Relationship between Organizational Intelligence, Organizational Learning, Intellectual Capital and Social Capital Using SEM 
(Case Study: Zabol Organization of Medical Sciences)

*Javad Rahdarpour  
Department of Agricultural Management, Zabol Branch, Islamic Azad University, Zabol, Iran  
*Corresponding author 

Ayyoub Sheykhi 
(Department of Management, Islamic Azad University, Rafsanjan Branch) 

Abstract 

The focus of this study was optimal modeling of organizational variables to improve service quality and enhance productivity of human resources. For this purpose, a model was developed and tested by reviewing literature. The studied population included 3200 employees of the Zabol University of Medical Sciences; the sample size (343) was determined by using Morgan table. Four questionnaires developed by the current authors were used to collect data on organizational intelligence, organizational learning, intellectual capital and social capital. Considering the hypotheses, correlation analysis and SEM were done using the software LISREL 8/54 and SPSS 20. The results confirmed the proposed model.

Keywords: organizational intelligence, organizational learning, intellectual capital, social capital, structural equation modeling.
Introduction
Currently, one of the greatest challenges of management is that how intelligent institutions are formed. As people may not use their intelligence, organizations may not be able to apply their intelligence. Over the past 20-30 years, management efforts have been focused on improvement of operations including time cycle reduction, reengineering, quality management, Six Sigma, etc.; however, the attempts to make organizations more intelligent have been neglected. Focusing on knowledge management and learning, organizational intelligence creates intelligent organizations which learn to manage knowledge intelligently.

With current advances in information technology and arrival to the knowledge economy in which financial and physical capitals are no longer accountable for organizational success, organizations need to consider alternative capitals, including intellectual capital by which they can achieve sustainable competitive advantage in a new world where they compete over information and knowledge acquisition. In fact, organizations need to increase and manage their intangible capitals to ensure their survival and future success. Meanwhile, social capital has been discussed in various fields such as sociology, political sciences, economics and management in recent years. It has been taken into consideration in organizations to increase intellectual capitals and their effective application in the organization (Malhatra, 2001).

Relying on previous research and assuming a positive and significant relationship between four variables contributing to improving productivity, the present study examined the significant relationship between variables, and effect of organizational intelligence and intellectual capital as mediator variables.

Multivariate analysis is one of the strongest and most straightforward analyses used in behavioral and social sciences. The nature of these subjects is multivariate and they cannot be solved by bivariate methods (in which only one independent variable and one dependent variable are considered in each run). Multivariate analysis refers to a series of analyses with N dependent variables and K independent variables which are analyzed at a time. As there are several independent variables in this study and their effect is examined on the dependent variable, it is essential to use structural equation modeling.

Literature Review
Organizational Intelligence
Simic defines organizational intelligence as intellectual ability of an organization to solve organizational problems. He emphasizes on integration of human and technical capabilities to solve problems. According to Simic, organizational intelligence is precisely a combination of information, experience, knowledge and understanding of organizational problems (Simic, 2005). Organizational intelligence refers to performance of five cognitive subsystems including organizational structure, culture, stakeholder relations, knowledge management and strategic processes (Prejmerean & Vasilache, 2008).

Organizational Learning
Organizational learning was first introduced by cumulative development of management theories such as Adam Smith, Taylor, learning curve, etc. The concept of organizational learning dates back to 1990, when Taylor suggested the transfer of learning to other employees to promote efficiency and improve the organization. However, Richard Cyert and James March (1963) were
the first to link the terms learning and organization and introduced learning as an organizational phenomenon in the literature (Tempeltoon et al., 2002).

**Intellectual Capital**

Intellectual capital refers to a combination of intangible assets which enable the organization to fulfill its duties. This definition raises important discussions for understanding intellectual capital (David, 2002). Intellectual capital is defined as a source which is recognized, acquired and relied upon to create higher value assets. Intellectual capital implies intellectual materials such as knowledge, information, intellectual assets and experience used to create value (Kanan et al, 2004).

