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Research Article

THE STUDY OF RELATIONSHIP BETWEEN TECHNOLOGICAL INNOVATION MANAGEMENT, ORGANIZATIONAL ATMOSPHERE AND SELF-LEADERSHIP ON INNOVATION PROCESS, INNOVATION PERFORMANCE AND ACTIVITIES

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ABSTRACT
This paper is published in order to help management and leadership, to maintain survival and development in dynamic and progressive conditions in IT and science era and communication in a green way. The purpose of this work is to illustrate the relationship between three main components including: scientific – technical, psychological – social and innovative – entrepreneurship in Zanjan Azad University and for this goal, four hypotheses are provided:
1. There is a significant relationship between TIM and innovation process (scientific – technical dimension).
2. There is a significant relationship between TIM and innovation performance (scientific – technical dimension).
3. There is a significant relationship between collaborative atmosphere and innovative activities (social – organizational dimension).
4. There is a significant relationship between self-leadership and innovative activities (psychological dimension).
This research is performed using standard questionnaires distributed among 72 managers and experts' 88 personnel of the university and to process the data, descriptive and inferential statistical methods (correlation and multivariate regression) by SPSS, Liesrel and Stepwise software were used.
None of the hypotheses were rejected and executive recommendations about each of the hypotheses were presented.

Keywords: *Tim, Self-Leadership, Collaborative and Innovative Atmosphere*

INTRODUCTION
Managers and leaders of the organizations obtain information and resources necessary for survival and development from environment through concentration on customers' needs and requirements (Zahir *et al.*, 2012).
Management literatures consider an innovative strategy as a vital and important factor for organizations (Borumand and Ranjbari, 2009). TIM is a category which can cover factors such as knowledge promotion and intellectual capital, effective utilization of resources, protecting environment and so on (Ghanbari and Mohammadi, 2012).
Several frameworks are presented for technological management and by summarizing them, a more comprehensive framework can be presented from combination of six activities (acquiring, utilization, recognition, learning, protection and selection) for enabling a dynamic and specific potential and six tools (patent analysis, portfolio management, roadmap development, S curve, gate stage and value analysis) are presented for increasing technology capacity.
On the other hand, these are personnel of the organization who enable it to grow and are the most basic capitals of the organization.
Of the important mechanisms for managing such critical issue is making structure and atmosphere for participation, providing leadership mechanisms and cultural atmosphere of self-leadership which together form the socio-psychological atmosphere of innovation (Jacob and all, 2008; Houghton, 2008; Tastan 2013).

Research Article

Literature Review

a. Innovation

In psychology, innovation is a process which leads to conceptualization, hypothesizing and problem solving (Farmer, 2003). According to above definition, innovation is an extensive process which at least has three main stages:

1. Innovation or creativity: is a mental activity which results in inference and clarification of novel concepts and finally invention, discovery and new theories. From psychological point of view, it entails a certain level of talent and personality characteristics and an appropriate cultural environment.

2. Initiative: is an ability or skill of using findings of previous group according to environmental conditions or a type of technique and art of engineering which is affordable by the realistic creative person.

3. Entrepreneurship: whether personal or organizational, it is a valuable tool for development and is a reasonable and active thought created according to opportunities and conditions (Limmons & Spinellit, 2008).

Triple concepts of innovation, initiative and entrepreneurship are related to each other and have overlapping and separate categories which can be sketched as follows.

