shows the validity of the relationship between these structures. The figure below shows significant coefficients in the relationship between the research structures.

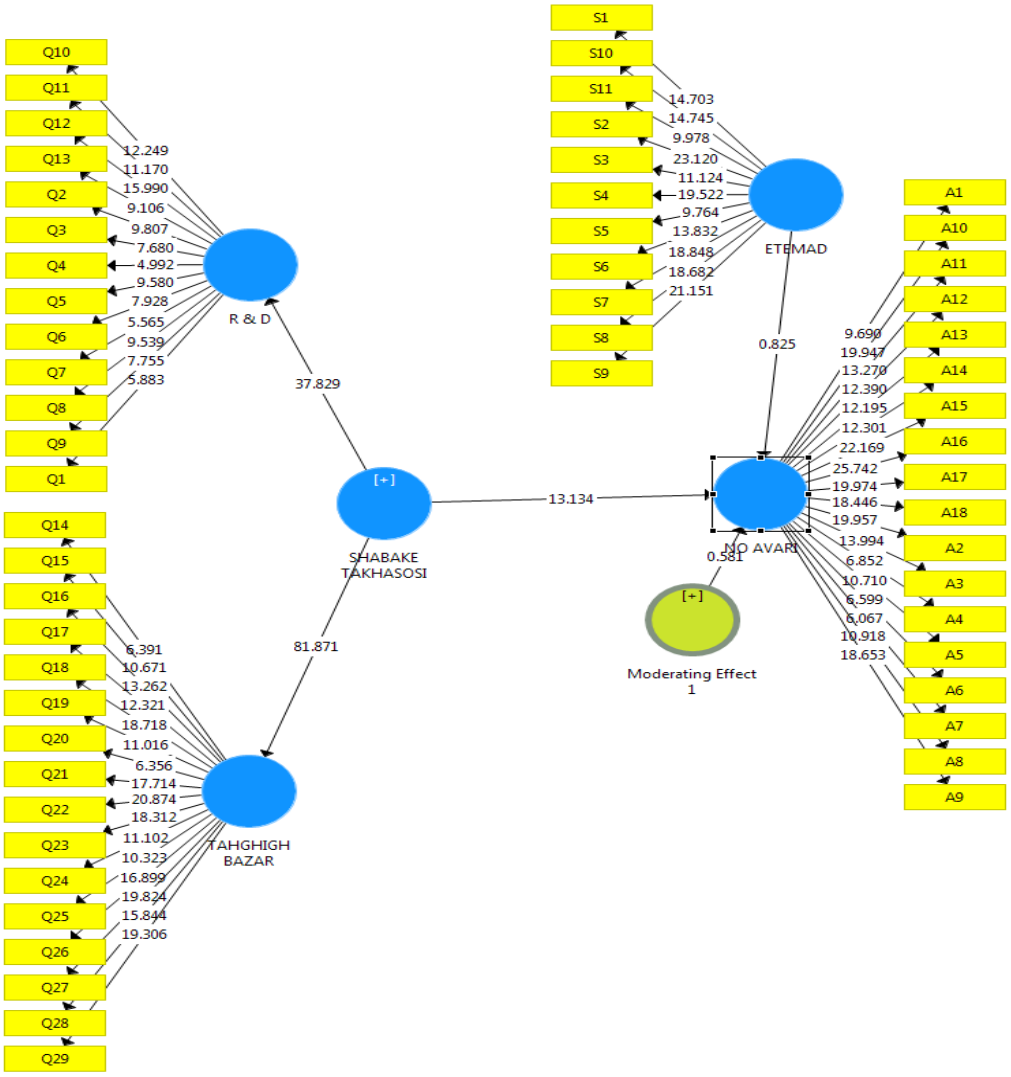

Figure 3: T significant coefficients to examine the structural fitness of the model

Data analysis commensurate with research hypothesis

Main question: How is the impact of specialized on product innovation in hi-tech industries?

As seen in Figure 3, a significant coefficient of the route between competitive specialized networks and product innovation is 13.134 that is higher than 1.96. This indicates that the impact of specialized networks on product innovation is at confidence level of 95%. On the other hand, as seen in Figure 3 standardized coefficient of the route between variable of specialized networks and product innovation is 0.793 that indicates the fact that specialized network explains the percentage of changes in competitive advantage in the extent of 79.3%.

Sub-Question 1: How is the impact of research and development on product innovation in hi-tech industries?

As seen in Figure 3, significant coefficient of the route between research and development and product innovation is 37.829 that is higher than 1.96. This indicates the significant impact of research and development on product innovation at confidence level of 95%. On the other hand, as seen in Figure 2 standardized coefficient of the route between research and development and

product innovation is 0.853 that indicates the fact that research and development explains the percentage of changes in product innovation in the extent of 85.3%.

Sub-Question 2: How is the impact of market researches on product innovation in hi-tech industries?

