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A Study of the Effect of Reward system's Mechanisms on New Product development considering the mediating role of Knowledge-Sharing (Case study: Home Appliances Province Manufacturing Companies in Esfahan)

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Abstract

The present paper, titled 'A Study of the Effect of reward system's mechanisms on new product development the mediating role of knowledge-sharing' examines the important role of rewarding mechanisms in facilitating the knowledge-sharing among individuals and the effects of a joint reward system on knowledge-sharing among the members and the new product development performance in home appliances factories in Isfahan Province. This research, in terms of its purpose, is an applied one; and in terms of implementation method, is a survey with a correlation approach. The statistical population include 170 managers (senior, marketing, manufacturing and R&D) of the home appliances manufacturing companies in Esfahan Province. Since the population is limited no sampling is necessary. Thus, the whole population is studied. The data collection tool is a researcher-made questionnaire containing 30 items, of which the validity has been confirmed using the comments from advisors, professionals and experts; and the reliability, determined through Cronbach's alpha coefficient of 92%) The questionnaire includes personal data and main, specialized items for examining the research hypotheses. The collected data were analyzed using SPSS and AMOS software programs through statistical tests at descriptive (frequency, percentage, accumulated percentage, average and standard deviation) and inferential (t-test, regression modeling, variance analysis, non- parametric Kolmogorov and Smirnov test, and Freedman non-parametric test) levels. According to the results obtained, all hypotheses were supported.

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Therefore, it was concluded that joint design of reward system has a significant effect on the development of a new product.

Key words: Reward, joint design of reward system, development of a new product, knowledge-sharing.

1. Introduction

Many organizations believe that the manpower is the main factor in creating value in the organization. It also is considered as a competitive advantage. In such conditions, it is necessary to maintain manpower and create motivation in them for increasing job productivity through different mechanisms such as rewards. Nowadays, the knowledge is the necessary and sustainable resource of competitive advantage. In the revolution and environmental uncertainties period, which organizations can be successful that create knowledge continuously and distribute it in their organization and also use it in technologies, products, and services. The increasingly importance of new products development in the business world and increasingly attention to the researches in terms of new products development results in many researches in terms of management knowledge. The organizations have strived to achieve competitive advantage through encouraging, facilitating, and applying the comprehensive organizational knowledge. This tendency was rapidly developing for new products development process and its employees' groups. In order to achieve such tendency, it is inevitable to create a knowledge station in the new products development process (Song et al., 2006). Although the results of different studies suggest that interpersonal knowledge reinforces its creation, but there are several empirical evidences that indicating the effective mechanism of knowledge sharing encouragement among members in different functional areas is not applied comprehensively and competitively (Milne, 2005).

The effectiveness of the personal-based continuous reward mechanism is less than the inter-functional collective efforts in terms of new products development. This is why the reward systems that encourage the collective efforts of members and their cooperative behaviors in new products development such joint reward systems are more effective than others (Barclay, 2004). The previous studies paid attention to the joint reward system in regulating new products development from many aspects. The considerable role of organizational reward plan in facilitating the knowledge sharing among individuals and the effects of joint reward system on sharing knowledge among members of new products development teams are studied to now (Sarin and Mahaja, 2007). This is why that the purpose of the present study is to examine the mediating role of knowledge sharing in the relationship between reward system mechanisms and new products development.

2. Literature review

2-1. Joint reward system mechanism

The organizational members are rewarded for their efforts, creativity in finding and applying new and better procedures and methods in the organization for achieving organizational goals. The reward that everybody receives in the organization is common for doing functions that receive its salaries. It also can derive from doing functions in higher levels of standardized works that receive its rewards. The organizational reward system includes every type of

performance and is a system that determines the employees' reward based on the especial regulations and rights. The reward system should be an effective and efficient system. Allocating and giving rewards in the organization should be so exactly that obtains the maximum benefits for organization. In order to this, the system should be designed so exactly that the rewards depend on the effective performance. The effective performance refers to the performance that helps the organizations in obtaining their goals. It is the only way that the use of reward can be effective mechanism for encouraging employees and creating motivation in them (Saadat, 2007).

