



Assessing the Impact of Innovation Culture on the Relationship between Human Capital and Product Innovation

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ARTICLE INFO

ARTICLE HISTORY:

Received: 7 Aug 2014
Revised in revised form:
15 Oct 2014
Accepted 21 Feb 2015

Key words:

Innovation Culture,
Product and Services
Innovation, Human
Capital, IT

ABSTRACT

One of the main challenges facing management today is to develop an organization culture which gives value to innovation and creativity. Creating innovation culture (IC) can encourage employees to be innovation in product and service. The main objective of this research is IC effects on the relationship between knowledge assets and product innovation (PI), with emphasis on the use of IT. Lack of IC in organizations is one of the factors of creativity and innovation decreasing and eventually of achieving less competitive advantage. The research is an applied one, using descriptive methods regards to data collection, and it can be considered as a case study. The population of this research is employees of production notes and coins organization. Data were gathered by questionnaire. Correlation test results showed that the highest correlation belongs to the relationship between the IC and PI and the lowest correlation belongs to the relationship between PI and IT. Path analysis results showed that greatest impact is concerned with the effect of IC on human capital and lowest effect on the impact of IT on PI. Determination coefficient value indicates that IT is a poor predictor of IC, human capital is a good predictor of IC. PI is also a good predictor of IC, IT and human capital. IC has positive relationship with human capital and PI, it seems decision to implement innovative at all levels of organization and infrastructure needed to build and strengthen innovation.

1- Introduction:

One of the main strategies of the organization is organizational culture and perhaps the most important task of managers is a setting organizational strategic in the cultural sphere and the

establishment of an appropriate organizational culture. The importance of organizational culture is that managers now feel more power and magical effects on the behavior of employees and also realized the importance of recognizing this matter to remain in competition or overtaking other organizations (Taslimi et al., 1385). One of the consequences of increasing this kind of competition is the interest of organizations to institutionalize a culture of innovation in their work environment, because the individual innovation of employees in working environment is the main base of improving any organization's performance (Scott & Bruce, 2004). Therefore, one of the main challenges facing modern management is to develop a corporate culture in which there are regards toward innovation, creativity and change (Pandey & Sharma, 2009). In the organization's environment, innovation culture is recognized through the conduct or activities that lead to new products, new services, improving existing products and services, initiatives that lead to cost savings or improving work processes, improving relations, application of new technologies, research and development, unique behaviors and reactions of employees to unforeseen opportunities (O'Cass & Ngo, 2007). On the other hand, the undeniable benefits of IT in improving the accuracy and speed of flow, increasing the global quality, cost reduction and more customer's satisfaction has led organizations to quickly deploy and use of information systems. In fact, in today's business environment, IT is seen as a competition source (Chen et al., 2009).

The main aim of this research is to study influence of innovation culture on knowledge assets and product innovation. Also, another aim is survey of relationship between Innovation Culture with human capital and IT. This research emphasizes that innovation culture have effect on products and services innovation, and knowledge assets. Knowledge assets are not physical capital nor financial capital, but defined human capital as knowledge, skills, creativity and health (Becker, 2002). Since the ability and skills help better performance and productivity in the organization, carrying out any cost in training and its development is a long-term investment which organizations are able to benefit from it up to a long time. In this regard, the need to develop innovation culture can be grounds for encouraging employees to innovate in products and services. Lack of innovation culture in organizations is one of the factors of creativity and innovation decreasing and eventually of achieving less competitive advantage. According to Hartmann (2006) innovation culture can encourage innovation behaviors among members of an organization, because culture can guide members of the organization to adopt innovation as a fundamental value of the organization and develop commitment to it. On the other hand, according to Scott and Bruce (2004) employees' individual innovation in the workplace is the main basis for improving an organization

performance. Therefore, the main research question is whether innovation culture can adjust the relationship between human capital and product innovation and also IT.

