THE EFFECTS OF ORGANIZATIONAL INTELLIGENCE AND CREATIVITY ON TECHNOLOGICAL INNOVATION: A CASE STUDY OF THE MANUFACTURING FIRMS IN IRAN

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Abstract
Technological innovation has been a key factor in the survival and competitiveness of organizations in the present day. The purpose of the present study is investigating the effect of organizational intelligence on organizational creativity and presenting a conceptual model that can analyze the effect and the role of organizational intelligence and organizational creativity on the promotion of technological innovation in manufacturing firms in Fars province in Iran. This is a pioneering work in presenting a model to investigate the effect of organizational intelligence and organizational creativity on technological innovation. The statistical population is all researchers, experts and managers of five manufacturing firms whose number exceeded 1210. Through stratified sampling, a sample of 290 persons was selected for data collection. To collect the data related to organizational intelligence, Albrecht’s (2003) questionnaire, which was reduced to a 21 item scale, was employed and for technological innovation and organizational creativity, two questionnaires developed by the researchers were utilized. To investigate the relation among the variables of the research and investigating the hypotheses, the Structural Equation Modeling analysis was carried out by Lisrel8.5 and SPSS22. The results indicated that organizational intelligence has a meaningful and positive effect on technological innovation. Considering the reported R2, organizational intelligence can explain 55% of changes in organizational creativity and 45% of changes in the technological innovation. Moreover, organizational creativity can explain 40% of changes in technological innovation.

Key Words: organizational creativity, organizational intelligence, structural equation modeling, technological innovation

INTRODUCTION
Innovation plays a critical role in the economic growth process, whereby it can help a firm enhance its activity and garner a higher profit figure (Galindo & Mendez-Picazo 2013). Comparing various types of innovations, it has been confirmed by many researchers that technological innovation is the most essential form of innovation for manufacturing firms due to its potential to enhance performance, resolve problems, provide added value and also help develop a competitive advantage for a firm (Cooper 1998).

Along the same lines, Sabir and Sabir (2010) mentioned that state policy makers and practitioners are continuously analyzing and developing strategies which can be used to stimulate economic growth and prosperity. Of the strategies evolved during the last 50 years is the use of technological innovation.
Technological innovation provides opportunities for entrepreneurs to get informed about the available market. To profit more from this market, entrepreneurs need to renovate and change the factors and systems in their production and operation to simultaneously meet the market needs for both higher efficiency and lower costs. It is widely accepted that the technological innovation is the core composition of the enterprises’ competitiveness (Chen & Zhao, 2012). However, the essence of technological innovation is not only important for creating competitive advantage but also for assuring a sustainable development (Trappey et al., 2012). In general, technological innovation, as a link to the modifications in current products and processes which are based on single or multiple technologies, is vital; moreover, manufacturing firms are strongly dependent on technological innovation to produce and manufacture high-end products (Bi et al., 2006).

Fars province suffers an unfavorable economic condition and economic experts believe that the high dependency of Fars economy on traditional agriculture and subsistence, poor performance and heterogeneous policy making of the previous managers, disregarding the investors, the severe weakness of Fars industries at competing in international fields, the poor performance of the banking system, the administrative bureaucracy and severe drought are among the most influential factors on the emergence of the poor economic conditions in Fars province. Internalism is one of the main features of industrial firms in Fars province and the industries are formed merely to meet the demands and the needs of the province and country; therefore, they lack the essential features for entering the global market. In such a case, one of the most important factors that can prepare the manufacturing firms in Fars to compete in the global markets and help the economy of this province to move out of its status quo is technological innovation.