If the rewards are focused on the collective performance probably leads to encourage the knowledge sharing in the groups and facilitates the idea adoption for creativity. This leads that the new products development project members' commitment and job satisfaction can be obtained through cooperation of medium managers' cooperation. This also results in the voluntary or social behaviors among employees (Bartol and Srivastava, 2005). The authors suggest two methods of rewarding that include process-based and result-based rewards. The first refers to the groups' rewards for their performances, behaviors, or other instruments of obtaining results such as function completion in a process. The second refers to degree in which the groups receive rewards because of adapting with results in final line. It is inevitable that the reward systems mechanism should be contingency. The results-based reward can be effective in complex and continuous projects. On the other hand, the process-based reward cannot be effective in the performance. In addition, the authors introduce the reward systems in two main steps. These include beginning and completion steps. The difference between these two steps is that the beginning step is concentrated on the product conceptualization and the second is focused on the implementation of this concept. The results-based mechanism may does not act like to an appropriate approach. The reason is that the members' desire for sharing knowledge may be discouraged by several results such as losing individual values or increasing probability costs. Also it should be remembered that the results of first step can be explained through structure so that encourage the thoughts and activities in terms of results (Sarin and Mahajan, 2007).

The managerial approaches such as risk-taking encouragement or characteristics such as being success and undertaking failure in the process of new products development influence the success of new products development positively. Also the compensation system needs equilibrium between efforts of new product development group and risks. As a result, the joint reward system that facilitates the group integration and knowledge-sharingshould be ranked through eliminating risks or minimizing it for new products development project members (Tusan et al., 2007).

 In the dynamic business world, the companies seek to achieve competitive advantage so that can precede their competitors. Undoubtedly, new products development is a prerequisite for entering such a step. It is necessary to decrease the costs and time of new products development with regard to the product life cycle. The companies' speed in delivering products to the market, a new successful product can leads to higher levels of sell. This is why that it is important to make the new products development simple so much that the development projects can be accelerated. Although new products create new opportunities for companies, but the managers have to pay attention to the risk of these products. The results of empirical studies indicated high levels of failures in the final products. This is why that many efforts that

have been done to recognize the success and failure factors of such projects and decrease the risks of these projects. Even with regard to the information of old products development projects, there is uncertainty in the development of new products. Such uncertainty not only creates ambiguity in time of project or its costs, but also there is difference between the necessary time to complete a project and the team members' accessible time (Ramezaianian et al., 2011).

The individual desire to achieve higher levels of performance and also cooperation of the group members will be increased if they receive more rewards. On the other hand, the group members that receive less rewards, will have less cooperation and also will be more selfish. The surplus reward approach is a mechanism that eliminates the selfish behaviors and encourages the cooperative behaviors in developing new products with interrelationship. Therefore, designing the reward system is so common through positive surplus encouragements that facilitate the process of creating and distributing knowledge among members of new product development team (Harder, 2006). So, the following hypotheses can be developed based on the literature review.

1. The cooperation of operational managers in the reward allocation influences knowledge-sharing significantly.
2. The contingency rewards that are suitable for new product development influences knowledge-sharing significantly.
3. Decreasing risks of employees' cooperation influences knowledge-sharing significantly.
4. The payment of surplus reward for participants in the new product development influences knowledge-sharing significantly.

2-2. Knowledge sharing

In order to valuate the knowledge, it is necessary to share it with others. The knowledge transition can be active or inactive. The knowledge can be transmitted through informational systems or personal interactions. It can be integrated in the educational and internship plans or can be placed in the processes. Also it can be saved in a source so that use it in necessary times. This is why that it is necessary to share knowledge before exploiting it in the organizational levels. The interaction between organizational technologies, techniques, and individuals can influence knowledge-sharing directly. Knowledge transition can be grouped based on the following factors. These include (saadat, 2007):

1. Perceived value of unit knowledge that is considered as the main source of knowledge.
2. The desire of knowledge resource in knowledge sharing
3. The transitional channels and their enrichment
4. Changing the motivational situation of the receivers of knowledge.