**Social Capital**

Social capital is a set of networks, norms, values and perception which facilitate the within-group and between-group cooperation to achieve mutual interests (Sharifian-Sani, 2001). Social capital results from collaboration of people who share common ideas (Karmona et al, 2010).

**Background**

Jamalzadeh et al (2009) examined the relationship between organizational intelligence and organizational learning among employees and faculty members of Islamic Azad University, District 1, and developed a model for organizational learning promotion. They found a positive and significant relationship between organizational intelligence and organizational learning. Bohlooli (2004) evaluated the effect of organizational learning on service component of the Porter chain value in development of elevator industry. He found that high job knowledge and learning are effective on delivery of services by staff.


Bontis et al (2000) examined the relationship between intellectual capital and business performance of companies in the service and non-service industries. The results indicated mutual relationships between the two variables studied; that is, intellectual capital had a relatively medium effect (25-30%) on business performance.

Riahi-Bolooki evaluated the effect of intellectual capital on performance of multinational companies using data on 81 companies during 1992-1996. The results indicated a significant positive relationship.

Determining components of social capital effective on performance of American companies, Cruz et al (2006) found that cognitive capital, social participation, social cohesion and increased social interactions were effective in improving performance of companies.

Zhang (2007) evaluated the role of social capital on performance of Chinese private companies. He found no significant relationship between diversity of membership in various organizations and performance of private companies.
Hypotheses

**First Hypothesis**: intellectual capital and organizational intelligence and social capital are effective on organizational learning at a time.

**Second Hypothesis**: intellectual capital mediates the relationship between social capital and organizational learning.

**Third Hypothesis**: organizational intelligence mediates the relationship between social capital and organizational learning.

Conceptual Model

![Conceptual Model](image)

Materials and Methods

The present study is an applied research using descriptive data collection, correlation and particularly structural equation model. Many methods have been proposed in recent decades to examine the relationships between variables. One of these methods is structural equation modeling or multivariate analysis with latent variables. Structural equation modeling is a statistical approach to test hypotheses on the relationships between observed variables and latent variables. This approach can test the reliability of theoretical models. Since most variables of management studies, particularly, organizational behavior, are latent, these models are increasingly required for management studies.

Structural Equation Modeling

Structural equation modeling is a comprehensive statistical approach to test hypotheses on the relationships between observed and latent variables. It is sometimes called as structural analysis and analysis of covariance, causal modeling and sometimes LISREL. However, the so-called term is structural equation modeling or SEM (Homan, 2008).

A SEM is generally composed of measurement model and structural model. The measurement model defines how to measure a latent variable using two or more observed variables. In fact, SEM relates a set of observed variables to a smaller set of relevant latent variables, which are examined using confirmatory factor analysis (CFA). The structural model shows the relationship
between the inner and outer latent variables and allows an evaluation of the direction and intensity of causal effects between these variables. Based on measurement models, the researcher defines the observed variables which measure the latent variables. Based on structural models, those independent variables which are effective on dependent variable are determined.

To evaluate SEM, there are various tests with different indices which are called fitting indices; these indices are constantly compared, developed and evolved; however, still there is no consensus on a single optimal test. The indices used in this study included:

Relative chi-square ($\chi^2$/df): relative chi-square is one of the general indices to account for free parameters in calculation of fitting index. This index is calculated by simple division of Chi-square by degrees of freedom of the model. The acceptable values of this index vary from 1 to 3 (Homan, 2008).

Root mean square error of approximation (RMSEA): it is the square root of the estimated variance in error of approximation, reported in decimal. The index is calculated for different confidence intervals. It is <0.1 for acceptable models. The models with RMSEA >0.1 are estimated weak.

Comparative fit index (CFI): This index tests the improvement by comparing a so-called independent model in which there is no relationship between variables with the suggested model. Scholars believe that CFI >0.9 is acceptable.

