

resulted from a linear view of variables related to intellectual capital and ability of economic competition.

Keywords: Intellectual capital; economic competitiveness; system thinking; Tehran stock exchange.

Introduction

In the first chapter of the research, the main problem of research, which was not in fact unknown, was the effect of the components of intellectual capital on the ability of economic competition and its economic consequences. The importance and necessity of this research have been discussed in detail. Based on the issues and the requirements presented, the objectives and questions of this study have been determined. Finally, the main vocabulary of the research including intellectual capital and its components, the ability of economic competition and system dynamics was defined in both theoretical and operational aspects.

Increasing the importance and effectiveness of intellectual capital and its significant role in promoting the power of organizations has increased the attention of this category. This has led to a significant number of researches and valid books in this field. Although intellectual capital has a significant impact on various organizational concepts, one of the most important effects is competition and economic competition. Significant research has been conducted on these two important cases, which have caused the enrichment of these two important ones. The present study has focused on the effect of intellectual capital on the economic competitiveness. It tries to identify all the effective factors in this regard so that it can obtain the target ali-maalai model. Also, the economic consequences of this relationship are considered.

The purpose of this study was to model the impact of the components of intellectual capital on economic competitiveness and to measure its economic consequences. For this purpose, in order to achieve this goal, qualitative and quantitative methods are consistent with the defined methodology of the researcher. In this section, the findings of data analysis are presented according to the approach introduced in the third chapter.

Identify related variables

In the first step of the study, in order to understand all variables related to three issues of intellectual capital, economic competitiveness and economic consequences; the history of related researches and related variables were obtained. This research focuses on the subject of human resources, and its special nature in different environments has led to the use of internal research that has been conducted according to domestic human resources. Also, the current conditions of Iran's economy and the existence of sanctions have led to the lack of variables on this issue outside of Iran. The main focus of this research is on finding variables on internal research. The results in this section are shown in table (1-4).

Table (1) Intellectual capital dimension based on the research history

| Author (s) | Related concepts |
|-------------------------------------|--|
| Taheri Nia and Dehkordi (2017) | Product market competition |
| Avali et al. (2016) | Productivity |
| Ghiasi and Amin al-Ruaya (2016) | Human resource productivity |
| Rahimi Rigi et al. (2016) | Performance |
| Mahmoudi Miamand and Kiarzam (2015) | Competitive advantage and organizational innovation |
| Safari et al. (2014) | Enterprise entrepreneurship |
| Dastgir et al. (2014) | Fiscal performance |
| Ghasemi Nejad and Solgi (2014) | Innovative products development |
| Asadi and Al-Qayani (2014) | Market value, total return of assets, flow of assets, return of equity |
| Deilmi Dianti and Ramezani (2012) | Financial information quality |
| Sepehr Doost (2010) | Company performance |
| Abbasi and Goldi Sadghi (2010) | Profit per share, return rate for stock owners' rights, annual return |
| Namazi and Ebrahimi (2009) | Current and future financial performance |
| Qelich Lee et al. (2007) | Competitive advantage |

By eliminating the existing overlapping, we find that besides intellectual capital and economic competitiveness, product market competition variables, productivity, efficiency, organizational innovation, entrepreneurship, financial performance, product development, market value, total assets, financial returns, financial information quality, corporate performance, profit per share,

return rate for stock owners' rights and annual return can also contribute to the relationship between these two variables.

Determining the relationship between variables through fuzzy cognitive map

Fuzzy cognitive map is a modeling methodology for complex decision-making systems. A fuzzy map describes the behavior of a system based on its concepts. Each conception indicates an identity, status, variable, or system property (Oxyrogyanization and Glikas, 2004). Fuzzy cognitive maps have been used in simulation, modeling organizational strategies, supporting strategic issues and analyzing failure states, specification and requirements of the system of support of urban design, management of relationships in aviation services and strengthening network exploitation (Rodriguez and others, 2007).

The concept of the first Baxley Maps (1976) was introduced and used. The cognitive map is a diagram designed to express the cause and disability of an individual about a particular field and then to analyze the effects of options such as politics or business decisions related to the realization of specific objectives (Assr, 1983).

The developed methodology by Rogoez Raspo and others (2006) uses four matrices, including the initial success matrix, the fuzzy matrix, success relationship strength matrix and the final success matrix to form fuzzy cognitive maps.

Fuzzy mapping process consists of 5 steps. As a first step, the initial success matrix is formed. This matrix consists of a $n \times m$ matrix in which n is the number of key success factors, which are called mafia or variables, and m is the number of people interviewed to obtain data. Each element of Natries represents the importance that a J person has given to a special i concept on a scale that can be different in projects and even for different kinds of success in a project. Because in the future, these results will be transformed into a fuzzy set with values between zero and one.

Success occurs in the next step. In this matrix, V_i numerical vectors are transferred to fuzzy sets in which each element of the fuzzy set suggests that the membership of any V_i vector O_{ij} element is V_i self-grown V_i . Explicit vectors with values between zero and one are transformed into fuzzy sets as follows.

The maximum value in V_i is found and $X_i = 1$ is considered for it. Then found the maximum value in V_i and $X_i = 0$ for it.

$$X_i(O_{ij}) = \frac{O_{ij} - \min(O_{ip})}{\max(O_{ip}) - \min(O_{ip})}$$

In the third stage, the relationship matrix creates the strength of success. The matrix of success is a $n \times n$ matrix. Rows and columns of the matrix are key factors for success and each element in the matrix indicates the relationship between factor I and j factor. S_{ij} can also accept values in the range of -1 to $+1$. Any key property agent is shown as a S_i numerical vector that contains the n element for each concept shown in the map. There are three possible relationships between the two concepts of S_{ij} .

$S_{ij} > 0$ reflects a direct (positive) causality between i and j concepts. This means that increasing the value of i concept increases the value of j concept.

$S_{ij} < 0$ represents the inverse (negative) causality between i and j concepts. It means that increasing the value of i concept decreases the value of j concept.

