



Full Length Research Paper

The Effect of Thinking Styles on the Organizational Innovation in the Metal Industry City in Iran Kaveh

Majid Ghobadi ^{1*} and Behzad Shoghi ²

¹ Department of Psychology and Social Science, Central Tehran Branch, Islamic Azad University, Tehran , Iran

² Young Researchers Club, Saveh Branch, Islamic Azad University, Saveh, Iran

**Corresponding Author: Majid Ghobadi*

Abstract

This study aims to study the effects of thinking styles on the organizational innovation in metal industries of Kaveh Industrial City of Iran in 2012. The population of the research included 4700 employee involved in metal industries of Kaveh Industrial City, among whom 355 subjects were selected as the research sample by using Cochran formula and sampling method of relational stratified random sampling method. The instruments of the research included Thinking Styles Questionnaire (Sternberg and Zhang, 2005) and Organizational Innovation Questionnaire (James, et al., 2008). Before path analysis and testing the hypotheses of the research, we investigated the technical characteristics of the used measuring instruments (i.e. the reliability and validity of the questionnaires) by Cronbach's Alpha and factor analysis. Then the obtained results of the questionnaires were analyzed using the factor loadings and t coefficients by LISREL software. The results showed that the thinking styles have positive effect on the innovation of the employees of the organization.

Keywords: Metal Industries, Organizational Innovation, Procedural Innovation, Thinking Style.

Introduction

In order to undertake the competition and continue their life and growth, the organization search for the competitive advantage; and the innovation is one of the most important ways of reaching such an advantage. The organizations have to be innovative in order to be responsible for the demands of their customers and their variable life style and in order to exploit the new opportunities of the technology and market changes (Rowley, et al, 2011). Innovation is increasingly becoming a main factor of long term success of the companies in the competitive market because if the companies have a high capacity for innovation, they will manage to react better and more prompt to the environmental challenges (Jimnes, et al, 2008). According to Sternberg (1998), thinking style is one of the three effective factors on the creativity and innovation (the two other factors are intelligence and personality). Ford (1999) believes that several factors (such as the capabilities and motivations) are necessary for creating the innovation in every organization but the thinking style plays a prominent role in this regard. In order to show the necessity of conducting such a research it is sufficient to point out that if the person is familiar with the thinking styles, his strategies for decision making and problem solving will be extended and his wrong decisions will be reduced. Moreover, when the necessity for change is inevitable in today complex and competitive environment, the thinking style can be changed as well. On the other hand, with regard to the effectiveness of the thinking style on the behavior and activities of the people, it is necessary for the managers to adopt their facilities appropriate to the thinking styles of the persons and so facilitate the development the personal and organizational the innovation of their employees.

Table 1. Classification of the characteristics of thinking styles (Sternberg, 1994)

Thinking styles		Characteristics
Functions	Legislative	Tend to create, invent, and plan, and do the tasks in their own way
	Executive	Tend to follow the instructions and do what have been said to them
	Judicial	Tend to judge and evaluate the people and the works
	Monarchic	Tend to do his task in a specific single period of time, and spend all his energy on doing that task
Forms	Hierarchical	Tend to do several tasks in a specific time, and prioritize his tasks and the way of doing the tasks, and specifies the needed energy for doing that task
	Anarchic	Tend to use random methods for solving the problems but faces problems in prioritizing the tasks

Levels	Global	Tends to deal with the generalities, and general and abstract forms
	Local	Tends to deal with the details and concrete things
Domain	Internal	Tends to do the tasks personally and focus on his own internal world
	External	Tends to do tasks in group and focus on the external world
Tendency	Liberal	Tends to do tasks in new ways; fights the traditions
	Conservative	Tends to do the tasks in pre-tested proper ways; follows the traditions

The concepts of creativity and innovation are usually used interchangeably though many writers may distinguish these two terms. Some researchers have considered the creativity as the mental and internal process about new ideas while the innovation implies the practical use of such ideas. Basadur, et al. (2002) found that the creativity can be developed, increased, and conducted by the organization. The creativity and innovation can occur by anyone anywhere in the organization. Innovation is the process of accepting creative ideas and converting them to the new products, services and methods of operation. In other words, innovation is the process of implementing creativity and fulfilling and operationalizing new ideas, and in general words, converting creativity into concrete results (Plessis, 2007). Innovation can be classified in different types based in the applications and levels. Different types of innovation have different effects on the organization and consequently will lead to different results (Siguaw, et al., 2006). Some studies have focused on some types of innovation such as the innovation of product, process, administrative, technical and fundamental, and gradual. Others divide the innovations into two main types: administrative innovation and technical innovation. Technical innovation relates to the new products, processes or services; while administrative innovation relates to the changes of social structure of the organization like the employment policies, resource allocations, task structures, authorities, and awards (Draft, 1978). One of the commonly referred innovations that is usually related to the coming opportunities of the organization and is indeed the subsequent of the technological developments is the technological innovation. This type of innovation includes innovations that are being begun by the technologies (Damanpour and Evan, 1984). Product innovation and process innovation are other types of innovation. Product innovation refers to the new or improved products and services for the customers, and the process innovation includes what changes or improves the ways of handling the affairs in the organization (Knight, 1967). Fundamental innovation and gradual innovation is another classification that is being done based on the scale of the changes and the scale of the novelty of innovation. Fundamental innovation refers to the fundamental and basic changes, while gradual innovation refers to the innovations that are added to previous ones without changing the basic ground. In yet another classification, Weng, et al. (2001) classified the innovation in three groups: technological, market, and organizational innovation:

Technological innovation is the relationship between the parts, methods, processes, and technics that are being utilized in the process of service and/or product innovation. Technological innovation leads to the increase of the competitive advantage and the improvement of the organizational efficiency and performance.

Market innovation includes the new knowledge in channels of distribution, production, and application in order to meet the needs, values, and expectations of the customers, and its main objective is to improve the marketing mix (product, price, distribution, and promotion) and to identify the new and potential markets in order to create more beneficial advantages for the customers (Ojasalo, 2008).

Organizational innovation refers to the openness of the organization, accepting new ideas, and being willing to change the situations based on the new technologies, resources, skills, and administrative systems (Ussahawanitchakit, 2008).

Theoretical framework of the research

Components of the organizational innovation

- 1) **Productive innovation:** productive innovation provides the tools for the production and refers to the development and providing new and improved productions and services. Indeed, productive innovation shows how much the organization is pioneer in providing new services, assigning financial resources for research and development, etc.
- 2) **Procedural innovation:** provides the needed tools for preserving and improving the quality and saving the costs. This type of innovation includes the adoption of new and improved method for production, distribution and delivering the services. In fact procedural innovation shows how much the organization applies new technologies and tests new methods of work.
- 3) **Administrative innovation:** refers to the new organizational procedures, policies, and forms. It includes the changes that affect the policies, resource allocation, and other factors that are related to the social structure of the organization (Jimenez, et al., 2008).

Several studies have shown that the thinking styles are related to the processes of creativity and innovation. Moreover, there are different factors such as the culture, gender, parenting styles, and socio-economic situations that are able to affect these styles. Ettlie, et al, (2011) points out that there is a significant relationship between the thinking styles and the creativity and innovation in the organizations. Besides, in their research, Zhu and Zhang (2011) found that there is a significant relationship between the thinking styles and concepts of creativity.

In yet another research, Yang and Lin showed that there is a positive significant relationship between the liberal, legislative, judicial, global, and external thinking style and the creativity, while the relationship between conservative, local and internal thinking style and the creativity, is a negative significant relationship (Beceran and Ozdemir, 2010, quoted by Purqaz, et al., 2011).

On the other hand, in his research, Pelffin (2005) has shown that some dimensions of the working environment lead to creativity and hence they lead to the increase of organizational creativity and health. This study has shown that the role of leader's thinking style can be effective on the organizational creativity and health by providing suitable environment and situation.

Dean, et al. (2008) have stated in their study that there is a significant relationship between the thinking styles and the creativity. They also stated that there is a significant relationship between the challenge-taking, risk taking and creativity as well. Additionally, Zhang (2002) conducted a research on 371 subjects in order to study the relationship between the thinking style and the creativity. He concluded that the creativity has relationship with the thinking style, while this relationship is positive with the global thinking style and negative with the local thinking style.

Hypotheses

Considering these two main factors, we proposed our hypotheses as follow:

Main hypothesis: the thinking styles of the employees are effective on the innovation in the organization.

Subsidiary hypothesis 1: thinking functionalities of the people in organization are effective on the organizational innovation.

Subsidiary hypothesis 2: thinking forms of the people in organization are effective on the organizational innovation.

Subsidiary hypothesis 3: thinking levels of the people in organization are effective on the organizational innovation.

Subsidiary hypothesis 4: thinking domains of the people in organization are effective on the organizational innovation.

Subsidiary hypothesis 5: thinking tendencies of the people in organization are effective on the organizational innovation.

With regard to the main objective of the research that is to study the effects of the thinking styles on the organization innovation of the employees of metal industries of Kaveh industrial city, and with regard to the hypotheses of the research, the theoretical framework of this research is show on Figure. 1.