2-2-1. Difficulties of knowledge sharing

Many companies know that the knowledge sharing is here that the actual problems of managers begin. One of the most difficult functions of knowledge management responsibility is transmitting it to the appropriate individuals and locating the organizational knowledge here that is necessary. Unfortunately, this problem is ignored in many cases. The results of the studies in many companies revealed that more than a half of the intellectual capital is not used

by organizational members and also they report the problem of knowledge transition. In many cases, the main components of knowledge are owned by someone (Prost et al., 2006).

2-2-2. Different types of knowledge

1. **Explicit knowledge**: this type of knowledge is a part of the knowledge station that can be interacted with other as information. The explicit knowledge refers to involving facts and thereby is the knowledge of anything. The skeletal knowledge is a type of explicit knowledge that is reported and saved continuously. This knowledge is accessible for everyone who knows its source. The explicit knowledge is interacted in the formal interactions. This knowledge can be reported and essayed simply. It can be helpful in creating and obtaining competitive advantage. Unfortunately, the age of explicit knowledge is short and it cannot be duplicated by others (Sefoddin et al., 2006).

2. **Implicit knowledge**: this refers to a type of skills, capabilities, and art on creation. In other words, it refers to the knowledge of "how". Transmitting this knowledge to others as information is somewhat difficult. Also the implicit knowledge is the only method of educating points through practice. The implicit knowledge is rarely explicit and derives from organizations' administrative operations. This usually refers to the organizational culture. The implicit knowledge includes relations, rules, values, and standardized practical methods. Because this type of knowledge can be broken into its details and duplicate and distribute it. Therefore, it can be considered as a fixed resource of competitive advantage (Sefoddin et al., 2006).

2-2-3. Transition and use of knowledge

The primary purpose of knowledge management is to assure that the decision makers are provided with related and reliable knowledge timely and continuously for their decision making. Therefore, it is necessary to transmit the sound knowledge timely to the decision makers and problem solvers for achieving their continuous success. The knowledge transition does not mean contacting others and sharing knowledge with them or making the knowledge accessible for them, but it includes both knowledge-sharing and its attraction. When the information and capabilities will be transited effectively that the receiver can understand the knowledge in the best manner and also use it effectively and efficiently. The structure of a company has direct effect on the effectiveness of its knowledge transition. Transition of the individual knowledge is very valuable and also the personal and informal learning and information network can be helpful in the individuals' learning in every organization considerably. Evaluation of the accessible knowledge, which makes the knowledge transition and selection possible, is a part of designing capacity of knowledge transition system. The technology is a capability. Culture and people are the main critical issues in the knowledge transition (Fayrstvn, 2008).

2-3. Knowledge-sharing and new product development

Any study has not been done in terms of effective factors on effectiveness of new product development in Iran during past 30 years. Many authors believe that new product development process is a knowledge-based activity. This is why that some studies have been done during past years in terms of convergence of new product development process and knowledge

management and also the effects of applying knowledge management processes on the performance of new product development process. The development of new product usually includes the inter-sectional relationships that different participants with different points of view participate in same teams. Such teams can be characterized through the team participants' interaction with each other that result in high levels of synergy. This synergy requires organizing, integration, filtering, summarizing, knowledge interpretation, and related information that are shared in such teams. The scientists employ three types of knowledge in the new product development process. These include 1: general knowledge: this refers to the knowledge that individuals obtain through their daily experiences that are general without any especial area; 2: especial knowledge: this is the knowledge that is obtained through study and experience in an especial area. This knowledge usually can be improved through involving in the projects; 3: process knowledge: this knowledge can be obtained through achieved experiences in an especial area. Indeed, this is a combination of the first types of knowledge. Knowledge management can be defined as a method of decreasing risk of new product development (Sabaghchi et al., 2011). Therefore, the following hypothesis can be developed with regard to the literature review.