And if S_{ij} is equal to zero, it shows that there is no relationship between i and j concepts.

Relationships must be determined before entering the next section. IMS and FZMS numerical vectors become fuzzy sets. Based on the V_1 and V_2 vectors associated with the 1, 2 and $X_1(V_j)$ and $X_2(V_j)$, the j membership degrees of the V_1 and V_2 vectors, these vectors have an increasingly interconnected relationship. (direct relation between 1 and 2 concepts and $S_{ij} > 0$). If $X_1(V_j)$ is similar to $X_2(V_j)$ for all or most of the elements associated with two vectors, and V_1 and V_2 vector only has a reduced relationship between concepts 1 and 2, and if $X_1(V_j)$ is similar to $(1 - X_2(V_j))$ for all or most of the related elements is $S_{ij} < 0$.

Also, in order to determine the bi-close relationship between the two vectors V_1 and V_2 , according to the similarity between these two vectors, the strength of the relationship between these two vectors is an indication of the relationship between these two vectors which is demonstrated by the element of S_{12} in SRMS. The proximity of the relationship between the two vectors is based on the

concept of the distance between vectors (Kosko, 1985). The mathematical procedure to calculate the similarity between these two vectors indicates a policy spoken by Schneider and colleagues.

A different calculation is required for vectors that are directly related and those with a reverse relationship. If the V1 and V2 vectors have a direct relationship, then the nearest relationship between the portions is a time when $X_1(V_j)=X_2(V_j)$ is $X_2(V_j)$.

If the distance between the j-widgets of V1 and V2 is as follows:

$$d_j = |X_1(v_j) - X_2(v_j)|$$

And AD is the mean distance between V1 and V2,

$$AD = \frac{\sum |d_j|}{m}$$

The closeness or similarity of S between two vectors is shown based on this equation.

$$S = 1 - AD$$

S = 1 indicates complete similarity and S = 0 indicates the maximum degree of dissimilarity.

If the vectors V1 and V2 are inversely related, then the method of calculating the similarity between them is similar to the previous case. With the exception that in this case, the equation for calculating the distance between the relevant elements is a common relation to the vectors V1 and V2.

$$D_j = |X_1(V_j) - (1 - x_2(V_j))|$$

The remaining equations are the same for calculating the mean distance between the AD vectors and their (S) similarity.

In this case, S=1 indicates the full inverse similarity and S=0 indicates the complete insimilarity between the two vectors.

The final success index is the next step in this method. When the SRMS matrix is complete, part of the data in it can be misleading data. Not all the key factors of success in the matrix are related and there is not always a causality between them. In order to analyze data and transform SRMS into the final matrix of success, an expert idea is required that only includes the elements of the number, which represent the causal relationship among the key factors of success. In the process of data analysis in the SRMS matrix, two vectors can be interconnected by each other. The vectors can represent close mathematical relationships and at the same time reasonably, two indices/ concepts can be completely unrelated. These unconventional relationships can be easily identified as experts.

In the last step, the graphics of fuzzy mapping is considered. The graphics display of the final success matrix as a fuzzy map draws a targeted fuzzy mapping to draw the key factors of success. In the final show, every flashbacks of the i and j factors of darya is a marked weight. This value indicates the strength of the direct relationship or reverse causality between both the factors and the value contained in the final matrix of success in the cells provided in row i and column j (Osoba & Kosko, 2017).

In this study and according to the method introduced, 15 variables of product market competition, productivity, efficiency, organizational entrepreneurship, financial performance, product development, market value, total assets, financial return, corporate rights, return of each share, return rate of return, return of stock owners and annual return as intermediate variables between two main variables of intellectual capital and competitiveness power. In fact, the purpose of using fuzzy map is to determine the relationship between 15 aforementioned variables and two main variables of the study. It should be noted that two variables of intellectual capital and competitive power have been introduced based on the research hypothesis and 15 additional variables have been introduced based on the background of research.

Due to the aim of this study and statistical method used, 15 experts have scored 17 variables in this study. The basis for scoring is that each expert determines the importance of the variable in intellectual capital and the ability of economic competition between 0 and 100. Scoring results are presented in table 2. Table Number (2) columns indicate the score of each expert to each variable and the table rials represent the following 17 variables, respectively.

1. Intellectual Capital 2: Economic Competitiveness 3: Productivity Market 4, 5, 6, Organizational Innovation, 7, Organizational Entrepreneurship, 8 Financial Performance, 9 Product Development, 10 market value, 11 total assets, 12 return, 12 return of stock, 13 Financial Information Quality, 14 Company performance, 15 Share Share Rate And 17. Annual output.