2- Literature Review and Hypotheses Development

2-1- The relationship between technology and Innovation Culture

All organizations exist in order to create any change in the "object" and making these changes requires technology. However this object might not necessary be superficial or materialistic, but rather could include items such as information, symbols, and even individuals as well. Whether this changing object in the organization is visible and tangible or not, has no effect on the meaning and importance of technology in general. In other words in the analysis of technology as a factor just as an oil refinery, an insurance company also will be examined in the same way (Scott, 2011). Technology refers to the species and activity patterns, equipment, materials, knowledge and experience to perform the functions of the organization (Garloff, 2008). Also, technology refers to the knowledge and expertise of how to do things, and includes innovations, inventions, techniques and a wide range of knowledge and information (Koontz & Weihrich, 2009). Present scientific and technical progress has increased importance of technology in organizations (Bedeian, 2010). Application of IT in the organization, at all levels is effective and increases effectiveness of management activities in order to maintain the values and the use of actual and potential capabilities. IT and effective use of it is taken into account as a major step in the administrative organization. Impact of information technology on methods, tools, transformation and regeneration of systems is inevitable. IT can be used as a tool for the implementation and implementation of capabilities and strategic policies for the success of the organization's missions (Ali Ahmadi et al., 1385). All experts and researchers agree on different levels that technology has been effective on organizational performance and is one of the factors that cannot be ignored in the analysis. Today, technology is considered as the main cause of the increase in productivity and its entering to organization alter the occupational structures and how to do things, it affects employee attitudes and behavior. This affects are effective on the whole organization and essential to organizations (Bedeian, 2010). IT increases creativity and efficiency of employees and by creating new ways for internal communications, shares information on the company's code with the employees (Daft, 1390: 266). We can say that successful organizations have the ability to institute innovations in their organization's corporate culture and management;

because innovation culture involves in the organization through different ways such as socialization and sociability processes, policies, programs and procedures. In the field of innovation culture, administrative areas include the ability of the organization to implement ideas that can bring added value. This category also encompasses the capacity of mutual and immediate regulation of the systems and processes with making changes in the competitive environment (Dobni, 2008).

Thus the first and second research hypothesis is:

Hypothesis 1. There is a significant and positive correlation between the innovation culture and IT.

Hypothesis 2. There is a significant and positive correlation between IT and innovation in products and services.

2-2- Relationship between innovation culture and innovation in product and services

Human is forced to actually and virtually possess and overcome nature to maintain its existence. Human possession during the time does not go on the same way, but it takes shape in each period according to the economic status of human and in accordance of natural circumstances to some extent. Changes of dual factors, especially the first factor, necessarily prompts human on new theoretical and practical plans. These contraptions at the beginning of their emergence are called social innovation or "innovation culture". These innovations appear on two original forms: Discovery and invention. Innovation depends on the culture or cultural heritage in two directions:

First, each new element is created from elements which potentially exist in society, because nothing can be born from nothing.

Second, human demands a new element and provides it when culture of the society calls for it (Mariji, 1387).

But it must be said about first direction that: Every culture is composed of various elements and each element of cultural has a function or tasks. All community needs are fulfilled by the functions of cultural elements. As society struggles with nature, put foot in a new phase, faces new requirements that cultural elements are not able to ensure them correctly. It is here that the introduction of new elements and the invention of them are not possible without using of the elements of culture. After society mixes some of existing cultural elements or so-called cultural links, creates new elements. About the second direction it must be noted that, firstly, any discovery or invention is done correctly generally when it's about both society's needs and theoretical and practical afford of community. Secondly, discovery or invention which is not

commensurate with the needs and abilities, but made its way from outside to the society, rarely can find an active role in society life and bring great changes.