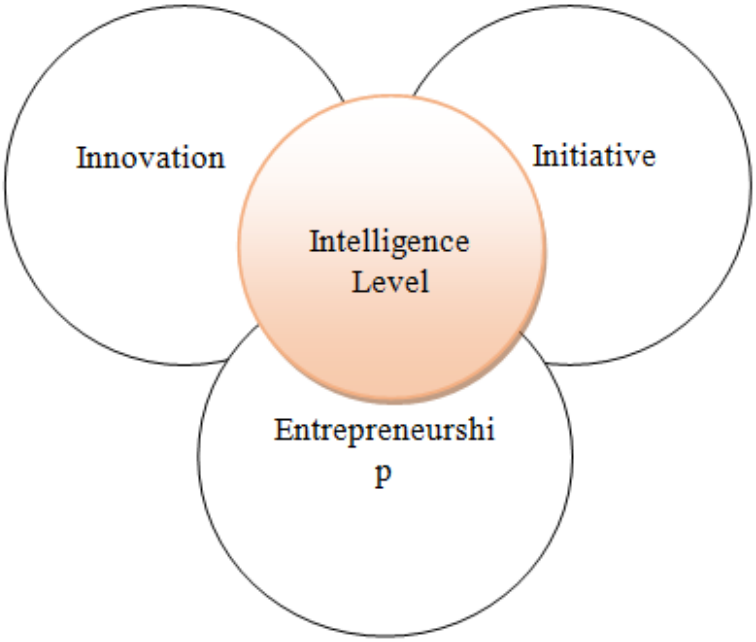

Figure 1: Khodaverdi, 1993, p. 65, MSC thesis

Initiative Categories

1. **In outlets:** including products, services and their distribution
2. **In inlets:** including materials, resources, skills and methods of supply
3. **In processes:** technologies, skills and procedures
4. **In supply:** customer needs and requirements
5. In reducing design time, development and production
6. **In expenses:** increasing profit margin and competitive advantage
7. in making value for customers

Characteristics of Innovation

Fluency, originality, flexibility and extensibility (Algue and Filier, 2010)

Components of Innovation

1. expertise, creative thought and attempt (Hennessey & Amabile, 1976)

2. casting doubt on reasoning and their conclusions (Torran, 1979)
3. being affected by thinking, intelligence and processing processes (Guil, 2005)
4. multiple factors of personality, cognitive, family and social abilities (Gernberg, 2009)

Tools of Improving Innovation

Brainstorming, kinetic, lateral thinking, neural and expressive planning, mental planning and so on as well as techniques of TRIZ and IFR.

Models of Innovation

Graham Wallace, Osborne, Roseman and full basic

b. Technological Innovation Management (TIM)

It's any type of ability which enables us to manage utilities, knowledge, environment and nature.

Importance of Technology

Technology is the factor of historical developments and material saving, capital, workforce, quality improvement, production, communication improvement, speed and accuracy improvement, as well as increasing economic, industrial, military, political and security capacity and finally development and revolution in science and culture. Technological deficiency leads to weakness in meeting needs and security, lower quality of exports and increase of imports.

There are various frameworks for managing technology, one of which is a combination of six activities (acquiring, utilization, recognition, learning, protection and selection) for enabling a dynamic and specific potential and six tools (patent analysis, portfolio management, roadmap development, S curve, gate stage and value analysis) are presented for increasing technology capacity (Ansari and Soltan Zadeh, 2012).

Research has shown that technology management and research and development have more ability to predict organizational innovative performance (Ghanbari Pour and Mohammadi, 2012).

TIM is in fact a chain of relationship between science, engineering and management as follows:

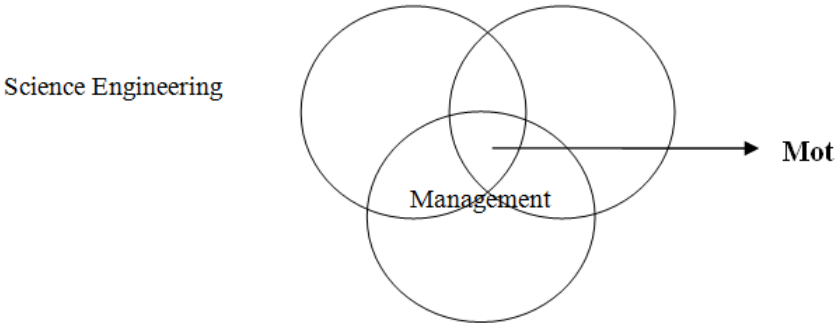

Figure 2: Basirzadeh, 2010

General Model of TIM

Framework of technology management (Cetin and Damar *et al.*, 2010)

c. Collaborative Atmosphere

Structure and culture of an organization play pivotal role in innovations and most of the common problems of industry arise from weakness of culture and structure in substantiating talents and thoughts (Tastan, 2013).