The creativity of organizations will have a direct influence on the innovative performance (Amabile et al., 1996; Ekvall, 1997) and creativity produced by individuals and teams of individuals serves as a primary source for innovation within the organization (Amabile et al., 1996). Creativity is generally of three types, namely, individual creativity, group/team creativity and organizational creativity. The last one which is organizational creativity is the focus of the present study. Organizational creativity is the creation of valuable and useful new products, services, ideas, procedures, or processes by individuals working together in a complex social system (Woodman et al, 1993). Creativity has become increasingly important for organizations aiming to cope and thrive in complex and unexpectedly changing environments. In other words, increasing creativity in organizations can improve both the quantity and quality of service, reduce costs, avoid waste of resources, reduce bureaucracy and increase efficiency.

Therefore, paying attention to organizational intelligence is a basic and essential issue for innovation and creativity in an organization (Kiani et al., 2013) and for promoting the capacity for innovation (Glynn 1995). This type of intelligence has been attended to as a new concept in the field of management and organization; furthermore, it has an increasing prominence as a theoretical concept in organization theory (Golestan Hashemi et al, 2015). Organizational intelligence implies the competence and potential of an organization to summon all the thoughts, suggestions and views, and direct them along the lines of the organizational objectives (Albrecht, 2003). Individual intelligence is intrinsic while organizational intelligence can be acquired (Lefter et al, 2008). Furthermore, organizational intelligence enhancement should support more gainful collaboration, prudent management, cutting-edge technology and professional act to improve the long-standing perspectives of an organization (Veryard, 2012). In conclusion, organizations that can successfully utilize organizational intelligence are the ones that use human resources the best, create rational plans to reach aims, explore the hidden potentials, have an integrated and systemic organizational thinking and help the development of organization (Potas et al., 2010).
Considering the above mentioned points and the prominent role of technological innovation and organizational creativity in the survival and competitiveness of manufacturing firms, this study explains the relation between these two concepts and the role of organizational intelligence through presenting a model. In fact, the present study seeks to find the answer to the question of how organizational intelligence and creativity promote the technological innovation in manufacturing firms.

LITERATURE REVIEW
Technological innovation
Innovation is always considered as an intangible resource that is impossible to imitate; in addition, it is acknowledged as an organizational capital, a source of competitive advantage (Hung et al., 2010). One of the most prominent innovations for firms is the technological innovation, the driving force for industrial growth and development, which is at the heart of policies for the economic development of today’s world.

The definition of technological innovation includes: (1) Bringing to market products that are technologically new for the company or which represent significant improvements in technology; and (2) Implementing technologically new or greatly improved manufacturing procedures (Wang et al., 2003).

Cooper (1998), Damanpour and Gopalakrishnan (2001), Wang et al. (2003), Chuang (2005), and Lee et al. (2013), consider product and process innovation as the two most key elements of technological innovation. Product innovation is defined as the introduction of goods or services that are new or significantly improved with respect to their specifications or the intended uses. This includes significant improvements in technical specifications, components and materials, incorporated software, user friendliness or other functional characteristics (Mothe & Thi, 2010). Process innovation is defined as the “new elements introduced into the firm’s production or service operations to produce product or render a service” (Damanpour & Gopalakrishnan, 2001, p. 48). In other words, process innovation is described as improving the existing process and/or generating a new process. These two types of innovations may require similar, but still different organizational skills since product innovations are market-driven while process innovations concern the efficiency within the firm (Ettlie & Reza, 1992).

There are commonly two types of innovation, namely, radical and incremental. Radical innovation includes the production and presentation of an utterly innovative product, process or the manner of production organization and may propose a fundamental departure and shift from the preceding standards in technology which may give rise to numerous new businesses, divisions and markets. The second refers to the introduction of any kind of improvement in a product, process or organization of production within a firm with no change in industrial structure (Barcellos et al., 2011). Components of technological innovation, supporting researches and index of measuring components are presented in Table 1. It is worth mentioning that this table is the basis for the development of technological innovation questionnaire.
Table 1. Measurement Index and Supporting Research Related to Technological Innovation Components