Therefore, great social innovation and creativity which can be seen in some periods of society's history are born social needs. When society puts foot in a new historical stage faces new needs and challenges and inevitably tries to fix them and with emphasis on existing cultural elements in society seeks to resolve them. At this time we will witness the innovation and knowledge production and "cultural creativity" in this field is undeniable (Ag Bran and a Nim Kof, 411: 1380). Characteristics of the innovation culture include: decision to be innovative at all levels of the organization, creating and strengthening the infrastructure needed for innovation, investment in the operational dimension and activities which influences market-oriented and added value, with organizational environment in which innovation is executed (Dobni, 2008). In the area of innovation, innovation refers to a complex process which its aims are to create, move, change and respond to new ideas. In other words innovation of employees in the workplace is a complex behavior that involves a three-stage process, understanding of the problem and offer novel solutions, promoting new ideas and finding logical rules to defend it and finally providing models or experimental samples for implementing the ideas and solutions in group or in line with the emphasis of organization (Janssen et al., 2004). In the organization's environment, innovation culture is recognized through the conduct or activities that lead to new products, providing a new service, improving existing products and services, initiatives which led to cost savings or improving working processes, improving relationships, using new technologies, research and development, unique behaviors and reactions of people to not expected opportunities (O'Cass & Ngo, 2007). Adams (2004) during the discussion of product innovation, defined product innovation as introduction of new products or services or a substantial modification to meet the needs of a user or market which result is what the client sees (Adams, 2004). Teslak et al (1997) regarding the impact of organizational culture on innovation concluded that innovative organizations have similar cultures. They encourage experiment,

Value new experiences; reward both the successes and failures considering all aspects, gain experience from their mistakes, the organization controls environment closely and in the shortest time and the best method fitted with the changes made responds to changes. According to their opinion innovation culture has seven characteristics; acceptance, confusion, patience in impractical matters, low external control, patience in risk, patience in attitudes, emphasizing the process and emphasis on open systems (Tesluk et al., 1997). In general organizational culture is considered as an important factor in the success of an organization.

Successful organization has the ability to attract innovation in organizational culture and in management processes. O'Reilly and Tushman (2002) believe that organizational culture is the heart of organization innovation. Organizational culture influences on areas which require creative solutions, encourage, support and applications. A supporting creativity culture also offers, innovation ways to offer problems and finding solutions (Oreilly & Tushman, 2002).

Therefore third research hypothesis is:

Hypothesis 3. There is a significant positive correlation between innovation culture and innovation in products and services.

2-3-The relationship between innovation culture, human capital and innovation

Knowledge has become a powerful tool to gain competitive advantage for organizations (Shih et al., 2010: 74) and successful organizations will not be able to achieve their goals only based on other intangible assets ; to achieve this, they must try to create knowledge in organization (Guthrie, 2001: 29). Organization today has recognized that technological competitive advantage is fundamental and the only sustainable competitive advantages are based on intellectual capital management (Motaghi and Mobaraki, 1389: 1). Intangible assets and intellectual which considered being the intellectual capital are seen as a critical factor. In other words, those organizations are able to win the transformations which can improve and develop their intellectual and intangible capital (Rezaeaiian Ferdoyi and Ghazi Nouri, 1389: 2). Successful organizations are constantly innovating based on the knowledge and skills of people and people's role is undeniable in the sustainable competitive advantage and the key to sustainable development lies in the intellectual capital of organizations (Akhavan et al., 1388: 116). Intellectual capital can be considered as a collection of intangible assets (resources, capabilities, competition) which obtain organizational performance and create value. According to Adinsson and Malone (1997) intellectual capital information and knowledge used for working, is for creating value (Ileanu & Tanasoiu, 2008: 367). Many researchers have emphasized on the importance of intellectual capital in the creation of value for their organizations and considered intellectual capital as a critical intangible source in organization. In this regard, managers understanding of this key resource and its reflection in the culture and organizational structure can ensure the survival of the organization (Bonits & Girardi, 2000: 546). There have been some studies in the application of knowledge management in software development. Sheremeta (2002) provided a method for finding and solving problems in new product development software through knowledge generation and knowledge integration and suggests that this approach improves the quality and timing of the development. According to

Yang and Liu (2006) Knowledge management can be considered as facilitator of new product development process. Today, innovation and speed of delivering products to market is essential in business success and will be increasingly important in the future. There are intangible assets which add a high value to activities; they are knowledge-based assets. Many researchers have introduced new product development as a focused process of knowledge which with increasing complexity of products and technologies new product development process has an urgent need of tacit knowledge and explicit and managing of these knowledge(Yang & Liu, 2006).

Therefore fourth and fifth hypothesis are:

Hypothesis 4. There is a significant positive correlation between the innovation culture and human capital.