Goodness of fit index (GFI): The index calculates the ratio of the sum of squares explained by the model to the total sum of squares of the estimated matrix. It ranges from zero to one. GFI >0.9 is acceptable.

Normed fit index (NFI): NFI is one of the comparative indices. NFI is based on the correlation between variables, so that high coefficients of correlation lead to high NFI. NFI >0.9 is acceptable.

Moreover, t-value is used to evaluate significance of the model. The model will be significant at 95% confidence if t-value >1.96 or < -1.96.

Root mean square residual (RMR): RMR is a measure of mean residuals. In a well-fitted model, these residuals are very small. In short, the closer RMR to zero, the better fit the model is.

Confirmatory Factor Analysis (Measurement Model)

Confirmatory factor analysis or CFA is used to assess validity and reliability of the used measurement scales (Homan, 2008). This model is based on pre-empirical information on structure of data; CFA is required prior to path analysis. In fact, CFA examines the fact that whether the selected questions provide good factor structures to measure dimensions studied in the model. In CFA, the factor loadings <0.3 are considered small and should be removed from the model (Chin, 2003); moreover, if t-value >1.96 or < -1.96, the markers provide good factor structures at 95% confidence for measurements. In all cases, t-value >1.96 and factor loading >0.3; thus, the selected questions provide good factor structures for measurements.
Figure 2: path coefficients and factor loadings
Fit of Model

Fit indicates the extent to which the model is consistent with the relevant data. In SEM, once the parameters are estimated, fit of the model is ensured prior to parameter interpretation. Fitting indices are shown in the following table.

Table 1: Fitting indices

<table>
<thead>
<tr>
<th>Test</th>
<th>Description</th>
<th>Acceptable values</th>
<th>Obtained value</th>
</tr>
</thead>
<tbody>
<tr>
<td>χ2/df</td>
<td>Relative Chi-square</td>
<td>3&gt;</td>
<td>1.218</td>
</tr>
<tr>
<td>RMSEA</td>
<td>Root mean square error of approximation</td>
<td>0.1&gt;</td>
<td>0.066</td>
</tr>
<tr>
<td>GFI</td>
<td>Modified fitness index</td>
<td>0.9&lt;</td>
<td>0.94</td>
</tr>
<tr>
<td>RMR</td>
<td>Root mean square residual</td>
<td>0.1&gt;</td>
<td>0.062</td>
</tr>
<tr>
<td>NFI</td>
<td>Normed fit index</td>
<td>0.9&lt;</td>
<td>0.93</td>
</tr>
<tr>
<td>CFI</td>
<td>Comparative fit index</td>
<td>0.9&lt;</td>
<td>0.91</td>
</tr>
</tbody>
</table>

According to Table 1, RMSE = 0.066 and <0.1, indicating that the mean square error of the model is good and the model is acceptable. Furthermore, χ2/df varies from 1 to 3; GFI, CFI and NFI are also >0.9. Thus, the measurement model is well fitted.
Population, Sample Size and Sampling

The studied population included 3200 employees of Zabol University of Medical Sciences. The sample size (343) was calculated by simple random sampling using Morgan table.

Methods

Various sources such as textbooks, journals and dissertations were used for theoretical framework. Data was collected using standard questionnaires and their distribution among the samples.

Materials

In this study, the author developed a questionnaire in the form of a 5-point scale to measure variables. Reliability is one of the technical characteristics of measuring instruments. A measuring instrument is reliable if it produces similar results under consistent conditions. Reliability varies from zero to one; the closer value to one, the higher is the reliability. In this study, Cronbach's alpha was used to determine reliability.