<table>
<thead>
<tr>
<th>Technological innovation components</th>
<th>Index of measuring components</th>
<th>Supporting research</th>
</tr>
</thead>
<tbody>
<tr>
<td>A new or developed product</td>
<td>New product</td>
<td>Cooper, 1998; Damanpour &amp; Gopalakrishnan, 2001; Wang et al., 2003; Chuang, 2005; Lee et al., 2013</td>
</tr>
<tr>
<td></td>
<td>Product improvement</td>
<td></td>
</tr>
<tr>
<td></td>
<td>More innovative product</td>
<td></td>
</tr>
<tr>
<td>New production technology</td>
<td>New technology</td>
<td>Cooper, 1998; Damanpour &amp; Gopalakrishnan, 2001; Wang et al., 2003; Chuang, 2005; Lee et al., 2013</td>
</tr>
<tr>
<td></td>
<td>Improving technology</td>
<td></td>
</tr>
</tbody>
</table>

Organizational creativity

The issue of organizational creativity has become increasingly popular in many social sciences fields. Social and cognitive psychologists, sociologists, as well as management and industrial experts are addressing this issue from different perspectives in an attempt to find specific answers concerning its antecedents and moderating factors.

There are various definitions of organizational creativity. However, the outcomes of organizational creativity should be new and useful, i.e. be valuable to the organization (Isaksen & Ekvall, 2010). Styhre and Sundgren (2005, p.4) defined organizational creativity as the “a variety of activities in which new ideas and new ways of solving problems emerge through a collaborative effort by promoting dialogues that involve multiple domains of scientific knowledge to produce value for the organization’s mission and market”. Fisher and Amabile (2009) defined organizational creativity as the production of ideas for novel and appropriate (useful or valuable) products, services, processes or strategies in an organization. Bratnicka et al. (2013) defined organizational creativity as firm’s ability to generate new and useful ideas, to address the rapidly changing opportunities and threats by making timely and market – oriented decisions and to frame breakthrough changes in its resource basis.

Organizational creativity, in the present study, is defined as generating new, valuable and useful ideas applied by the personnel in an organization to resolve problems through joint efforts and making timely and market-based decisions in line with the available resources (Golestan Hashemi et al, 2015). Components of organizational creativity, supporting researches and index of measuring components are presented in Table 2. It is worth mentioning that this table is the basis for the development of organizational creativity questionnaire.
Organizational intelligence
The idea of organizational intelligence was first proposed by the American sociologist Harold Wilensky who wrote a book on this issue in 1967 (Veryard, 2012). However, organizational intelligence was unambiguously and markedly made known by Matsuda (1992). He wrote a paper on organizational intelligence and its significance from the perspective of both product and process (Kiani et al., 2013).

Considering different definitions of organizational intelligence and the key concepts in this field, organizational intelligence can be defined as the capability of an organization in
processing information, producing and applying new knowledge, permanent training to be innovative and applicative and making sensible and effectual decisions to adjust to environmental settings (Golestan Hashemi et al, 2015).

Reviewing the relevant literature, one might come across different models developed by different scholars to elucidate and explicate the notion of organizational intelligence. Some of those prominent models are Veryard (2012), Kazemi et al(2012), Potas et al(2010), Albrecht (2003), Perkin(2003) and Matsuda(1992). Albrecht’s model is the most comprehensive since besides having the features of other models, it is statistically measurable(Golestan Hashemi et al, 2015). Taking the models' comparison into account, this study has been built on Albrecht’s (2003) model as the basis for measuring, interpreting and elaborating the concept of organizational intelligence.

In the Albrecht's book of mind power at work, seven elements of the organizational intelligence are proposed as the followings: Shared Fate: a sense of common purpose and synergistic action. Appetite for Change: the ability to face the unpredictable challenges and adapting to changes. Heart: double spirit and energy to succeed. Alignment and Congruence: the helpfulness of the tools and regulations of the organization in success and the interaction of the members to deal with the environment. Knowledge Deployment: the capacity of sharing information, knowledge and insight and the free flow of knowledge in organization. Performance Pressure: seriousness in doing the right things for a skilled and efficient return and a common success.