Hypothesis 5. There is a positive and significant relationship between human capital and innovation in products and services.

2-4- The role of innovation culture on the relationship between human capital and innovation and IT

At the current era, the success is for those organizations that instead of assets, such as machinery, have continuous innovation, they rely on the knowledge and skills of employees and also new technology. Produced value by the intangible assets is not always reflected in the financial statements. But the leading companies in this field, were conceived this issue that Intangible assets are the major functions of the company. The emerging field of intellectual capital has become an exciting subject to both organizational researchers and practitioners and can be seen in the course of many attempts to apply concepts of intellectual capital. For example, accountants are interested in measuring the balance sheet, IT professionals seeking information coded in the system, sociologists tend to balance power with it, Psychologists tend to develop minds, HR managers tend to calculate investment returns through it and staff of training and development want to use it in human resource development programs (Alam-Tabriz et al, 23: 1388). Martin and Terbelanch (2003) examined the relationship between organizational culture, creativity and innovation as follows:

External environment: for example includes encouraging continual changes in the products, technologies and preferences of users.

Response to external and internal factors which is reflected in the organization's strategy (innovation strategy).

Values and beliefs of managers, for example includes free exchange of information, open questions, and supporting of the diversity of beliefs.

Organizational structure that allows managers parallel achievement of organizational goals (including flexible structures with characteristics of decentralization, joint decision-making, a suitable definition of task).

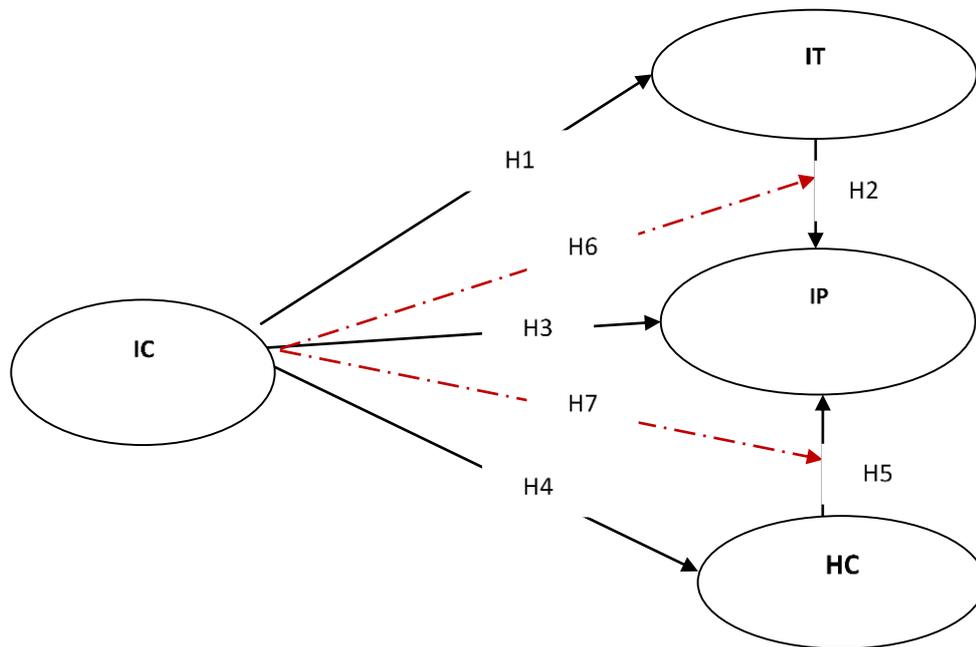
Technology, including individual knowledge, available and facilitate to support the process of creativity and innovation (Martin & Terbelanche, 2003: 66).