<table>
<thead>
<tr>
<th>Variables</th>
<th>Cronbach's alpha</th>
</tr>
</thead>
<tbody>
<tr>
<td>Social capital</td>
<td>0.792</td>
</tr>
<tr>
<td>Organizational intelligence</td>
<td>0.913</td>
</tr>
<tr>
<td>Organizational learning</td>
<td>0.831</td>
</tr>
<tr>
<td>Intellectual capital</td>
<td>0.791</td>
</tr>
<tr>
<td>Total</td>
<td>0.949</td>
</tr>
</tbody>
</table>

Given that Cronbach's alpha is greater than 0.7 for all the variables, the questionnaire is reliable (total reliability = 0.949).

Results

Using structural model in SEM, hypotheses are discussed in this section. Three hypotheses are examined in this study, the results of which are summarized in the tables below.

First hypothesis: intellectual capital and organizational intelligence and social capital influence organizational learning at a time.

According to Figure 2 and 3, the path coefficient is a positive value (0.22) between social capital and organizational learning. Moreover, value = 20.56, which is >1.96. Thus, social capital has a significant positive effect on organizational learning at 95% confidence level.

The path coefficient is a positive value (0.51) between intellectual capital and organizational learning. Moreover, t-value = 40.77, which is >1.96. Thus, intellectual capital has a significant positive effect on organizational learning at 95% confidence level.

The path coefficient is a positive value (0.43) between organizational intelligence and organizational learning. Moreover, t-value = 17.39, which is >1.96. Thus, organizational intelligence has a significant positive effect on organizational learning at 95% confidence level.
Table 3: Path coefficient and T-value for the first hypothesis

<table>
<thead>
<tr>
<th>Path</th>
<th>Path coefficient</th>
<th>t-value</th>
<th>Standard error</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Social capital on organizational learning</td>
<td>0.22</td>
<td>20.56</td>
<td>0.011</td>
<td>Accepted</td>
</tr>
<tr>
<td>Intellectual capital on organizational learning</td>
<td>0.51</td>
<td>40.77</td>
<td>0.013</td>
<td>Accepted</td>
</tr>
<tr>
<td>Organizational intelligence on organizational learning</td>
<td>0.43</td>
<td>17.39</td>
<td>0.025</td>
<td>Accepted</td>
</tr>
</tbody>
</table>

**Second hypothesis**: intellectual capital mediates the relationship between social capital and organizational learning.

This hypothesis examines the mediating role of intellectual capital in the relationship between social capital and organizational learning; in other words, it examines the indirect relationship between social capital and organizational learning. To examine the indirect effects of independent variable on the dependent variable, the following conditions need to be met. First, a significant relationship is supported between independent variable and mediator. Second, a significant relationship is supported between dependent variable and the mediator. If the above conditions hold, the significant indirect relationship and path coefficient will be obtained by multiplying path coefficient of the relationship between independent variable and the mediator by path coefficient of the relationship between dependent variable and the mediator.

According to Figure 2 and 3, path coefficient is equal to 0.74 between social capital and intellectual capital (the relationship between independent variable and the mediator). Moreover, \( t = 22.52 \), which is >1.96. Thus, social capital has a significant positive effect on intellectual capital at 95% confidence level. Therefore, the relationship between independent variable and the mediator is supported. The path coefficient is equal to 0.51 between social capital and organizational learning (the relationship between mediator and dependent variable). Moreover, \( t = 40.77 \), which is >1.96. Thus, social capital has a significant positive effect on organizational learning at 95% confidence level. Therefore, the relationship between mediator and dependent variable is supported.

Given that the relationship between independent variable and mediator as well as the relationship between mediator and dependent variable is supported, the indirect effect of social capital on organizational learning is significant and equal to \( 0.51 \times 0.74 = 0.38 \).