Organizational Intelligence and Organizational Creativity
Kiani et al, (2013) state that organizational intelligence has four benefits for an organization, namely, improving organizational performance, competitive advantage, efficiency and innovation. To explain innovation, Kiani et al (2013) mention that one of the key benefits of organizational intelligence is being inventive (creative) and making creative solutions and claim that the chance of the occurrence of new ideas in the organization will be increased if it acts intelligently and uses its personnel’s intellectual and mental capacities in its best way. Mehar et al, (2012) in the investigation of the relation between organizational intelligence and creativity of managers in public junior high schools of East of Gilan province concluded that there is a positive and meaningful relation between organizational intelligence and creativity.

The findings of Nasabbe et al, (2009) showed a statistically significant relation between organizational intelligence and creativity; in other words, any increase or decrease in organizational intelligence indexes equally changes those of creativity. Referring to what has been stated above; the first hypothesis is that organizational intelligence has a positive and meaningful effect on organizational creativity (Figure 1).
Organizational Intelligence and Technological Innovation

It is worth mentioning that most research conducted on the effect of creativity on organization innovation investigated the role of creative climate in organizational innovation and only few studies have focused on the relationship between organizational creativity and technological innovation.

Some of the few studies carried out so far on the relation between organizational intelligence and technological innovation will be described below. It is worth mentioning that the indirect relation between organizational intelligence and technological innovation is investigated.

Xuezhong et al., (2008) investigated the impact of organizational intelligence on organizational innovation and concluded that organizational intelligence has a profound effect on the components of organizational innovation leading to a more foresighted and feasible management innovation, reduction in the technical innovation risks and shortening the period of knowledge innovation. The result of the study by Marjani and Arabi (2011) indicated that there was a positive and significant relationship between organizational intelligence (and all its components) and knowledge management (and all its components). Furthermore, the results of Lee et al., (2013) study, indicated a positive and significant relation between knowledge management and technological innovation. Therefore, the second hypothesis is that organizational intelligence has a meaningful and positive effect on technological innovation (Figure 2).
Figure 2. The second sub-model of the research

Organizational Creativity and Technological Innovation

Most research conducted on the effect of creativity on innovation in organization investigated the role of organizational creative climate in organizational innovation and only few studies have focused on the relationship between organizational creativity and technological innovation. Therefore, the present study is an attempt to fill this gap in research.

Ismail (2005) found that creative climate influences firm’s innovation and the result of the study done by Knudsen and Cokpekin (2011) affirmed that organizational creativity does lead to innovation; however, only product innovation. Porzse et al. (2012) conducted a study on the impact of creative organizational climate on the innovational activities of medical devices manufacturing firms in Hungary. The results confirmed that an creative organizational climate is a key factor in increasing the innovational activities. Lin and Liu (2012) explored the relation between creative organizational climate and perceived innovation. The result of the statistical analysis showed that 27% of perceived innovation had been defined by an creative climate.

Cekmecelioglu and Gunsel (2013) examined the effects of individual creativity and organizational climate on firm’s innovativeness. The results confirmed the positive impact of both individual creativity and organizational climate on firm’s innovativeness. Nasurdi et al. (2014) looked into the influence of organizational creative climate on product innovation in Malaysian manufacturing firms. The results revealed that three out of eight factors of creative organizational climate has a meaningful positive effect on product innovation. Furthermore, the results showed that the creative organizational climate can meaningfully predict the product innovation in large manufacturing firms in Malaysia. Therefore, the third hypothesis is that organizational creativity has a meaningful and positive effect on technological innovation (Figure 3). Considering the literature presented, the indicators of the two concepts of the model are reflective.
METHODOLOGY
The design of this study is the analysis of correlation matrix, therefore, it is descriptive in nature. The aim of such studies is finding an interrelation among variables and in the case of the relationship existence, these studies sought to find the strength of the relationship. Moreover, in a correlation matrix study, a bivariate set of variables will be correlated. Factor analysis and Structural Equation Modeling are two types of analysis in which Correlation Matrix is analyzed.