Kaba and Osei-Bryson (2013) point out in their study that little research has been performed on the impact of national culture on people's perception of information and communications technology (ICT). These studies have provided conflicting results. Although some researchers argue that there is a relationship between culture and interactions of people and perception of innovation in information technology and communications, but the other researchers have concluded that this relationship does not exist. The main way to achieve innovation culture in organizations is rate of ability to identify, inspire and strengthen implementation context for innovation which supports the individual special characteristics. This issue is obvious that innovation flourishes only under appropriate conditions and factors such as the vision and mission of the organization, customer focus, processes of management, leadership and advocacy strategies (Martins & Terblanche, 2003). Studies have been done on the convergence of the new product development process and Knowledge management and the effects of knowledge management processes on the performance of new product development process. Among them a study can be cited which Examined the relationship between knowledge integration and new product development performance in ICT industry in Thailand resulting in improving of financial market and rate performance (Ching Ho et al., 2008). According to Martin de Castro et al. (2013) Development of a successful innovation is essential for the survival of a company's competitive advantage. They point out in their study that company's ability to innovate depends on knowledge and intellectual property organization and companies are dependent to these assets in order to become powerful. In their study they worked on technical knowledge and human assets direct correlation with product innovation, as well moderator role of innovation culture on this relationship. They studied 251 small and medium industrial enterprises as well as a large Spanish company and explaining this relationship using a questionnaire. Research results on basis of multiple regression analysis indicate that the innovation culture has a moderator role on model of product innovation based on knowledge. Therefore the sixth and seventh research hypothesis is:

Hypothesis 6. Innovation culture moderates the relationship between information technology and innovations in products and services.

Hypothesis 7. Innovation culture moderates the relationship between human capital and innovation in product and service.

The variables examined in this study include the innovation culture, information technology, human capital and innovation in products and services (Figure 1). The research model is extracted based on studies of (Lemon & Sahota, 2004; Martín-de Castro et al., 2013; Kaba & Osei-Bryson, 2013).



Figur1: Purposed Model of Research

3-Methods

The present research is an applied one, using descriptive methods regards to data collection, and in terms of the relationship between variables, also it can be considered as a case study. The population of this research is employees of production notes and coins organization which 230 ones were selected through sampling. Sampling method for this research is a randomized sampling technique. In this study, a standardized questionnaire of Martin de Castro et al (2013) is used for data collection and obtained data will be used to evaluate and test hypothesis. This

questionnaire distributed in different organizations. Five first questions are about variable of innovation culture, the next 5 questions about product and service innovation, 7 next questions about human capital, and 14 questions about information technology. To assess the validity of questionnaire content validity was used. Cronbach's alpha was used to evaluate the reliability of the questionnaire. To analysis the data, descriptive statistical techniques, including frequency, mean and standard deviation were used. In addition in order to test the research hypothesis correlation test, path analysis and structural equation modeling using Smart PLS and SPSS software respectively.

1- Result

Descriptive statistics of the research components indicates that the innovation culture has a mean and standard deviation of (SD =.860, M =2.4720), Product innovation mean and SD (SD=.918, M= 2.5147), Human capital has the mean and standard deviation of (SD= .689, M= 3.4539) and information technology has the mean and standard deviation of (SD= .729, M= 3.3543). Human capital variable with the value of -.017 has the left skewness, information technology with the value of .028 has the positive and to the right skewness, innovation culture has a value of .060 and skewness to the right and products and services innovation has the value of .233 and skewness to the right. Reliability and validity results are shown in Table 1.

Table 1. Coefficient validity and reliability

Component	Number of questions	Load factor	Cronbach's alpha
Innovation culture	5	.873	.864
Product innovation	5	.763	.756
Human capital	7	.766	.707
IT	14	.599	.706
Total questionnaire	32		.849

Content validity results showed that variables have good validity. The minimum validity is 50 percent. Cronbach's alpha results showed that research instrument has good reliability. The minimum reliability is 70 percent. Correlation test was used to evaluate the research hypothesis. The results of Pearson correlation test for hypothesis 1 to 5 showed that:

1. There is a significance correlation between Innovation Culture and Information Technology at 99% confidence level. The amount of this correlation is .505 values. The first hypothesis is confirmed.
2. The relationship between information technology and innovations in products and services, according to a confidence level of 99% and a correlation coefficient of .459 was approved.
3. The relationship between culture and innovation in product and service innovation, at the 99% confidence level with a correlation coefficient of .718 was approved.
4. The relationship between the innovation culture and human capital, according to a significance level of 99% and a correlation coefficient of .679 was approved.
5. The relationship between human capital and innovation in products and services is significant at 99% confidence level. The correlation coefficient for the two variables .622, which represents the relationship is positive, hence the fifth research hypothesis was confirmed (Table 2).