5. The knowledge-sharing influences performance of new product development.

3. The conceptual model of study

The conceptual model of study has been presented in figure 1. The relationships between variables of this model refer to the research hypotheses.

Fig2: The conceptual model of study
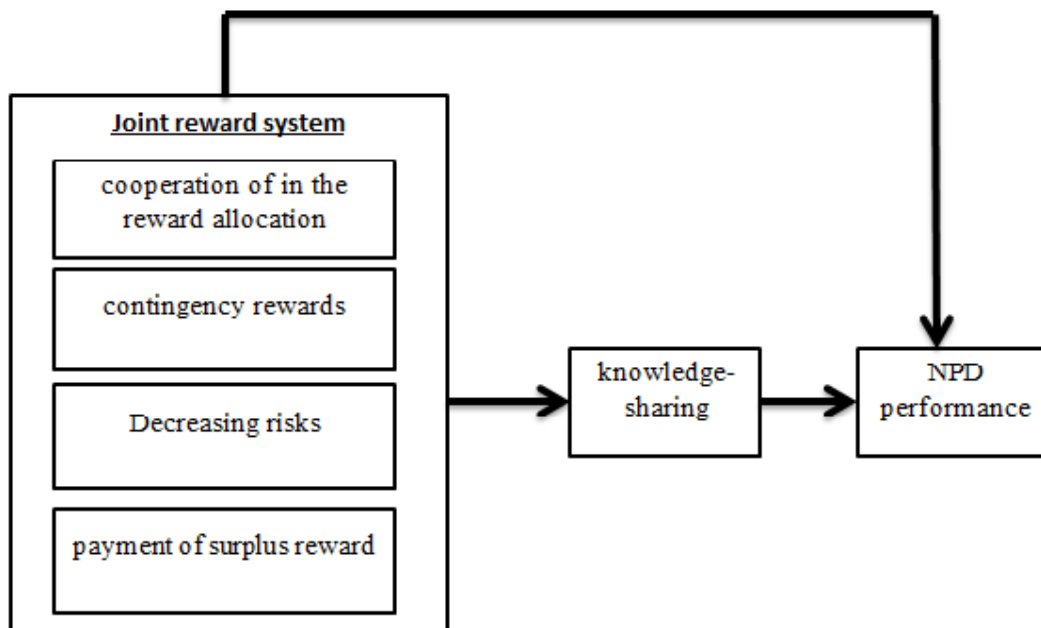
4. Research methodology

This study is a descriptive research from methodological view and is a practical one from purpose perspective. Also this study is a correlational research from identity view.

The relationship between research variables will be analyzed based on the research purposes in this study. Also the relationship and its type between independent and dependent variables will be examined in this study. In order to collect the research data, library and field study methods have been followed. This is why that it can be said that this study is a field study based on identity and research methodology. Finally, it should be said that this study is a descriptive-survey study.

5. Statistical population and sample

The statistical population of this study includes production managers, marketing managers, senior managers, and research and development managers of Isfahan Appliance companies. This population consists of 84 persons. Because this population was as small as that it is not necessary to sampling

6. Data-collection method

In order to collect the research data for testing the research hypotheses, a questionnaire has been used with 35 items. 5 questions of this questionnaire refer to the demographic variables including gender, age, job situation, educational levels, and job experiences and the remaining 30 questions refer to the research variables. About 84 questionnaires have been distributed among respondents that 76 of them were submitted by respondents. Unfortunately, 6 questionnaires were not indicated completely by respondents and so 70 questionnaires were used in final analysis.

7. Reliability and validity of the questionnaire

Although the questionnaire has been standardized by its developer, but it is better to examine its reliability and validity. This is why that reliability and validity of this questionnaire has been examined and its results have been indicated in the following section.

7-1. Validity of the questionnaire

Validity refers to this fact the data-collection instrument can measure the research variables. The importance of validity is that the insufficient and inappropriate instrument can make the research and its finding unusable and invalid. Validity of every data-collection instrument can be measured and determined by any expert in that field. In order to this, the academic experts and professors were asked to review the questionnaire and indicate their modifications and corrections.