Statistical population, sample size and sampling method
The statistical population of this research is all researchers, experts and managers in five manufacturing firms in Fars, Iran, in 2014 and first six months of year 2015. It is worth mentioning that one the firms was on the border area of Fras and Isfahan.

Among the five firms, one was manufacturing refinery tools and parts, the next was making plastic materials; the two other firms were producing food and the fifth one was dealing with electronic and laser. All these five firms were classified among large or medium manufacturing firms whose number of employees ranged from 300 to over 2000 and each included some companies.

The total number of statistical population including researchers, experts and managers was more than 1210 at the time of sampling. The population was divided into three groups (researchers, experts and managers) and the sample was selected through proportional allocation. Finally, from among this population, a sample of 290 employees was selected.

Instruments
The organizational intelligence data were collected by Albrecht’s (2003) questionnaire which was reduced to seven components and 21 items after the investigation by academic and industrial experts and the confirmatory factor analysis. The data related to both organizational creativity and technological innovation were collected by the researcher-made questionnaires including four and five items respectively.

The three questionnaires were five-scale Likert type. Furthermore, the questionnaires were manually distributed by the researcher of which 203 (70%) were filled in and returned back. The reliability of all the questionnaires was calculated by Cronbach’s alpha coefficient which was .87 for organizational intelligence, .81 for organizational creativity and .88 for technological innovation. Convergent and discriminant validities were also investigated and approved after the first and second Confirmatory factor analysis.
Data Analysis Method

Structural Equation Modeling procedure was utilized for data analysis. This approach which is a collection of Path Analysis, Confirmatory Factor Analysis, and Multiple Regression. Structural Equation Modeling has two applications. The relationship among latent variables and their related questions is dealt with in Confirmatory Factor Analysis. The second application of SEM is finding the relationship among latent variables and hypotheses testing. Structural Equation Modeling is a system whose input is model and data. Fit Indices and parameters’ estimation are its output (Golestan Hashemi et al, 2015).

RESULTS AND DISCUSSIONS

Confirmatory factor analysis for latent variables

Before the investigation of the research hypotheses, a confirmatory factor analysis was carried out for the latent variables which are organizational intelligence, organizational creativity and technological innovation. Each of these latent variables has 7, 4 and 2 manifest variables respectively. The confirmatory factor analysis was run through Lisrel (Table 3). The values in the third column are the correlation coefficients or factorial loads among latent and manifest variables. The Lisrel output is in the Standard Solution Mode. The values in the fourth column are for the t statistics and the Lisrel output was in the T-value mode. By investigating this output, there is no need for T-test.

As it can be seen in Table 3, all factorial loads are above .5; moreover, the average of the extracted variance is .54 for organizational intelligence. The result of investigating convergent and discriminant validity indicated that the latent variable was valid and factors can explain the concept of organizational intelligence well. It is obvious that the indicators of Alignment and Congruence and Heart, having the factorial load of 0.81 and 0.77, exert the highest influence and Performance Pressure, with the factorial load of 0.67, exerts the lowest impact on the creation of latent variable of organizational intelligence.

The values of t statistics indicate a meaningful relationship. Values which are larger than 1.96 indicate significant relations. As it can be seen in Table 3, all relations among concept and dimensions of organizational intelligence are significant.

Regarding the latent variable of organizational creativity, as it can be seen, all factorial loads are above 0.5; furthermore, the extracted variance average is 0.52 for organizational creativity. The outcome of convergent and discriminant validity investigation specified the validity of the latent variable, moreover, factors can properly explain the notion of organizational creativity. Considering Table 3, it is evident that markers of rate of usefulness of ideas, with the factorial load of .78 has the highest influence and the rate of novelty of ideas, with the factorial load of .64, has the lowest influence on the formation of latent variable of organizational creativity.