Table 2. Results of correlation test

Indicators	Innovation culture	Product innovation	Human capital	IT
Innovation culture	1	.718**	.679**	.505**
Product innovation		1	.622**	.459**
Human capital			1	.652**
IT				1
M	2.4720	2.5147	3.4539	3.3543
SD	.860	.918	.689	.729

** 99% confidence level

The results of path analysis for 6 and 7 hypothesis indicates that Culture, modifies the relationship between information technology and product innovation and service to the .408 units. This

amount According to factor T ($T= 2.788$) that is greater than the absolute value of 1.96, can be explained at 95 percent level.

7. The innovation culture modifies the relationship between human capital and innovation in product and services to the .574 value. This amount according to factor T ($T= 2.879$) is greater than the absolute value of 1.96 is the level of confidence of 95% can be explained (Table 3).

Figure 1 shows the path coefficients for each of the variables. The results show that the culture of innovation has impact in the amount of .533 on information technology, in the amount of .698 on human capital, the amount of .545 on innovation in product and services. Also, information technology has impact on products and services innovation in the amount of .052. Human capital has impact on innovative products and services in the amount of .216 are.

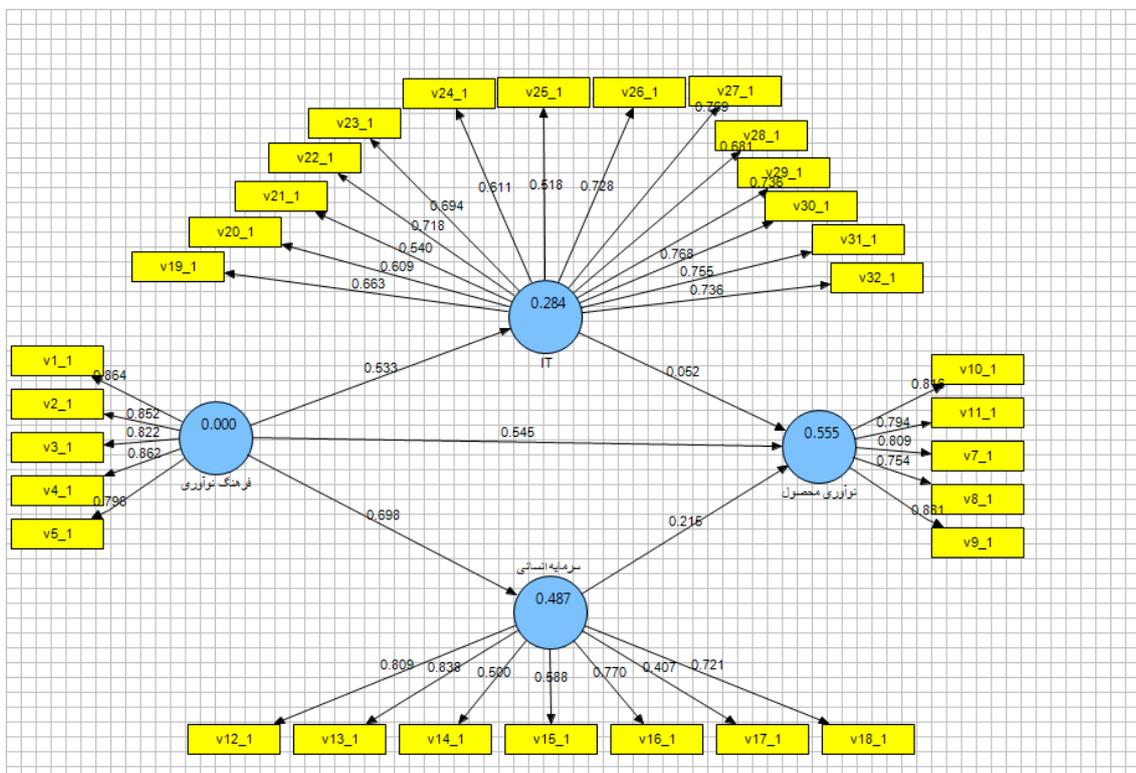


Fig. 2. Diagram of variables path analysis

According to path coefficient values in Figure 2, the innovation culture balances the relationship between human capital and innovation in products and services in the amount of .547. In addition, innovation culture balances the relationship between information technology and innovations in products and services in the amount of .408.