Table 4: Path coefficient and t-value for the second hypothesis

<table>
<thead>
<tr>
<th>Path</th>
<th>Path coefficient</th>
<th>t-value</th>
<th>Standard error</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Social capital on intellectual capital</td>
<td>0.74</td>
<td>22.52</td>
<td>0.033</td>
<td>Accepted</td>
</tr>
<tr>
<td>Intellectual capital on organizational learning</td>
<td>0.51</td>
<td>40.77</td>
<td>0.013</td>
<td>Accepted</td>
</tr>
</tbody>
</table>

Given the result obtained for the first hypothesis (path coefficient = 0.22 between social capital and organizational learning), indirect effect of social capital on organizational learning (0.38) is higher than the direct effect (0.22).

**Third hypothesis**: organizational intelligence mediates the relationship between social capital and organizational learning.

This hypothesis examines the mediating role of organizational intelligence in the relationship between social capital and organizational learning; in other words, it examines the indirect relationship between social capital and organizational learning. According to Figure 2 and 3,
path coefficient is equal to 0.94 between social capital and organizational intelligence (the relationship between independent variable and the mediator). Moreover, t-value = 23.39, which is >1.96. Thus, social capital has a significant positive effect on intellectual capital at 95% confidence level. Therefore, the relationship between independent variable and the mediator is supported. The path coefficient is equal to 0.43 between organizational intelligence and organizational learning (the relationship between mediator and dependent variable). Moreover, t-value = 17.39, which is >1.96. Thus, intellectual intelligence has a significant positive effect on organizational learning at 95% confidence level. Therefore, the relationship between mediator and dependent variable is supported.

Given that the relationship between independent variable and mediator as well as the relationship between mediator and dependent variable is supported, the indirect effect of social capital on organizational learning is significant and equal to 0.43 × 0.94 = 0.40.

<table>
<thead>
<tr>
<th>Path</th>
<th>Path coefficient</th>
<th>t-value</th>
<th>Standard error</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Social capital on organizational intelligence</td>
<td>0.94</td>
<td>23.39</td>
<td>0.040</td>
<td>Accepted</td>
</tr>
<tr>
<td>Organizational intelligence on organizational learning</td>
<td>0.43</td>
<td>17.39</td>
<td>0.025</td>
<td>Accepted</td>
</tr>
</tbody>
</table>

Given the result obtained for the first hypothesis (path coefficient = 0.22 between social capital and organizational learning), indirect effect of social capital on organizational learning (0.40) is higher than the direct effect (0.22).

**Conclusion**

Learning-based changes are the key to organizational success; therefore, proper solutions are required to improve and promote these changes to contribute organizations for an objective change. Management needs to establish a strategic vision in relation to learning to become an available central element and a valuable tool for achieving long-term outcomes. Management needs to play a leading role in the change process and take responsibility for an organization which can repair itself and face new challenges. Table 6 summarizes the results obtained by testing hypotheses.

<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intellectual capital mediates the relationship between social capital and organizational learning.</td>
<td>Accepted</td>
</tr>
<tr>
<td>Organizational intelligence mediates the relationship between social capital and organizational learning.</td>
<td>Accepted</td>
</tr>
<tr>
<td>Intellectual capital and organizational intelligence and social capital influence organizational learning at a time.</td>
<td>Accepted</td>
</tr>
</tbody>
</table>

According to the findings, intellectual capital mediates the relationship between social capital and organizational learning. Moreover, organizational intelligence promotes the relationship between social capital and organizational learning. Schwaninger believes that an intelligent organization results from participation of employees with a high level of organizational intelligence. An intelligent organization is flexible, effective, learner and durable (Tseng, 2009). It can be concluded that intellectual capital and organizational intelligence and social capital have a positive and significant effect on organizational learning at a time.
References

Bohlooli, P., 2004. effect of organizational learning on porter value chain in elevator industry, s.l.: s.n.
Jamalzadeh, M., Gholami, Y. & Seyf, M.-H., 2009. the relationship between organizational intelligence and organizational learning among employees and faculty of the islamic azad university and a model to promote orgaizational learning. management, leadership and educational management, Issue 8, pp. 63-86.