Recognition of organizational atmosphere which is the result of concrete aspects are important and affect consciousness, commitment and diligence since in addition to talent and genius, innovation requires hard working and concentration. Organizational atmosphere which represents the identity of the organization if provides personnel with satisfaction and motivation, can make appropriate circumstances for flourishing talents (Karim *et al.*, 2013).

Appropriate structure and participation of personnel, together with scientific management of human resources and communications as well as access to information is another field of organization for improving innovation.

d. Self-leadership

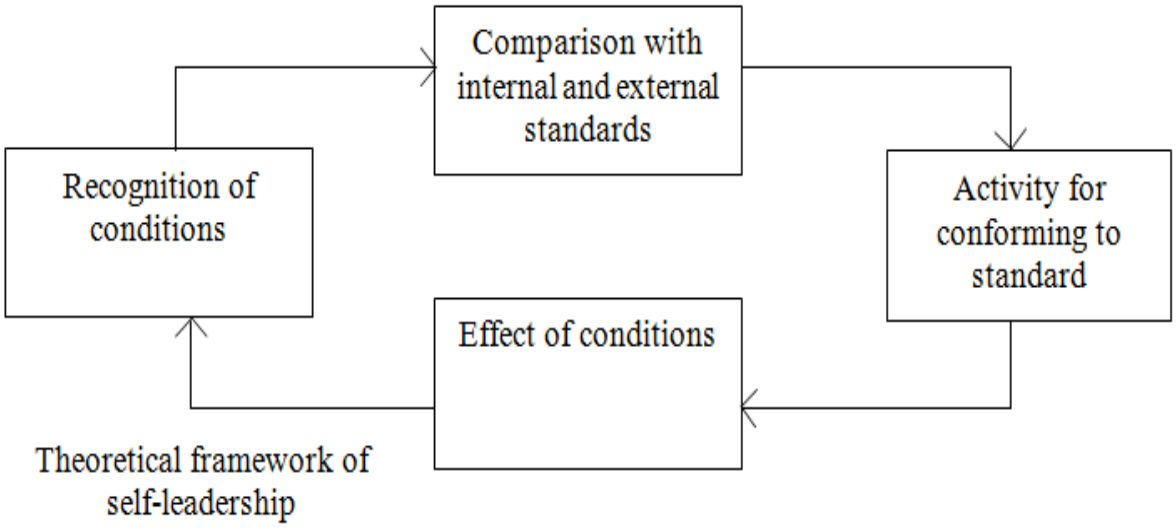

Figure 3: Stwart, 2011

When someone has an understanding about his position, he selects a path and applies behaviors for conforming to criteria. Self-leadership goes to the extent that not only people and groups reject external norms and criteria. Instead, they make internal standards.

MATERIALS AND METHODS

Methodology

Dependent variables of this work are TIM (scientific and technical), participatory and self-leadership (managerial - leadership) (personal – psychological).

Independent variables are innovative performance, innovation process and innovative behavior.

Research Hypotheses

1. There is a significant relationship between TIM and innovation process.
2. There is a significant relationship between TIM and innovation performance.
3. There is a significant relationship between participation atmosphere and innovation behavior.
4. There is a significant relationship between self-leadership and innovation behavior.

Data Collection Tool

In this work, to measure variables, standard questionnaires are used (for TIM, 4 questions about technological innovation management and 4 questions for research and development) from the work of Ghanbari and Mohammadi (2012) and for innovative performance (4 questions for innovative process) of the work of Farsijani and Samiei (2010), For participation atmosphere, questionnaire of Tastan *et al.*, (2013), For self-leadership, questionnaires of Fotoun and Lak (2002), for innovative behavior, questionnaire of Counter (2001) and indigenizing questionnaires are pretested and stability of Cronbach alpha is calculated.