As seen in Figure 3, significant coefficient of the route between market researches and product innovation is 81.871 that is higher than 1.96. This indicates the significant impact of market researches on product innovation at confidence level of 95%. On the other hand, as seen in Figure 2, standardized coefficient of the route between market researches and product innovation is 0.944 that indicates the fact that research and development explains the percentage of changes in product innovation in the extent of 94.4%.

Sub-Question 3: How is the impact of specialized networks on product innovation with moderator variable of trust in hi-tech industries?

As seen in Figure 3, significant coefficient of the route between specialized networks and product innovation is 0.825 that is less than 1.96. This indicates the non-significant impact of specialized networks on product innovation by considering moderator variable of trust at confidence level of 95%, and lack of direct impact of specialized networks on product innovation by considering moderator variable of trust.

RESULTS AND DISCUSSION

The obtained results show a significant direct impact of specialized units and research and development in creation of innovation in product of that organization. Standardized coefficient of the route between research and development and product innovation is 85.3. This coefficient shows a significant direct impact of component of the research and development on product innovation in studied organizations. This result has also close and significant proximity with previous researches. Various definitions have been expressed on research and development field that research and development is considered at first a creative work. This is natural this creative work can be an effective factor on creativity and innovation in other parts of the organization by itself.

The obtained results show a significant direct impact of Market researches' specialized network on creation of product innovation in that organization. Standardized coefficient of the route between market researches and product innovation is respectively 95, 4. This shows high significant impact of this component on product innovation of the company working in hi-tech industries. At the completion of this statistical result, can be stated that market researches due to the its research and survey nature that particularly pay attention to market conditions and customer needs, can be very effective factor to meet the needs and priorities of the creation of innovation and development in organization. Market researches can also be posed as an important factor in the production of intelligence in market-orientation, and help the focus of the organization's efforts in actively pursuing and generation of appropriate market information to supply customers' needs and demands.

In answering the research third sub-question that is posed on the impact of specialized networks on product innovation by considering moderator factor of trust indicates the presence of standardized coefficient of 0.825, which rejects the third hypothesis. This means that trust factor cannot have a significant impact by affecting the relationship between specialized networks and

product innovation. In explaining the obtained results, can be stated that indicators such as the belief in doing different affairs in networks in terms of some speech, facilitate for others, the possibility to freely state comments, do things that are promised, belonging to others, existence of emotional capital in organizational specialized networks, honest in expressing scientific limitations and so on have been examined in this research in order to measure the status of organizational trust level.

Statistical results show that the outcome of various indicators in the field of trust is not in a proper position. It should be noted that insignificance of this variable can have some organizational reasons such as certain relationships, sometimes rigid and well-defined in business areas, existence of certain human relationships, lack of the necessary fields to define new and innovative relationships to make trust and employees trust to each other in direction of activities related to organization in mentioned studied organizations.

The obtained results show a significant direct impact of specialized networks on product innovation in company working in hi-tech industries. The standardized coefficient of the route between specialized networks and product innovation is 13.134. This shows high significant impact of this component on product innovation in company working in hi-tech industries.

In this part, the issue that can be examined and considered is the important role of infrastructures especial conditions existing in the hi-tech industries to facilitate networking and to use specialized network for product innovation. Zhamsa et al. (2011) knows networking usages as follows:

1) Network as an opportunity
2) Network as a source of information
3) Network as a source of learning

Suggestions

It was specified in this study that major influencing factors in the research, including research and development, market research, specialized network and product innovation have proper place in the organization. The studied company working in the field of hi-tech industries requires trying to maintain and strengthen this proper position by considering factors and parameters affecting each of these variables. To maintain and improve proper place of research and development in organization, this company requires creating necessary infrastructure in order to improve a network or independent unit in organization. The main task and even the unique task of employees and experts are to define research and development merely in the specialized areas of R & D.

This organization to strengthen the specialized network in the field of market researches requires defining permanent and defined communication in the field of relationship of members of this network of with the market, customers, organization employees and so on. In this way this network uses other capacities of specialized networks, and informs the real needs of customers and the market. On the other hand, it is necessary that specialized network managers of market researches define certain channel and duct so that organization employees, as well as the customers can openly declare their opinions conveniently and easily.

One of the issues that need to be considered as a pathological problem is lack of proper and effective position of variable of trust in the studied organization. It should be noted that in dominant theory between innovation and networking, one of the important cases that was

mentioned by Pettway et al. (2004) is the effectiveness of specialized networks on innovation by increasing social interaction, create trust, create mutual relationships that led to the transfer of knowledge. So the existence of important asset such as trust in organization, especially in organizations that share knowledge through network for innovation is very important. Lack of appropriate status of this indicator in studied company working in hi-tech industries shows that companies are required to study and evaluate critically in this area, and strengthen them by identifying important indicators of trust in this organization.

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