Table (2) Fuzzy Central Drawing Matrix

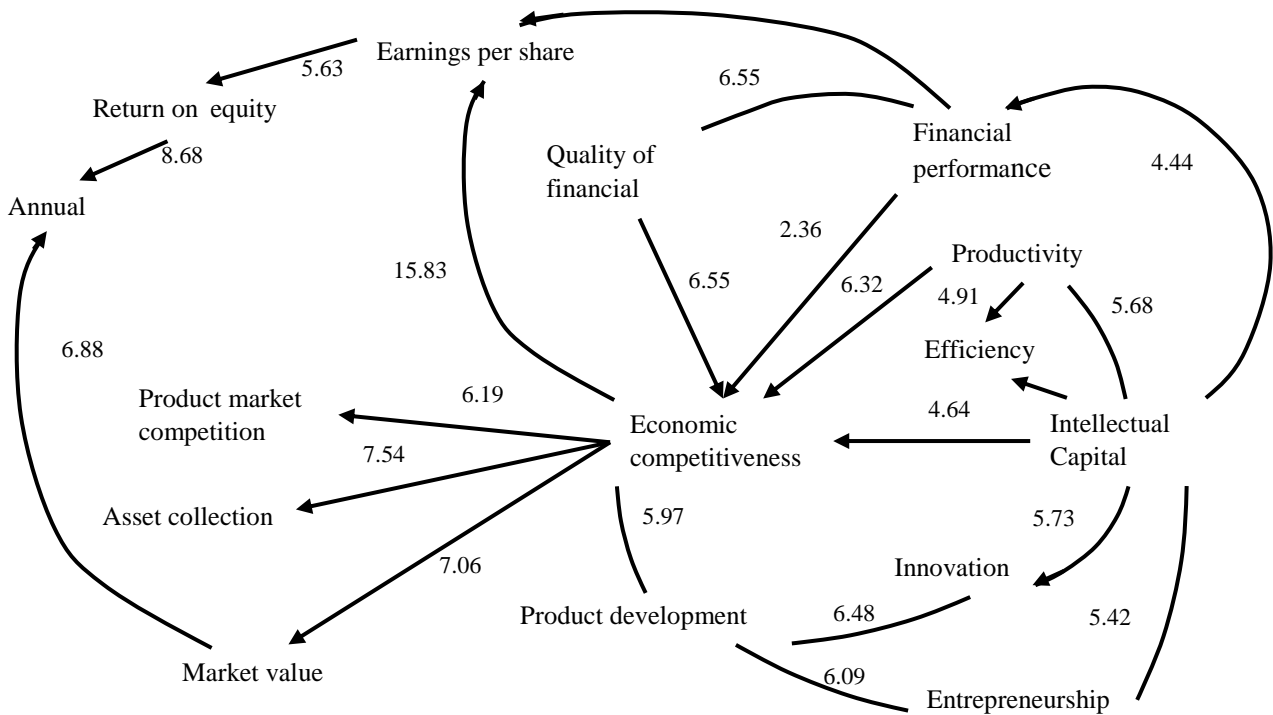
| | | | | | | | | | | | | | | | |
|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
| 1 | 95 | 50 | 80 | 60 | 40 | 90 | 90 | 80 | 90 | 80 | 70 | 90 | 80 | 80 | 60 |
| 2 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| 3 | 80 | 60 | 80 | 60 | 80 | 50 | 80 | 60 | 80 | 80 | 60 | 60 | 70 | 40 | 60 |
| 4 | 30 | 80 | 60 | 70 | 60 | 80 | 60 | 80 | 40 | 60 | 80 | 80 | 80 | 50 | 70 |
| 5 | 60 | 60 | 70 | 80 | 70 | 60 | 70 | 60 | 60 | 70 | 60 | 60 | 90 | 80 | 80 |
| 6 | 70 | 70 | 80 | 90 | 80 | 80 | 80 | 70 | 80 | 80 | 80 | 70 | 40 | 80 | 90 |
| 7 | 40 | 80 | 90 | 60 | 90 | 60 | 90 | 80 | 80 | 90 | 60 | 80 | 50 | 60 | 40 |
| 8 | 100 | 90 | 100 | 90 | 90 | 90 | 100 | 90 | 100 | 90 | 90 | 90 | 100 | 90 | 100 |
| 9 | 50 | 90 | 80 | 80 | 50 | 80 | 40 | 90 | 60 | 40 | 70 | 90 | 80 | 80 | 50 |
| 10 | 80 | 40 | 60 | 60 | 80 | 60 | 80 | 40 | 80 | 50 | 80 | 40 | 60 | 60 | 80 |
| 11 | 60 | 30 | 80 | 70 | 40 | 70 | 60 | 50 | 10 | 80 | 90 | 90 | 80 | 70 | 60 |
| 12 | 80 | 60 | 60 | 80 | 80 | 80 | 70 | 80 | 80 | 80 | 40 | 40 | 60 | 80 | 80 |
| 13 | 60 | 70 | 70 | 80 | 60 | 90 | 80 | 60 | 60 | 60 | 50 | 80 | 70 | 60 | 60 |
| 14 | 70 | 40 | 80 | 60 | 70 | 80 | 90 | 80 | 70 | 80 | 80 | 60 | 80 | 70 | 70 |
| 15 | 80 | 50 | 90 | 70 | 80 | 40 | 40 | 60 | 80 | 60 | 90 | 70 | 90 | 80 | 80 |
| 16 | 90 | 80 | 40 | 80 | 90 | 70 | 50 | 70 | 80 | 70 | 40 | 80 | 40 | 90 | 90 |
| 17 | 40 | 60 | 90 | 90 | 40 | 80 | 80 | 80 | 60 | 80 | 80 | 90 | 80 | 40 | 40 |

In Table 2 of 95, which is located at the first and first intersection, the first expert believes that intellectual capital directly affects the ability of economic competition by 95%.

In the next step, the fractions are obtained. In order to avoid the detection of replies, a limit of 20 and a limit of 90 were considered for the responses. However, all responses that are equal to or under 20 are considered equal to zero and all replies are equal to or more than 90 times the same in one aspect. In the next step, the power matrix of relations is obtained. In this matrix the relationship between the 17 factors of research is shown. In order to form the final matrix, a focus group with six members was formed. Members of the focal group included 6 university professors and competitive power specialists. On the basis of their opinion, meaningless relationships were omitted and the causal direction of relationships was determined. The results of analysis in table (3) and fuzzy mapping chart in shape (1) were shown. According to the results, the return of the stock owners' rights and the return of the return of the stock owners have equal meaning and meaning, and as a result, the return of the stock owners' rights is eliminated. The two concepts of financial performance and performance of the company are similar because of the organisation's financial nature, and as a result, the company's performance is eliminated. On the other hand, other illogical relations were removed from the experts.