7-2. Reliability of the questionnaire

When a data-collection instrument is reliable that there is a powerful correlation between scores and observation and actual scores. In order to examine reliability of this questionnaire, Cronbachs' Alpha Coefficient has been used in this study. In order to this, 30 questions of 30 primary questionnaires have been entreated to the SPSS and then its coefficient was calculated that is 0.92. . These findings have been indicated in table 1.

Table 1: scale, frequency of the questions, and Cronbachs' Alpha coefficient of the questions

Variables	Scale type	Number of questions	Cronbachs' Alpha coefficient
cooperation of in the reward allocation	Likert five-point	4	0.80
contingency rewards	Likert five-point	3	0.71
Decreasing risks	Likert five-point	3	0.72
payment of surplus reward	Likert five-point	4	0.73
knowledge-sharing	Likert five-point	11	0.81
NPD performance	Likert five-point	5	0.77
Total	Likert five-point	30	0.92

8. Data analysis
8-1. The respondents' demographic characteristics

As indicated in past section, five questions have been developed for describing the respondents' demographic characteristics. As the results of descriptive statistics indicated, 98.6% of the respondents were male and 1.4% of them were female. From age view, 40% of the respondents had 30-39 years old that indicate they are young respondents. About 50% of the respondents had academic educational levels (M.Sc.). Finally, the findings showed that 42% of the respondents had 6-10 years job experiences. These results have been indicated in table 2.

Table 2: the respondents' demographic characteristics

Variable	Levels	%	Variable	Levels	%
Gender	Male	98.6	Educational levels	Less than M.Sc.	37.1
	Female	1.4		M.Sc.	48.6
				M.A.	14.3
Age	>30	31.4	Job experiences	>5	20
	30-40	40		6-10	41.4
	40-49	7.1		11-15	11.4
	<50	21.4		16-20	27.1

8-2. Measurement model

Generally, two main models are tested in the structural equation models. The first is measurement model for latent variables. This model refers to the factor loadings of observed variables for latent variables. The goodness of fit measures has been indicated in the following table for all of the latent variables. As indicated in table 3, all of the goodness of fit indexes is in acceptable and in desirable range.

Table 3: the goodness of fit indexes for structural equation modeling

The fit indices	indexes	Secondary model
	NPAR	20
	DF	1
	P >0.05	0.794
Implicit	CMIN (Chi Square)	0.068
	AGFI >0.9	0.993
	GFI >0.9	1
Comparative	TLI > 0.9	1.058
	NFI > 0.9	1
	CFI > 0.9	1
Thrifty	PNFI > 0.5	0.067
	PCFI > 0.5	0.067
	RMSEA <0.08	0.000
	CMIN/DF < 0.5	0.068

8-3. Structural model

It is necessary to test the structural model after testing the measurement model. It is possible through structural equation modeling. In order to this, the Amos has been employed. The conceptual model of this study has been showed in figure 2. In order to use Amos, it is should be remembered that γ refers to the effects of external variables on the internal variables and the β refers to the effects of internal variables on each other. In order to examine significance of β and γ, it is necessary to examine t-value of every path. If the t-value is more than 2 and is significant, it can be said that all of the paths are confirmed. Therefore, it can be said that all of the research hypotheses are confirmed and all of the paths are significant