In this work, 2 types of questionnaires are designed and distributed. First questionnaire was distributed among managers and experts for measuring relationship between TIM and innovative performance and process and the second one was distributed among personnel for measuring participation atmosphere and self-leadership.

Statistical Population

Includes all managers and experts of the first questionnaire who were 72 persons from which no sampling was performed and 170 personnel of the organization who received the second questionnaire from which simple random sampling was performed using Cochran formula.

Table 1: Calculating Cronbach alpha for questionnaire questions

Cronbach alpha	Questions	Variable	No.
0.862	8	TIM	1
0.857	4	Innovation process	2
0.745	4	Innovative performance	3
0.820	5	Innovative behavior	4
0.85	20	Participation atmosphere	5
%83	18	Self-leadership	6

Data Processing Statistical Methods

To process data from descriptive statistics, test of normality and correlation factor, multivariate regression and SEM as well as SPSS, Liesrel and Stepwise software were used.

Table 2: Normality test, Kolmogorov – Smirnov

Sig	No.	Variables
0.05	72	TIM
0.38	72	Innovative process
0.17	72	Innovative performance
0.110	88	Participation atmosphere
0.105	88	Leadership atmosphere
0.25	88	Innovative behavior

Since sig is more than 0.05, all of the variables have normal distribution.

Descriptive Statistics of Research Hypotheses

Table 3: Abundance of TIM

	Description	Abundance	Abundance percent	Percent of reliability	Cumulative percent
Reliability	Disagree	20	27.8	27.8	27.8
	Null	36	50	50	77.8
	Agree	16	22.2	22.2	100
	Total	72	100	100	0

Table 4: Abundance of innovative performance

	Description	Abundance	Abundance percent	Percent of reliability	Cumulative percent
Reliability	Disagree	18	25	25	25
	Null	20	27.8	27.8	52.8
	Agree	34	47.2	47.2	100
	Total	72	100	100	0

Table 5: Abundance of innovation process

	Description	Abundance	Abundance percent	Percent of reliability	Cumulative percent
Reliability	Disagree	18	25	25	25
	Null	34	47.2	47.2	72.2
	Agree	20	27.8	27.8	100
	Total	72	100	100	0

Hypothesis 1

There is a significant relationship between TIM and IP.

By means of linear regression model of $IP = A_0 + B.TIM + E_0$, test output can be summarized as follows:

Table 6

	Non- Standardized coefficient		**Standardized coefficient**	**statistic**	**Level of significance**
	Variables coefficient	**Standard error**	**Beta**		
Constant	2.196	0.514	-	4.270	0.00
TIM	0.283	0.170	0.274	1.664	0.105
2.303 :(D-W) Durbin – Watson statistic			: (sig) Level of significance	2.769 : (F) statistic	
0.075 : (R^2) Determination factor			0.105		
			0.55 : (R) Correlation factor		

Results of above table

1. Value of Durbin – Watson is 1.5~2.5. Therefore, there is no positive correlation between regression errors and regression model can be used.
2. Determination factor shows that TIM has no effect on IP and this hypothesis is rejected.

IP = 2.196 + 0.283 Tim

Hypothesis 2

There is a significant relationship between TIM and IPR and output of the test can be summarized as follows:

Table 7

	Non- Standardized coefficient		**Standardized coefficient**	**Statistic**	**Level of significance**
	Variables coefficient	**Standard error**	**Beta**		
Constant	1.339	0.505	-	20652	0.012
Tim	0.630	0.167	0.550	30838	0.001
2.303 :(D-W) Durbin – Watson statistic			: (sig) Level of significance	2.769 : (F) statistic	
0.075 : (R^2) Determination factor			0.105		
			0.55 : (R) Correlation factor		

Above table shows that:

1. Value of Durbin – Watson is 1.5~2.5. Therefore, there is no positive correlation between regression errors and regression model can be used.
2. Determination factor shows 30.2% of the IPR changes can be expressed by TIM.