Table (3) Fuzzy Mapping Initial Matrix

| | | | | | | | | | | | | | | | |
|----|---|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 13 | 15 | 16 | 17 |
| 1 | | 64.4 | | 68.5 | 73.5 | 21.5 | 42.5 | 44.4 | | | | | | | |
| 2 | | | 19.6 | 32.6 | | | | 36.2 | 97.5 | 06.7 | 54.7 | 55.6 | 83.5 | | |
| 3 | | | | | | | | | | | | | | | |
| 4 | | | | | 91.4 | | | | | | | | | | |
| 5 | | | | | | | | | | | | | | | |
| 6 | | | | | | | | | 48.6 | | | | | | |
| 7 | | | | | | | | | 09.6 | | | | | | |
| 8 | | | | | | | | | | | | 55.6 | 83.5 | | |
| 9 | | | | | | | | | | 28.8 | 11.5 | | 51.5 | 51.7 | 54.4 |
| 10 | | | | | | | | | | | | | | | 88.6 |
| 11 | | | | | | | | | | | | | | | |
| 13 | | | | | | | | | | | | | | | |
| 15 | | | | | | | | | | | | | | 63.5 | |
| 16 | | | | | | | | | | | | | | | 68.8 |
| 17 | | | | | | | | | | | | | | | |



Shape (1): Fuzzy map of intellectual capital, economic competitiveness and related variables

The obtained model shows the relationship between variables related to intellectual capital and economic competitiveness as well as the level of this relationship. Therefore, intellectual capital affects economic competitiveness, innovation, entrepreneurship, efficiency, productivity and financial performance. Also, economic competition is related to productivity, financial performance, financial information quality, profit per share, market competition, total assets, market value and product development. On the other hand, the relationship between the variables of return rate of stock owners and annual return with intellectual capital variables and power of economic competition is considered as indirect. Therefore, the economic competitiveness initially affects the market value and profit of each share, and then these two variables influence the annual return and return of the stock owners, respectively. The results also show that the return rate of stock owners affects annual return.

Model verification

The statistical tests were used to investigate the data. To analyze the data, the researcher-made questionnaire was developed based on the final model. Accordingly, the questionnaire with 22 cases, each of which indicates the relationship between the variables of the model, was designed based on the five-degree Likert spectrum from very high to very low. For example, Gwaya, intellectual capital affects the ability of economic competition. As a question, the relationship between these two variables has been developed. To evaluate the validity and reliability of the questionnaire, content formal validity was used, using the opinions of 6 experts in the field of intellectual capital, economic competitiveness and financial management, and Cronbach's alpha (0.933) was used. After reliability and validity, all the questionnaires were distributed to the sample of 280 people and 265 questionnaires were returned. In fact, it was more than the minimum number needed by 260. Preliminary results show that 65% of respondents were male and 35% affected. Staff with an age range of 36-45 years had the maximum relative volume (48%) and most respondents had a masters degree. In the next stage the tests of the average and one-variable t relation to the questions were investigated. The constant value in the one-variable t-test, the Likert spectrum is considered as a 3 hypothetical mean. Results for each dialect are shown in table (4).

Table(4): Mean and t-heterovariate

| | Question | mean | t-value | sig |
|----|--|------|---------|-------|
| 1 | Intellectual capital affects the competitiveness of the economy. | 99/3 | 827/9 | 000/0 |
| 2 | Intellectual capital affects efficiency. | 83/3 | 365/7 | 000/0 |
| 3 | Intellectual capital affects productivity. | 83/3 | 799/7 | 000/0 |
| 4 | Intellectual capital influences innovation. | 85/3 | 017/8 | 000/0 |
| 5 | Intellectual capital affects entrepreneurship. | 92/3 | 897/8 | 000/0 |
| 6 | Intellectual capital affects financial performance. | 95/3 | 272/9 | 000/0 |
| 7 | Performance affects productivity. | 96/3 | 699/9 | 000/0 |
| 8 | Productivity affects economic competitiveness. | 62/3 | 314/5 | 000/0 |
| 9 | Innovation affects product development. | 06/4 | 095/11 | 000/0 |
| 10 | Entrepreneurship affects product development. | 96/3 | 528/9 | 000/0 |
| 11 | Product development affects economic competitiveness. | 08/4 | 493/11 | 000/0 |
| 12 | Financial performance affects economic competitiveness. | 64/3 | 574/5 | 000/0 |
| 13 | Financial performance affects the quality of financial information. | 34/3 | 600/5 | 000/0 |
| 14 | The quality of financial information affects the competitiveness of the economy. | 98/3 | 897/9 | 000/0 |
| 15 | Financial performance affects return on equity. | 00/4 | 874/9 | 000/0 |
| 16 | Economic competitiveness affects return on equity. | 76/3 | 980/6 | 000/0 |
| 17 | The power of economic competition affects the competitiveness of the product market. | 77/3 | 259/7 | 000/0 |
| 18 | Economic competitiveness affects the total assets. | 78/3 | 296/7 | 000/0 |
| 19 | Economic competitiveness affects market value. | 75/3 | 901/6 | 000/0 |
| 20 | Market value affects annual returns. | 88/3 | 462/8 | 000/0 |
| 21 | Return on equity affect the rate of return on equity. | 80/3 | 348/7 | 000/0 |
| 22 | The rate of return on equity affects the annual return. | 81/3 | 356/7 | 000/0 |

Based on table 4 results, if the average is above the assumed average 3 and the obtained sig value is less than 0.05, it can be said that t observed is acceptable and therefore a univariate relationship exists. On this basis, all existing relationships in the model are confirmed. On the other hand, and based on the results, the highest average related to the effect of the product development on the ability of economic competition, which can be considered as a result of the development of products has a significant impact on the ability of economic competition. Also, the mean of the relationship between innovation and development of products and the relationship between financial performance on each share has an average higher than 4. As a result, these relationships are considered strong in statistical society. The lowest mean is related to the effect of financial performance on the quality of financial information. On the one hand, according to the observed statistics of this relationship, and on the other hand, with respect to the lower mean of financial performance than other variables, the effect of financial performance on the quality of financial information can be considered as the weakest.

Causal model

One of the system's dynamic tools is to access system thinking and to understand all existing relationships in the model. For this purpose, WSIM software was used. This software is able to review all existing relationships. Also, this software can introduce the relationship between different variables in the most rings and introduce all the existing relationships in the model.