Fig2: the model of study (path analysis model)
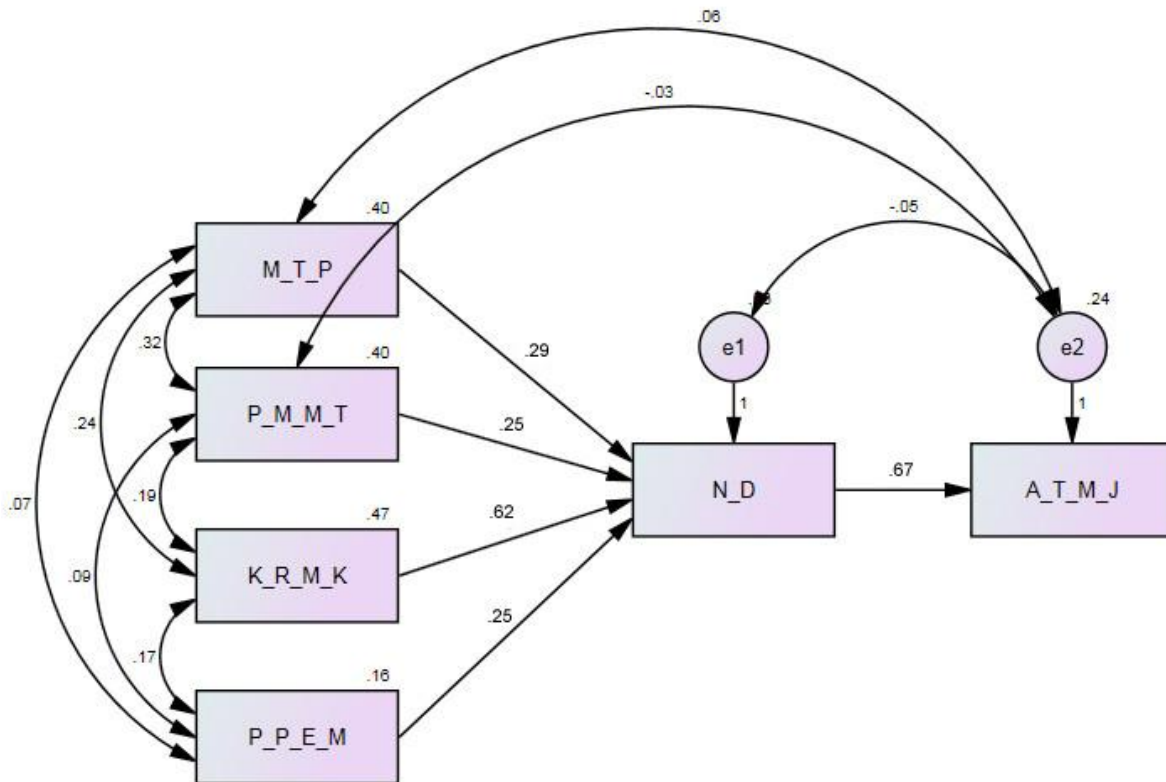
The coefficient of path can be examined through P-value. If the value is less than 0.05, the coefficients are acceptable and vice versa. Therefore, it can be said that all of the research hypotheses are confirmed. The results of examining direct and indirect effects of independent variables on dependent variable have been indicated in table 4.

Table 4. Examining direct and indirect effects of independent variables on dependent variable

	Secondary hypotheses	Standard coefficient	Standard error	C.R. Critical ratio	p-value	Result
cooperation of in the reward allocation ---> knowledge-sharing	H1	0.292	0.045	4.494	***	Is confirmed
contingency rewards---> knowledge-sharing	H2	0.245	0.079	2.064	0.039	Is confirmed
Decreasing risks---> knowledge-sharing	H3	0.625	0.059	6/433	***	Is confirmed
payment of surplus reward ---> knowledge-sharing	H4	0.245	0.057	3.574	***	Is confirmed
knowledge-sharing---> NPD performance	H5	0.636	0.175	4.377	***	Is confirmed
***P is less than 0.001						

In order to examine the direct and indirect effects of independent variables on the dependent variable, it is necessary to examine the total, direct, and indirect effects for internal variables.