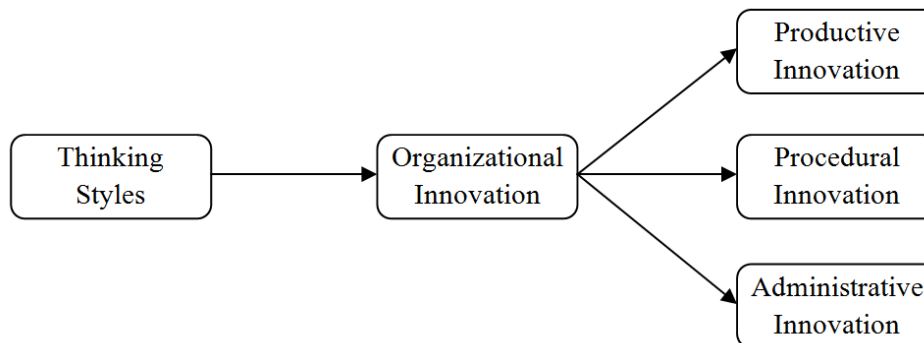


Fig. 1. Theoretical framework of the research

Methodology

The methodology of this research is functional according to its objective, and it is a descriptive survey according to its data collection method because it has polled the opinions of the involved subjects (employees of the metal industries in Iranian Kaveh Industrial City) to confirm its hypotheses. Moreover, this is a quantitative research with regard to the type of its collected data. Accordingly, we planned and distributed a series of questionnaires in order to collect the opinions of the employees of the metal industry of Iranian Kaveh Industrial City, and the collected results were recorded. Since in this research the causal relationship was going to be studied, the methodology of the research is causal with regard to the relationship between the variables; and we have used the structural equation model to come to a comprehensive analysis of our conceptual model. Structural equation model is the best tool for the researches in which the observed variables have measuring errors, and the relationship between their variables is complex.

Statistical population, sampling method, and sample size

The population of the research contains all employees in the companies of metal industry in the Iranian Kaveh Industrial City, which includes 4700 employees. The companies of the metal industry in the Iranian Kaveh Industrial City (36 companies) were divided into 4 groups: aluminum metal manufacturing companies, non-aluminum metal companies, household appliances, and automobile.

Relying on the relative stratified random sampling method, 12 companies out of the 36 active companies in the metal industry were selected as the sample. Then using the Cochran formula, we specified the sample size for our 4700 subject population. To

use the Cochran formula it is necessary to consider its assumptions. The assumptions of the Cochran formula include: $p=q=50\%$ (on the basis of probabilistic method); z is the standard statistic for normal distribution that is equal to 1.96 at the confidence level of 95%; d is the maximum allowable error (equal to 5% for this research); and N is the number of the employees in all relevant companies. The sample size (n) is calculated according to equation 1 on the basis of the Cochran formula (Saraei, 2000):

$$n = \frac{z^2 pqN}{Nd^2 + z^2 pq} \tag{equation 1}$$

Thus using the equation 1, considering the number of the statistical population (4700), 355 subjects were selected as the statistical sample. At the last step, regarding the number of the employees of each company and the total sample, we calculated the sample of each company separately. It is to be mentioned that 370 questionnaires were distributed among which the number of 360 questionnaire were completed and got back (response rate of 97%), and 5 questionnaires were removed due to their incompleteness. Thus the statistical operation was conducted on 355 subjects.

Data collection instrument: Reliability and validity

In order to collect the data we have used Thinking Styles Questionnaire (Sternberg and Zhang, 2005) and Standard Organizational Innovation Questionnaire (James, et al., 2008). The formal validity of the research was investigated through acquiring the opinions of some experts of the field (academic members of Islamic Azad University, Saveh Branch) and accordingly, their corrective comments were applied to the questionnaires. And in order to assess the reliability of the questionnaires we relied on Cronbach alpha method and the Cronbach's Alpha coefficient was calculated for each dimensions of the subject. The obtained coefficients were as follow: function: 0.76; forms: 0.83; levels: 0.81; domain: 0.77; tendency: 0.75; productive innovation: 0.83; procedural innovation: 0.80; and administrative innovation: 0.84. Since all coefficients are higher than 0.7, thus the measuring instrument of the research is reliable, so our questionnaire proved to be reliable. After collecting the questionnaires, we first conducted exploratory factor analysis using SPSS 20; and since in the communalities table, the extracted communality values of all factors were higher than 0.5, thus no one of the factors was removed. In the next step, we conducted confirmatory factor analysis using LISREL 8.8 in order to assess the used measuring model. According to Joreskog and Sorbom, the fitness conditions of the model are as follow: the significant level obtaining from the chi-square test (p -value) is higher than 0.05; the ratio of chi-square to degree of freedom is less than 3; the value of the statistic of Root Mean Square Error of Approximation (RMSEA) is less than 0.05; the value of comparative fitness index (CFI), general fitness index (GFI), adjusted general fitness index (AGFI), and non-norm fitness index (NNFI) are higher than 0.9. As it is shown in figure 2 (standardized coefficients), p -value is equal to 0.053; RMSEA is equal to 0.025; and the ratio of chi-square to degree of freedom is less than 3. Moreover, other outputs of LISREL showed that the value of CFI is equal to 0.911 and the values of GFI and AGFI are equal to 0.912 and 0.934 respectively. Figure 2 (standardized coefficients) shows that all factor loadings are higher than 0.3.; thus all relationships are significant. Moreover, figure 3 (t-value coefficients) show that all t-values are significant (higher than 1.96). Thus no one of the model indexes was removed and it was found that the fitness of both measuring models is acceptable.