First, the model obtained from fuzzy map is introduced into the software and then the available loops are recognized using the software. The model entered into this software was shown in chart (2). It is worth noting that some relationships have not been determined in the model obtained from fuzzy map and this leads to the incomplete model of the causal model. In other words, having a ring is one of the constraints of the Ali-Disabled model and lack of a ring in the fuzzy mapping model leads to a shortage. Based on this basis, according to experts, the model was reconsidered by fuzzy cognitive map and some additional relationships were added.

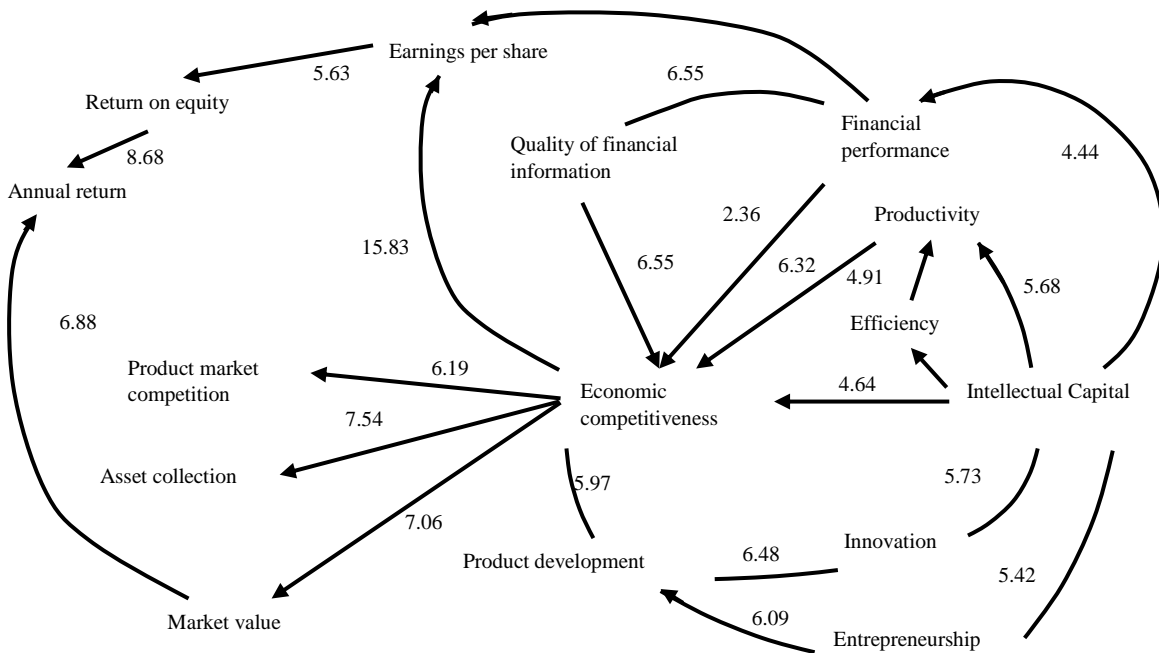


Figure (2): Vensim software entered model

After entering the model, the identification of the loops which is based on the relationship between variables is determined. For this purpose, the loops associated with each variable are introduced separately.

- Intellectual capital

Based on the software output, 45 rings that match the table (5) could be defined for the intellectual capital.

Table (5) defined loops for intellectual capital

| No. | length | Path | No. | length | Path |
|-----|--------|--|-----|--------|---|
| 1 | 3 | Intellectual Capital Economic competitiveness Total assets Education | 2 | 4 | Intellectual Capital Efficiency Economic competitiveness Total assets Education |
| 3 | 4 | Intellectual Capital Financial performance Economic competitiveness Total assets Education | 4 | 5 | Intellectual Capital Innovation Product development Economic competitiveness Total assets Education |
| 5 | 5 | Intellectual Capital Economic competitiveness Market value Annual returns Total assets Education | 6 | 5 | Intellectual Capital Performance Efficiency Economic competitiveness Total assets Education |
| 7 | 5 | Intellectual Capital Financial performance Quality of financial information Economic competitiveness Total assets Education | 8 | 5 | Intellectual Capital Entrepreneurship Product development Economic competitiveness Total assets Education |
| 9 | 6 | Intellectual Capital Financial performance Return on equity Equity rate of return Annual returns Total assets Education | 10 | 6 | Intellectual Capital Entrepreneurship Product development Financial performance Economic competitiveness Total assets Education |

| | | | | | |
|----|---|---|----|---|--|
| 11 | 6 | Intellectual Capital Economic competitiveness Return on equity Equity rate of return Annual returns Total assets Education | 12 | 6 | Intellectual Capital Efficiency Economic competitiveness Market value Annual returns Total assets Education |
| 13 | 6 | Intellectual Capital Financial performance Economic competitiveness Market value Annual returns Total assets Education | 14 | 6 | Intellectual Capital Innovation Product development Financial performance Economic competitiveness Total assets Education |
| 15 | 7 | Intellectual Capital Innovation Product development Financial performance Quality of financial information Economic competitiveness Total assets Education | 16 | 7 | Intellectual Capital Economic competitiveness Financial performance Return on equity Equity rate of return Annual returns Total assets Education |
| 17 | 7 | Intellectual Capital Financial performance Quality of financial information Economic competitiveness Market value Annual returns Total assets Education | 18 | 7 | Intellectual Capital Financial performance Economic competitiveness Return on equity Equity rate of return Annual returns Total assets Education |
| 19 | 7 | Intellectual Capital Performance Efficiency Economic competitiveness Market value Annual returns Total assets Education | 20 | 7 | Intellectual Capital Innovation Product development Economic competitiveness Market value Annual returns Total assets Education |
| 21 | 7 | Intellectual Capital Entrepreneurship Product development Financial performance Quality of financial information Economic competitiveness Total assets Education | 22 | 7 | Intellectual Capital Entrepreneurship Product development Economic competitiveness Market value Annual returns Total assets Education |
| 23 | 7 | Intellectual Capital Efficiency Economic competitiveness Return on equity Equity rate of return Annual returns Total assets Education | 24 | 8 | Intellectual Capital Innovation Product development Financial performance Return on equity Equity rate of return Annual returns Total assets Education |
| 25 | 8 | Intellectual Capital Innovation Product development Economic competitiveness Return on equity Equity rate of return Annual returns Total assets Education | 26 | 8 | Intellectual Capital Performance Efficiency Economic competitiveness Return on equity Equity rate of return Annual returns Total assets Education |
| 27 | 8 | Intellectual Capital Innovation Product development Financial performance Economic competitiveness Market value Annual returns | 28 | 8 | Intellectual Capital Entrepreneurship Product development Economic competitiveness Return on equity Equity rate of return Annual returns |