F-statistic and sig show that TIM contribute to innovation process

Inferential Statistics

Hypothesis 3

Table 8: Results of correlation test of participation atmosphere and innovative behavior

Participation behavior		**4 independent** **4 dependent**
0.82	Correlation factor	Innovative behavior
0	Sig	
88	Sum	

Table 9: Results of correlation test of self-leadership and innovative behavior

Self-leadership		**4 independent 4 dependent**
0.49	Correlation factor	Innovative behavior
0.008	Sig	
88	Sum	

Multivariate Regression Analysis (Innovative Behavior and Dimension of Participation Atmosphere)

Table 10: Initial information of regression of participation atmosphere

Model	**Input variables of model**	**Inactive variables**	**Method**
1	Access to information, innovative behavior Participatory environment, political and social supports	0	Enter

Table 11: Multiple correlation factor and determination factor of participation atmosphere

Model	**Multiple correlation factor**	**Determination factor**	**Moderation factor**	**Deviation error**
1	0.918	0.84	0.82	0.32279

Multiple correlation factor as much as 0.92 shows a considerable relationship and determination factor as much as 0.84 means that 84% of the innovative behaviors are determined by this variable.

Hypothesis 4

Table 12: Initial information of regression of self-leadership

Model	**Input variables of model**	**Inactive variables**	**Method**
1	Strategies of innovative behavior, natural award, behavioral, creative thought	0	Enter

Table 13: Multiple correlation factor and determination factor of self-leadership

Model	**Multiple correlation factor**	**Determination factor**	**Moderation factor**	**Deviation error**
1	0.689	0.475	0.466	0.58733

Table 14: Variance analysis for participation atmosphere

Model		**Sum of squares**	**DOF**	**Mean of squares**	**F**	**Sig**
1	Regression	54.037	2	18.012	-	
	Residues	59.677	85	0.345	52.217	0
	Total	113.714	87	-	-	

Since the level of significance of the test is less than 0.05, regression model is significant and model can predict the dependent variable.

Discussion and Recommendation

The purpose of this research is to investigate the relationship between scientific – technical, psychological – social and innovative – behavioral dimensions and in this way, 4 hypotheses were provided and through descriptive analysis, correlation and regression in managers, experts and personnel level was tested. None of the hypotheses were rejected. Since triple above dimensions are of considerable importance in internal empowering, development and external growth of the organization, according to results of the analysis, following recommendations are presented:

a. Regarding scientific – technical dimension (TIM and R&D), innovative performance, process innovation, i.e. relationship between two first hypotheses

1. Innovative performance, IP and innovative process for improving quality and organizational empowering are very important. Therefore, it is better to achieve higher levels of performance through continuous improvement and their readjustment.
2. Strategy of improving product innovation and development and diversification leads to improving knowledge and special empowerment of the organization which are rarely non-imitable.
3. Establishing committees and professional cores and promoting the culture of scientific – technical thinking in organizations through holding workshops and skill improving sessions
4. Analysis and revision of quantitative and qualitative criteria for doing jobs in order to deepen correctness and well-doing jobs.

In psychological dimension of the organizations and innovative behaviors of personnel, two hypotheses were prepared and according to results, following recommendations are presented. First, for improving participating environment:

1. Familiarizing managers with abilities and talents of the personnel working for them and making friendly atmosphere for utilizing their opinions in organizational decisions whether in decision making or implementation
2. Holding meeting of units managers for providing a friendly atmosphere and mutual confidence
3. Establishment of professional committees for evaluating characteristics and outcomes of personnel recommendations and fair compensation for encouraging innovative activities

Effect of self-leadership on personnel's innovative behavior:

1. Emphasis and concentration on human resources management, specifically in selection, testing and evaluation stages and feedback and considering the dimension of self-awareness about talents and emotions, self-evaluation, self-testing and control
2. Holding training workshops in order to improve purposeful independent behaviors, strengthening communication abilities and reducing confusions through establishing cultural committees to achieve collaboration and synergy
3. Using brochures and posters as well as making cultural patterns and symbols for institutionalizing self-reliance besides improving the sense of collaboration, cooperation and coordination.

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