Dealing with the meaningfulness of the organizational creativity relations and its dimensions, all relations among concept and dimensions of organizational creativity are significant.

Considering the factorial loads and the meaningfulness coefficients of the latent variable of the technological innovation, convergent and discriminant validities were confirmed which indicates that factors can explain the concept of technological innovation well. Furthermore, all coefficients are significance over 1.96; therefore, relations among technological innovation concept and its dimensions are significant.
**Table 3. The confirmatory factor analysis values for the research variables**

<table>
<thead>
<tr>
<th>Latent variables</th>
<th>Manifest variables of the latent variables</th>
<th>Factor loadings</th>
<th>T-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organizational Intelligence</td>
<td>Strategic Vision</td>
<td>0.74</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>Shared Fate</td>
<td>0.70</td>
<td>9.36</td>
</tr>
<tr>
<td></td>
<td>Appetite for Change</td>
<td>0.71</td>
<td>8.57</td>
</tr>
<tr>
<td></td>
<td>Heart</td>
<td>0.77</td>
<td>9.62</td>
</tr>
<tr>
<td></td>
<td>Alignment and Congruence</td>
<td>0.81</td>
<td>10.71</td>
</tr>
<tr>
<td></td>
<td>Knowledge Deployment</td>
<td>0.74</td>
<td>9.32</td>
</tr>
<tr>
<td></td>
<td>Performance Pressure</td>
<td>0.67</td>
<td>7.87</td>
</tr>
<tr>
<td>Organizational Creativity</td>
<td>Number of new ideas</td>
<td>0.71</td>
<td>10.56</td>
</tr>
<tr>
<td></td>
<td>Rate of usefulness of ideas</td>
<td>0.78</td>
<td>11.96</td>
</tr>
<tr>
<td></td>
<td>Rate of novelty of ideas</td>
<td>0.64</td>
<td>9.22</td>
</tr>
<tr>
<td></td>
<td>Number of creative problem solving</td>
<td>0.76</td>
<td>11.45</td>
</tr>
<tr>
<td>Technological Innovation</td>
<td>Product innovation</td>
<td>0.89</td>
<td>8.57</td>
</tr>
<tr>
<td></td>
<td>Process innovation</td>
<td>0.90</td>
<td>8.93</td>
</tr>
</tbody>
</table>

**Estimation of the sub-models of the research**

The first hypothesis is that organizational intelligence has a meaningful and positive effect on organizational creativity. To confirm or reject this hypothesis, the relations among the variables was investigated by Structural Equation Modeling in Lisrel.

Lisrel output for the sub-model is presented in Figure 4. The path coefficient of .74 indicates the strong influence of organizational intelligence on organizational creativity. Moreover, software output in T-Values mode is presented in Figure 5. The value of 8.76 denotes a significant relation between organizational intelligence and organizational creativity; therefore, the hypothesis is confirmed; moreover, the results show that organizational intelligence has a positive and significant effect on organizational creativity. The value of the reported R2, which is .55, indicates that organizational intelligence can explain 55% of changes in organizational creativity; moreover, the factorial loads values of the indicators of each latent variable and their level of significance, which is l (consistent with the reported T values) verifies that all indicators are appropriately placed in their own location. Hence, it can be established that the indicators have a satisfactory conformity with the theoretical rationale of the study. Given that the t statistics reported for all indicators is above 1.96, all indicators are significant at the level 5%.
Properties of model fitness are presented in Table 4. The appropriate value for relative Chi-square is between 1 and 3 (Raminmehr & Charsetad 2013, p. 280). The value obtained for the proposed model of the present study was 1.76 which indicates the suitability of the model.

The conclusions of Absolute Fitness Indices, encompassing Root Mean Squared Residual (RMR), Adjusted Goodness-Of-Fit Index (AGFI) and Goodness-of-Fit Index (GFI) indicated the proper control of variance and covariance of error. For Comparative Fit Indices,
including Normed Fit Index (NFI); Non-Normed Fit Index (NNFI); Relative Fit Index (RFI); Comparative Fit Index (CFI) and Incremental Fit Index (IFI); it is found that their values are above 0.97 for this model which is an acceptable value. The accepted value for the above mentioned indexes is above 0.9 (Joreskog & Sorbom, 1996, p. 98; Raminmehr & Charestad, 2013, p. 278).