| | | | | | |
|----|---|---|----|----|--|
| | | Total assets Education | | | Total assets Education |
| 29 | 8 | Intellectual Capital Entrepreneurship Product development Financial performance Economic competitiveness Market value Annual returns Total assets Education | 30 | 8 | Intellectual Capital Efficiency Economic competitiveness Financial performance Return on equity Equity rate of return Annual returns Total assets Education |
| 31 | 8 | Intellectual Capital Entrepreneurship Product development Financial performance Return on equity Equity rate of return Annual returns Total assets Education | 32 | 8 | Intellectual Capital Financial performance Return on equity Equity rate of return Annual returns Product development Economic competitiveness Total assets Education |
| 33 | 8 | Intellectual Capital Financial performance Quality of financial information Economic competitiveness Return on equity Equity rate of return Annual returns Total assets Education | 34 | 9 | Intellectual Capital Innovation Product development Economic competitiveness Financial performance Return on equity Equity rate of return Annual returns Total assets Education |
| 35 | 9 | Intellectual Capital Entrepreneurship Product development Financial performance Quality of financial information Economic competitiveness Market value Annual returns Total assets Education | 36 | 9 | Intellectual Capital Economic competitiveness Product market competition Product development Financial performance Return on equity Equity rate of return Annual returns Total assets Education |
| 37 | 9 | Intellectual Capital Innovation Product development Financial performance Economic competitiveness Return on equity Equity rate of return Annual returns Total assets Education | 38 | 9 | Intellectual Capital Entrepreneurship Product development Economic competitiveness Financial performance Return on equity Equity rate of return Annual returns Total assets Education |
| 39 | 9 | Intellectual Capital Innovation Product development Financial performance Quality of financial information Economic competitiveness Market value Annual returns Total assets Education | 40 | 9 | Intellectual Capital Innovation Product development Financial performance Quality of financial information Economic competitiveness Market value Annual returns Total assets Education |
| 41 | 9 | Intellectual Capital Entrepreneurship Product development Financial performance Economic competitiveness Return on equity Equity rate of return Annual returns Total assets Education | 42 | 10 | Intellectual Capital Efficiency Economic competitiveness Product market competition Product development Financial performance Return on equity Equity rate of return Annual returns Total assets Education |

| | | | | | |
|----|----|---|----|----|--|
| 43 | 10 | Intellectual Capital Entrepreneurship Product development Financial performance Quality of financial information Economic competitiveness Return on equity Equity rate of return Annual returns Total assets Education | 44 | 10 | Intellectual Capital Innovation Product development Financial performance Quality of financial information Economic competitiveness Return on equity Equity rate of return Annual returns Total assets Education |
| 45 | 11 | Intellectual Capital Performance Efficiency Economic competitiveness Product market competition Product development Financial performance Return on equity Equity rate of return Annual returns Total assets Education | | | |

-Economic competitiveness

Based on the software output, 67 loops can be defined for economic competitiveness according to Table (9).

Table (6) Definable loops for economic competitiveness

| No. | Length | Path | No. | Length | Path |
|-----|--------|--|-----|--------|---|
| 1 | 1 | Economic competitiveness Financial performance | 2 | 2 | Economic competitiveness Product market competition Product development |
| 3 | 2 | One economic competition Financial performance Quality of financial information | 4 | 3 | Economic competitiveness Total assets Education Product development |
| 5 | 3 | Economic competitiveness Product market competition Product development Financial performance | 6 | 3 | Economic competitiveness Total assets Education Intellectual Capital |
| 7 | 3 | Economic competitiveness Market value Annual returns | 8 | 4 | Economic competitiveness Product market competition Product development Financial performance Quality of financial information |
| 9 | 4 | Economic competitiveness Total assets Education Intellectual Capital Financial performance | 10 | 4 | Economic competitiveness Total assets Education Product development Financial performance |
| 11 | 4 | Economic competitiveness Total assets Education Intellectual Capital Efficiency | 12 | 4 | Economic competitiveness Market value Annual returns Product development Financial performance |
| 13 | 4 | Economic competitiveness Total assets Market value Annual returns Product development | 14 | 4 | Economic competitiveness Return on equity Equity rate of return Annual returns Product development |
| 15 | 5 | Economic competitiveness Total assets Education Intellectual Capital Performance Efficiency | 16 | 5 | Economic competitiveness Total assets Education Intellectual Capital Innovation Product development |
| 17 | 5 | Economic competitiveness Market value Annual returns Product development Financial performance | 18 | 5 | Economic competitiveness Financial performance Return on equity Equity rate of return Annual returns |