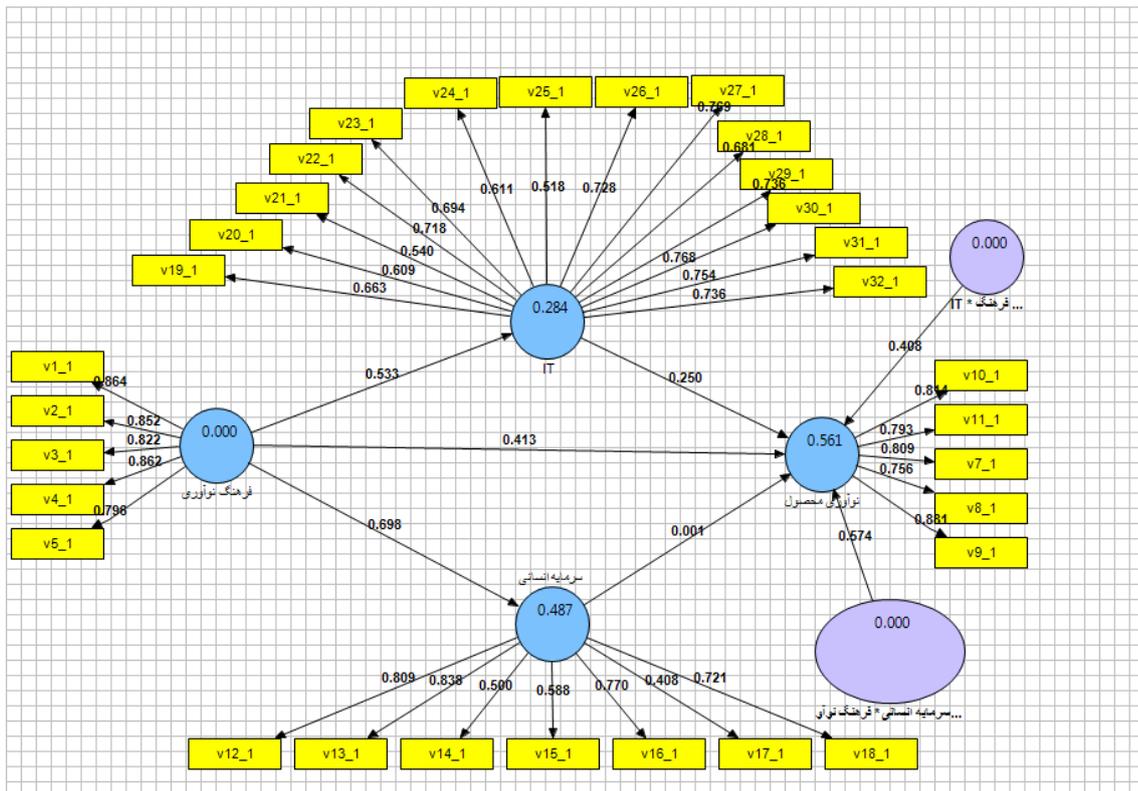


Figure 3. Diagram of path analysis with regard to moderator role

The results of this test for the research hypothesis are shown in Table 3.