Table 5: total, direct, and indirect effects

Dependent variable	Independent variable	Direct effect	Indirect effect	Total effect
knowledge-sharing	cooperation of in the reward allocation	0.29	-	0.29
	contingency rewards	0.25	-	0.25
	Decreasing risks	0.62	-	0.62
	payment of surplus reward	0.25	-	0.25
NPD performance	cooperation of in the reward allocation	-	0.64*0.29	0.18
	contingency rewards	-	0.64*0.25	0.16
	Decreasing risks	-	0.64*0.62	0.4
	payment of surplus reward	-	0.64*0.25	0.16
	knowledge-sharing	0.64	-	0.64

9. Conclusion

The results of this study revealed that designing reward system in common form influences new product development significantly (β: 0.48). These results are in consistency with the results of Li Paein et al. (2002). With regard to the main solution in maintaining and preserving companies in today's competitive market is to invent and develop new products. This is known as new product development. Many authors believe that the new product development is a knowledge-based activity. This is why that many studies have been done during past years in terms of convergence between new product development process and knowledge management and the effects of applying knowledge management processes in the performance of new products development process. The knowledge-sharing influences new products development positively (γ: 0.64). The results of this hypothesis are consistent with findings of Song et al. (2006). The results of structural equation modeling revealed that participation in the reward allocation influences knowledge-sharing positively (γ: 0.29). The appropriate contingency reward influences knowledge-sharing significantly (γ: 0.25). These findings are in consistency with Tosan et al. (2007) findings. The results of the study revealed that decrease in the risks of participation influences knowledge-sharing significantly. These findings are supported by findings of Bartol (2005) and Mahajan (2007). The surplus payment for employees' participation influences knowledge-sharing positively (γ: 0.25). The results also revealed that reward system influences new product development. It can be concluded from this finding that the managers can influences new product positively development through development, implementation, and designing of reward system collectively. The results also revealed that the reward system mechanism influences knowledge-sharing significantly. Therefore, it can be said that distribution and sharing of knowledge is a good instrument for transforming creative and innovative ideas to new products.

10. Limitations of study and suggestion for future studies

Every author has several limitations in his/her study that some of them exists in beginning of study. Also every comprehensive study has several limitations and difficulties that these prevent from generalizing its results to other cases. Recognizing these limitations paves the grounds for interpreting its results and promoting quality level of the future studies. There are several limitations in this study that some of these have been presented in the following sections. The difficulties that the managers facing in communicating managers, managers' sensitivity toward questionnaire, and inappropriate organizational culture are the main limitations of this study. Undoubtedly, the main limitation of every study is that the authors cannot generalize the results of the study to other cases. Such a limitation exists in this study and the authors cannot generalize its results and findings to other cases. Also this study has been done in an especial area of Iran in the city of Isfahan and thereby its results cannot be generalized to other cities of Iran.

The following suggestions can be indicated based on the findings of this study. The common rewards are allocated to the new product development team for their performances. Also the managers can use policies of common reward allocation as an instrument for creating motivation in new products development team. It is suggested that the project team members are asked to present their points of view in terms of reward allocation. Also it is necessary to consider the participants' collective behaviors in order to manage the unpredictable conditions.

When the team members fail, they will be encouraged to more efforts. Also the management has to encourage the employees to the entrepreneurship behaviors through supporting their new ideas and risk-taking behaviors. The reward system should be designed so that encourages creativity and innovation and also give surplus reward for employees who achieve higher levels of performance. If the new product development team fails in doing projects, the organization gives their main salaries. The organizations pave the grounds for creating knowledge through meetings without any problems and difficulties. With regard to this fact that knowledge-sharing influences new product development positively, the managers should seek to increase the employees' access to the knowledge and information. The knowledge should have sufficient reliability and can be accessible in necessary time and place so that can be used for creating new ideas about products. In order to distribute knowledge across the organization, the formal and informal and explicit and implicit knowledge should be distributed. In the present study the operational managers' participation in the reward allocation, contingency rewards based on the new product development progress, decreasing the risks of employees' participation, and surplus rewards payment for participants are the main mechanisms of joint reward system. It is suggested that the future authors use other variables such as cooperation and coordination as reward systems mechanisms and also their effects on the new product development will be examined. Finally, it is suggested that the future studies examine the common rewards in new products development process in other industries so that its results can be compared with results of the present study.

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