| | | | | | |
|----|---|---|----|---|---|
| | | Quality of financial information | | | Product development |
| 19 | 5 | Economic competitiveness Total assets Education Product development Financial performance Quality of financial information | 20 | 5 | Economic competitiveness Total assets Education Intellectual Capital Financial performance Quality of financial information |
| 21 | 5 | Economic competitiveness Total assets Education Intellectual Capital Entrepreneurship Product development | 22 | 5 | Economic competitiveness Total assets Market value Annual returns Product development Financial performance |
| 23 | 5 | Economic competitiveness Market value Annual returns Total assets Education Product development | 24 | 5 | Economic competitiveness Market value Annual returns Total assets Education Intellectual Capital |
| 25 | 5 | Economic competitiveness Return on equity Equity rate of return Annual returns Product development Financial performance | 26 | 6 | Economic competitiveness Total assets Education Intellectual Capital Entrepreneurship Product development |
| 27 | 6 | Economic competitiveness Return on equity Equity rate of return Annual returns Total assets Education Intellectual Capital | 28 | 6 | Economic competitiveness Return on equity Equity rate of return Annual returns Total assets Education Product development |
| 29 | 6 | Economic competitiveness Total assets Education Intellectual Capital Innovation Product development | 30 | 6 | Economic competitiveness Market value Annual returns Total assets Education Product development Financial performance |
| 31 | 6 | Economic competitiveness Market value Annual returns Total assets Education Intellectual Capital Financial performance | 32 | 6 | Economic competitiveness Market value Annual returns Total assets Education Intellectual Capital Efficiency |
| 33 | 6 | Economic competitiveness Return on equity Equity rate of return Annual returns Product development Financial performance Quality of financial information | 34 | 6 | Economic competitiveness Total assets Market value Annual returns Product development Financial performance Quality of financial information |
| 35 | 7 | Economic competitiveness Total assets Education Intellectual Capital Entrepreneurship Product development Financial performance Quality of financial information | 36 | 7 | Economic competitiveness Market value Annual returns Total assets Education Product development Financial performance Quality of financial information |
| 37 | 7 | Economic competitiveness Market value Annual returns Total assets Education Intellectual Capital Entrepreneurship Product development | 38 | 7 | Economic competitiveness Market value Annual returns Total assets Education Intellectual Capital Innovation Product development |
| 39 | 7 | Economic competitiveness Financial performance | 40 | 7 | Economic competitiveness Return on equity |

| | | | | | |
|----|---|---|----|---|---|
| | | Return on equity Equity rate of return Annual returns Total assets Education Intellectual Capital | | | Equity rate of return Annual returns Total assets Education Product development Financial performance |
| 41 | 7 | Economic competitiveness Financial performance Return on equity Equity rate of return Annual returns Total assets Education Product development | 42 | 7 | Economic competitiveness Return on equity Equity rate of return Annual returns Total assets Education Intellectual Capital Efficiency |
| 43 | 7 | Economic competitiveness Market value Annual returns Total assets Education Intellectual Capital Performance Efficiency | 44 | 7 | Economic competitiveness Return on equity Equity rate of return Annual returns Total assets Education Intellectual Capital Financial performance |
| 45 | 7 | Economic competitiveness Total assets Education Intellectual Capital Innovation Product development Financial performance Quality of financial information | 46 | 7 | Economic competitiveness Market value Annual returns Total assets Education Intellectual Capital Financial performance Quality of financial information |
| 47 | 8 | Economic competitiveness Return on equity Equity rate of return Annual returns Total assets Education Financial performance Quality of financial information | 48 | 8 | Economic competitiveness Return on equity Equity rate of return Annual returns Total assets Education Intellectual Capital Entrepreneurship Product development |
| 49 | 8 | Economic competitiveness Total assets Education Intellectual Capital Financial performance Return on equity Equity rate of return Annual returns Product development | 50 | 8 | Economic competitiveness Market value Annual returns Total assets Education Intellectual Capital Entrepreneurship Product development Financial performance |
| 51 | 8 | Economic competitiveness Return on equity Equity rate of return Annual returns Total assets Education Intellectual Capital Financial performance Quality of financial information | 52 | 8 | Economic competitiveness Market value Annual returns Total assets Education Intellectual Capital Innovation Product development Financial performance |
| 53 | 8 | Economic competitiveness Return on equity Equity rate of return Annual returns Total assets Education Intellectual Capital Performance Efficiency | 54 | 8 | Economic competitiveness Return on equity Equity rate of return Annual returns Total assets Education Intellectual Capital Innovation Product development |
| 55 | 8 | Economic competitiveness Financial performance Return on equity Equity rate of return Annual returns | 56 | 8 | Economic competitiveness Financial performance Return on equity Equity rate of return Annual returns |

| | | | | | |
|----|----|---|----|----|--|
| | | Total assets Education Intellectual Capital Efficiency | | | Total assets Education Intellectual Capital Innovation Product development |
| 57 | 9 | Economic competitiveness Financial performance Return on equity Equity rate of return Annual returns Total assets Education Intellectual Capital Entrepreneurship Product development | 58 | 9 | Economic competitiveness Return on equity Equity rate of return Annual returns Total assets Education Intellectual Capital Innovation Product development Financial performance |
| 59 | 9 | Economic competitiveness Product market competition Product development Financial performance Return on equity Equity rate of return Annual returns Total assets Education Intellectual Capital | 60 | 9 | Economic competitiveness Market value Annual returns Total assets Education Intellectual Capital Entrepreneurship Product development Financial performance Quality of financial information |
| 61 | 9 | Economic competitiveness Financial performance Return on equity Equity rate of return Annual returns Total assets Education Intellectual Capital Performance Efficiency | 62 | 9 | Economic competitiveness Market value Annual returns Total assets Education Intellectual Capital Innovation Product development Financial performance Quality of financial information |
| 63 | 9 | Economic competitiveness Return on equity Equity rate of return Annual returns Total assets Education Intellectual Capital Entrepreneurship Product development Financial performance | 64 | 10 | Economic competitiveness Return on equity Equity rate of return Annual returns Total assets Education Intellectual Capital Entrepreneurship Product development Financial performance Quality of financial information |
| 65 | 10 | Economic competitiveness Product market competition Product development Financial performance Return on equity Equity rate of return Annual returns Total assets Education Intellectual Capital Efficiency | 66 | 10 | Economic competitiveness Return on equity Equity rate of return Annual returns Total assets Education Intellectual Capital Innovation Product development Financial performance Quality of financial information |
| 67 | 11 | Economic competitiveness Product market competition Product development Financial performance Return on equity Equity rate of return Annual returns Total assets Education Intellectual Capital Performance Efficiency | | | |

Apart from the two main variables of the research, specific loops have been set for other variables. The number of loops created for each variable is shown in Table (7).