Table 3. Coefficients of the path analysis

variables	Path coefficients	T Statistics	result
innovation culture →IT	.533	7.151	Positive effect
innovation culture →innovation in product and service	.545	6.015	Positive effect
Innovation culture → human capital	.698	13.207	Positive effect
IT →innovation in product and service	.052	2.564	Positive effect
Human capital →innovation in product and service	.215	2.731	Positive effect
Innovation Culture * IT →innovation in product and service	.408	2.788	Positive effect
Innovation Culture * human capital → innovation in product and service	.574	2.879	Positive effect

To evaluate the model, the coefficient of determination (R^2) was used. The coefficient of the relationship between the amounts of variance explained by a latent variable measuring the amount

of total variance; the value of this coefficient varies from 0 to 1, where larger values are more desirable. According to output of software Smart PLS, approximately 28.4% of the variability dependent on IT can be expressed by the independent variable which is innovation culture. About 48.7 percent of the variability dependent on human capital and innovation culture can be expressed by the independent variable. Approximately 55.5% of the changes of dependent variable in product innovation and services expressed by the independent variable, the innovation culture, human capital and IT. In addition, 56.1% of the changes of dependent variable in products innovation and service culture can be expressed by the independent variable and the moderator variables. The results show that the coefficient of determination is obtained in an acceptable level.

5- Conclusions:

The main purpose of the research is the role of innovation culture on the relationship between knowledge assets and product innovation: With emphasis on the use of information technology in the production of banknotes and coins. The results of research hypothesis confirmed all seven hypothesized. Pearson correlation test results showed that the biggest correlation is between the innovation culture and innovation in products and services ($r = .718$) and the lowest correlation is between product innovation and IT ($r = .459$). Path analysis test results showed that the most effects belongs to innovation culture impact on human capital (Path Coefficient = .698) and the least impact is the effect of information technology on innovation in products and services (Path Coefficient = .052). Determination coefficient also indicates that IT is a relatively poor predictor of innovation culture, human capital is also a good predictor of innovation culture. Innovation in product and service are also a good predictor of innovation culture, information technology and human capital.

In a knowledge-based economy, most successful organizations are those organizations that live based on using more of these intangible assets better and faster knowledge. Investing on efficient information infrastructure, the expert system decision to share knowledge and ease of communication would be useful for the effectiveness, high-performance and achieve of competitive advantage. Research results of Vaccaro et al. (2010) showed that experience of cooperation and the size of organization and natural use of ICT has a positive impact on confidence and knowledge management tools and the use of knowledge management tools leads to increasing speed of offering to market and performance of new product and consequently increasing of financial performance. According to Martin de Castro and Delgado Verde (2013)

development of a successful innovation is essential to create and survival of a company's competitive advantages. They point out in their study that innovation ability of enterprises depends on knowledge and intellectual assets and also to enable companies to make power depends on these assets. In their study they examined the direct relationship between technology and human asset and product innovation as well moderator role of innovation culture on this relationship. The result of the multiple regression analysis indicates that the innovation culture has a moderator role on product innovation model based on knowledge.

The main way to achieve innovation culture in organizations is rate of ability to identify, inspire and strengthen implementation context for innovation which supports the individual special characteristics. This issue is obvious that innovation flourishes only under appropriate conditions and factors such as the vision and mission of the organization, customer focus, and processes of management, leadership and advocacy strategies. The dimensions of innovation should be institutionalized. Management of organization must provide signs and symbols in order to facilitate change in thinking and behavior for their staff. Also employees should react to these changes and take advantage of the opportunities. It's obvious that existence of Culture and organizational climate supports innovation in products and services in implementation of investment in human capital and all individuals are sufficiently involved in strategic planning.

In the following, some implications based on the research findings are suggested. The implications are divided in two groups: research and practice implications. The research one is: study the impact of IC on the relationship between HC and PI in different industries, different types, and different organizational sizes. The following are practical implications:

IC has positive relationship with HC and PI, it seems decision to implement innovative at all levels of organization and infrastructure needed to build and strengthen innovation. On the other hand, the investment becomes operational in market-oriented and value-added activities. Organization management shall be signs in order to facilitate change in thinking and behavior to provide employees. With this research study, the focus will be more on the creation of an IC, because individual innovation in the workplace employee base to improve organizational performance.

6- Limitations:

In questionnaire research frequently used specialized words, therefore it were distributed at the location by researcher. Some managers due to lack of time and have a meeting refused to answer

questions. For this reason, a questionnaire was distributed to over-sample, this restriction does not work out. Another study suggested that the role of knowledge sharing also be studied. In addition, it is recommended another study also examined in other organizations, to thereby increase the generalizability of this results.

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