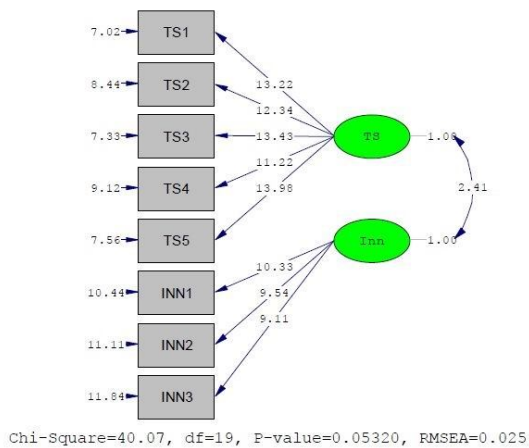


Fig. 3, T-values; Thinking Style (TS) and Organizational Innovation (INN)

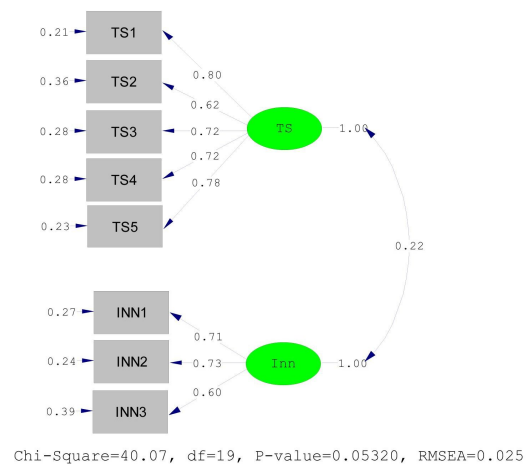


Fig. 2, Standardized coefficients; Thinking Style (TS) and Organizational Innovation (INN)

In the next step, we used structural equation model in order to test the structural part of the model and to know the relationship between the independent variable (thinking style) and the dependent variable (organizational innovation). Table 2 shows the output results of LISREL software in this step. As it is shown in table 2, all t-values are significant (higher than 1.96) and hence all hypotheses of the research are confirmed.

Table 2. Results of testing the structural part of the structural equation model

Hypotheses	Standardized coefficients	t-value	Result
Thinking styles → Organizational innovation	0.81	19.11	confirmed
$\chi^2 = 141.33$ df=71 RMSEA= 0.004	GFI= 0.93	AGFI= 0.94	
Thinking functionalities → Organizational innovation	0.31	11.65	confirmed
Thinking forms → Organizational innovation	0.24	12.72	confirmed
Thinking levels → Organizational innovation	0.19	11.21	confirmed
Thinking domain → Organizational innovation	0.25	10.99	confirmed
Thinking tendency → Organizational innovation	0.21	13.12	confirmed
$\chi^2 = 122.21$ df=66 RMSEA= 0.014	GFI= 0.91	AGFI= 0.92	

Conclusion and Discussion

The main objective of this research was to study the relationship between thinking styles and the organizational innovation among the employees of metal industries of Kaveh Industrial City. According to the findings of this research and previous studies, we can claim that the occurrence of creativity and innovation is related to the thinking styles of the persons. Thinking style plays a vital and fundamental role in the innovation. It is to be mentioned that no thinking style is preferred over the other styles, and each of these styles will lead to optimal results in different conditions. According to Sternberg (1998) the best results will be obtained when the thinking style of the person is suitable to his own conditions and situations. Accordingly, it is important to provide the desirable grounds and facilities in order to conduct the tendencies of the people toward the innovation, so that the persons with different thinking styles can approach their suitable innovations. Finally, we suggest that the managers of metal industries of Kaveh Industrial City provide suitable facilities for each thinking style of the people in order to conduct them toward their own personal and organizational innovation and development.

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