Table (7): Number of loops created for other research variables

| Variable | Number of loops | Variable | Number of loops | Variable | Number of loops |
|-----------------------|-----------------|----------------------------------|-----------------|---------------------|-----------------|
| Financial performance | 50 | Quality of financial information | 17 | Earnings per share | 33 |
| return on Equity | 5 | Product market competition | 6 | Total assets | 60 |
| Annual returns | 54 | Market value | 21 | Product development | 51 |
| Education | 56 | Innovation | 11 | Entrepreneurship | 11 |
| Performance | 5 | Efficiency | 10 | Earnings per share | |

In addition to the above, the relationship between intellectual capital and other variables is also clear in Figure 4.

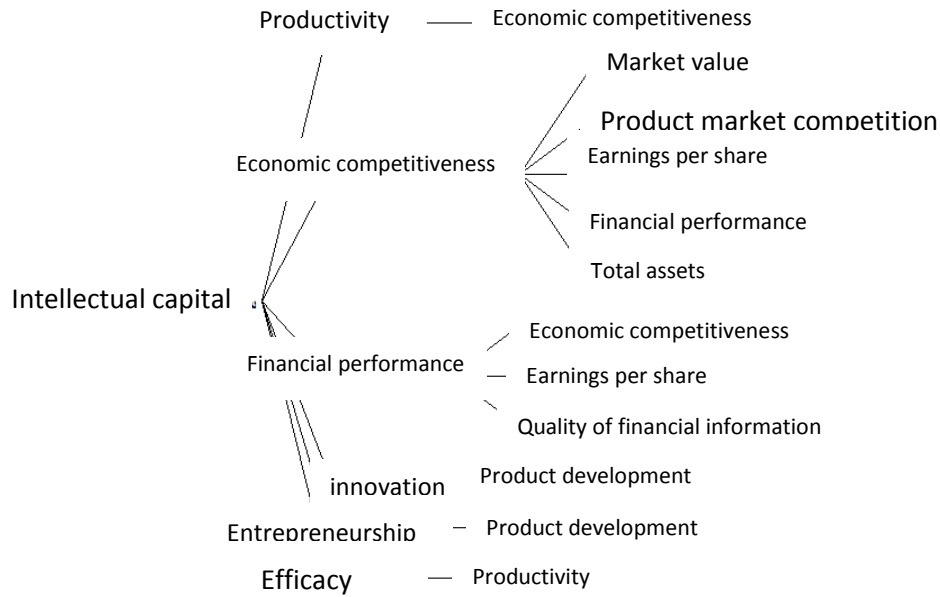


Figure (4): The relationship between intellectual capital and other research variables. According to the information obtained, intellectual capital is directly related to productivity, economic competitiveness, financial performance, innovation, entrepreneurship and efficiency, and its relationship with other variables is indirect. This chart is also available for economic competitiveness.

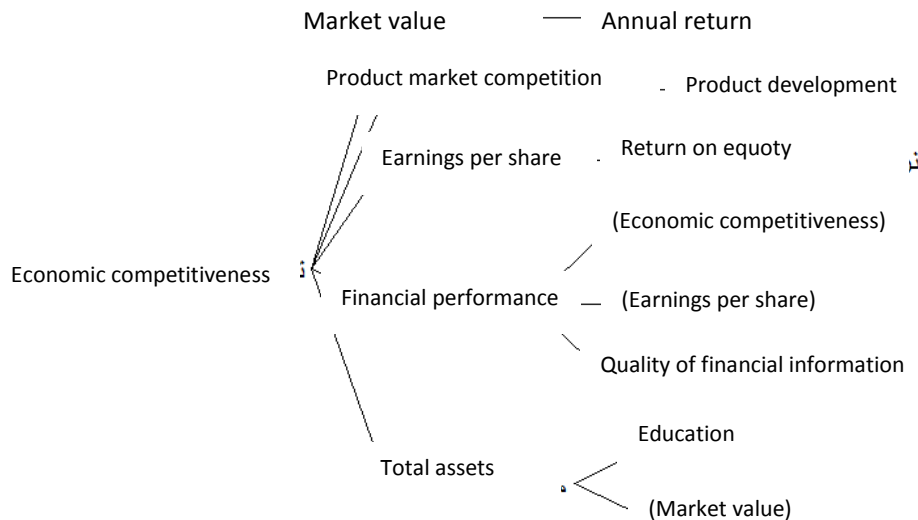


Figure (5): The relationship between economic competitiveness and other research variables

Based on the information obtained, economic competitiveness is directly related to the variables of market value, product market competition, earnings per share, financial performance and total assets, and its relationship with other research variables is indirect.

Summary

In the fourth chapter of the present study, information related to the research findings was presented. In this chapter, first the variables related to the subject of intellectual capital and economic competitiveness were introduced. In the next step, through fuzzy cognitive map, the relationships between the variables were determined and then the obtained relationships were confirmed using a questionnaire and statistical tests. In the final step, the obtained model was developed based on the opinion of experts and all existing circles in the field of intellectual capital and economic competitiveness were determined.

Suggestions for future research

- Identifying variables related to the subject of intellectual capital and economic competitiveness based on qualitative methods such as Delphi
 - Modeling intellectual capital and economic competitiveness based on modeling methods such as grounded theory.
 - Achieving the model of intellectual capital and economic competitiveness with respect to financial companies.
 - Examining the consequences of economic competition according to the conditions of sanctions.
 - Implementing the model obtained in this research in the organizations listed in the Tehran Stock Exchange and receiving feedback.
- Expand the model based on mathematical relationships in system dynamics.

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