Furthermore, the value reported for Root Mean Squared Error of Approximation (RMSEA) index signifies the control of the measurement error. The value of less than or equal to 0.08 for an RMSEA denotes an acceptable fit (Browne & Cudeck, 1993, p. 148). By and large, the results of Table 4 show fitness with data is good for the model. Consequently, the parameters estimated in this model are reliable.

### Table 4. The fitness properties of the first sub-model

<table>
<thead>
<tr>
<th>Reported Value</th>
<th>Desirable Limit</th>
<th>Index</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/76</td>
<td>Between 1 and 3</td>
<td>Relative Chi - Square</td>
</tr>
<tr>
<td>/031</td>
<td>≤ 0/08</td>
<td>RMR</td>
</tr>
<tr>
<td>0/95</td>
<td>≥ 0/90</td>
<td>GFI</td>
</tr>
<tr>
<td>0/91</td>
<td>≥ 0/90</td>
<td>AGFI</td>
</tr>
<tr>
<td>0/98</td>
<td>≥ 0/90</td>
<td>NFI</td>
</tr>
<tr>
<td>0/99</td>
<td>≥ 0/90</td>
<td>NNFI</td>
</tr>
<tr>
<td>0/99</td>
<td>≥ 0/90</td>
<td>IFI</td>
</tr>
<tr>
<td>0/99</td>
<td>≥ 0/90</td>
<td>CFI</td>
</tr>
<tr>
<td>0/97</td>
<td>≥ 0/90</td>
<td>RFI</td>
</tr>
<tr>
<td>0/062</td>
<td>≤ 0/08</td>
<td>RMSEA</td>
</tr>
</tbody>
</table>

The second research hypothesis is that organizational intelligence has a meaningful and positive effect on the technological innovation. To confirm or reject this hypothesis, the relations among the variables were analyzed by the Structural Equation Modeling through Lisrel. The path coefficient of .67 in the Standard Solution Mode (Figure 6) indicates the strong influence of organizational intelligence on technological innovation and the value of 8.91 in the T-value Mode output (Figure 7) denotes a significant relation between organizational intelligence and technological innovation; therefore, the hypothesis is confirmed; moreover, the results show that organizational intelligence has a positive and significant effect on technological innovation. The value of the reported R2, which is .45, indicates that organizational intelligence can explain 45% of changes in technological innovation. Properties of model fitness related to the second sub-model are presented in Table 5. Considering the desirable limit, model has a good fitness with data. Therefore, the estimated parameters in this model are dependable.
Figure 6: Lisrel Output for the second sub-model of the research in Standard Solution Mode

Figure 7: Lisrel Output for the second sub-model of the research in T-Value Mode

Table 5. The fitness properties of the second sub-model
The third research hypothesis is that organizational creativity has a meaningful and positive effect on the technological innovation. Considering the path coefficient of .63 (Figure 8) and the reported t value of 7.54 (Figure 9) and considering the fitness properties reported for the third sub-model (Table 6), the positive and meaningful effect of organizational creativity on technological innovation (the third hypothesis) is confirmed.

![Figure 8: Lisrel Output for the third sub-model of the research in Standard Solution Mode](image)

![Figure 9: Lisrel Output for the third sub-model of the research in T-Value Mode](image)
Table 6: The fitness properties of the third sub-model

<table>
<thead>
<tr>
<th>Reported Value</th>
<th>Desirable Limit</th>
<th>Index</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/6</td>
<td>Between 1 and 3</td>
<td>Relative Chi-Square</td>
</tr>
<tr>
<td>0.023</td>
<td>≤ 0.08</td>
<td>RMR</td>
</tr>
<tr>
<td>0.98</td>
<td>≥ 0.90</td>
<td>GFI</td>
</tr>
<tr>
<td>0.96</td>
<td>≥ 0.90</td>
<td>AGFI</td>
</tr>
<tr>
<td>0.98</td>
<td>≥ 0.90</td>
<td>NFI</td>
</tr>
<tr>
<td>0.99</td>
<td>≥ 0.90</td>
<td>NNFI</td>
</tr>
<tr>
<td>0.99</td>
<td>≥ 0.90</td>
<td>IFI</td>
</tr>
<tr>
<td>0.99</td>
<td>≥ 0.90</td>
<td>CFI</td>
</tr>
<tr>
<td>0.97</td>
<td>≥ 0.90</td>
<td>RFI</td>
</tr>
<tr>
<td>0.03</td>
<td>≤ 0.08</td>
<td>RMSEA</td>
</tr>
</tbody>
</table>

CONCLUSION

Technological innovation has a crucial role in the existence and competitiveness of manufacturing firms; therefore, specifying the factors influencing technological innovation is imperative in identifying the prospective challenges and promoting the firms’ performance. From among the influential factors, organizational intelligence and organizational creativity are of the most prominence. As such, the aim of the present study was the investigation of the impact of organizational intelligence on technological innovation and organizational creativity and also the effect of organizational creativity on technological innovation. The indicators of the three concepts in the model are considered as reflective whose rank is approved by the confirmatory factor analysis.

The findings of the study showed that the seven factors proposed in this study have properly defined organizational intelligence; moreover, the factors of product and process innovation properly explained the notion of technological innovation and the four factors proposed for the organizational creativity were suitable in describing this concept.

The findings of the study denote a positive and meaningful relationship between organizational intelligence and technological innovation and also organizational intelligence and organizational creativity. Organizational intelligence explains 45% of changes in technological innovation and 55% of changes in organizational creativity. Moreover, organizational creativity has a positive and meaningful relationship with technological innovation and it can explain 40% of changes in the technological innovation. The proposed sub-models have a good fitness with the data and no revision was needed; therefore, they are dependable. The final model of the research, after the confirmation of the hypotheses, is presented in Figure 10.
The present study indicates that the increase in organizational intelligence promotes the organizational creativity and it consequently increases the product and process innovation; moreover, the technological innovation promotes dramatically accordingly. The managers and experts in the manufacturing firms can promote the technological innovation in their firm by taking the components such as organizational intelligence and creativity into account. Moreover, manufacturing organizations can raise the level of technological innovation through improving organizational intelligence influential factors such as knowledge management (Chenari et al. 2013; Kiani et al. 2013), organizational learning (Shahabi et al. 2012; Potas et al. 2010), organizational culture (Kiani et al. 2013; Kazemi et al. 2012), organization structure (Kiani et al. 2013; Kazemi et al. 2012), quality of working life (Sohrabi et al. 2013; Kazemi et al. 2012), and organizational communications (Kazemi et al. 2012; Matsuda 1992).

Along the same line, manufacturing organizations can raise the level of technological innovation through improving organizational creativity influential factors such as knowledge management (Kiyae et al., 2014; Sung & Choi, 2012), organizational culture (Andriopoulos, 2001; Mobarakeh, 2011), leadership style (Andriopoulos, 2001; Parjanen, 2012), Resources (Andriopoulos, 2001; Axelsson & Sardari, 2012) and organizational Structure (Andriopoulos, 2001; Axelsson & Sardari, 2012).

The limitations of our study can be the starting point for future studies. First, our study was carried out in just five manufacturing firms. To make the model generalizable, a similar study may be carried out with larger number of firms and electronic distribution of questionnaires is also recommended. Second, we did not investigate factors influencing organizational intelligence and organizational creativity in our model; therefore, it is suggested to use a more comprehensive model which includes the influential factors on organizational intelligence and organizational creativity as well.
REFERENCES


