INTELLECTUAL CAPITAL INDICATORS RANKING IN THE UNIVERSITIES OF IRAN USING DELPHI FUZZY TECHNIQUE

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Abstract

The purpose of this research is to rank the intellectual capital indicators in the universities of Iran using Delphi Fuzzy technique. To achieve this goal, the intellectual capital maturity model of the universities of Europe (Leitner et al., 2014) was used for the questionnaires. The questionnaires were then sent to the experts. The results of the research revealed that which indicators of the maturity model of the universities of Europe are suitable for the universities of Iran and how they are ranked using Delphi Fuzzy technique.
The results of this research can be an important step in applying intellectual capital reporting in the universities of Iran.

Keywords: Intellectual Capital, University, Delphi Fuzzy Technique

1. INTRODUCTION

In today's knowledge-based economics, there appears to be some intangible factors as the main factors of providing value in companies and the main elements of economic wealth. As a result, measuring and management of intellectual capital have become very important. Although the concept of intellectual capital was initially produced as a framework for the analysis of the contribution of intellectual resources in profit companies, a very short time after that, it was accepted by public and nonprofit organizations such as universities and research centers because of its worldwide importance (Ramirez and Gordillo, 2014). There are various definitions for intellectual capital. Roos et al. (1997) have defined intellectual capital as, "Intellectual capital is the addition of the knowledge of the members of an organization and its practical usage."

Intellectual capital has been classified in different ways since 1990s. The three-part classification has been accepted as the most acceptable classification in research literature. This classification includes human capital, structural capital, and relational capital. Not only the sum of the elements producing intellectual capital is important, but the relationships between these elements are also important (Leitner et al., 2014).

During the last decade, there has been an interest in the application of intellectual capital approach in universities (Leitner, 2004, Ramirez and Gordillo, 2014).

Many European countries and also educational institutions and research institutes have started to develop the application of intellectual capital reporting systems during recent years. The new forms of the universities governance, and the demand for clearance and more responses require the sufficient allocation of the resources, the development of new managerial skills, and the introducing new managerial and reporting means. Intellectual capital reporting has two aims: first dependable and comparable information should be provided for the university management, and therefore suitable management of intellectual capital of university will influence the invested financial funds; and second the information should be published for outside stakeholders to increase the responsibility of answering related questions. So the standardized and comparable indicators should permit inside and outside benchmarking (Leitner et al., 2014). Sanchez et al., (2006) believe that intellectual capital and intangible assets have been

important issues not only for universities but also for governments, legislators, companies, investors, and other shareholders during the last decade.

Intellectual capital is very significant for knowledge-based organizations, because their most important resources and output are intangible (Leitner et al., 2014).

The intellectual capital reporting has a series of indicators that make the quality of accounting information in organizations to be improved (Ramirez and Gordillo, 2014).

Altenburger and Schaffhauser-Linzatti (2015) believe that the main emphasis of the intellectual capital reporting is presenting information for outside stakeholders. In fact the role of the universities nowadays is much vaster than before. Universities do not just teach students, but besides teaching they look at research, entrepreneurship, communication with the society (sanchez et al., 2009), social and cultural life (sanchez et al., 2009), employment of graduates (Leitner et al., 2014) and even environmental responsibility (Ramirez and Gordillo, 2014).

By the increase in the quantity and role of universities in the world, there seems to find a basis for the comparison of universities. This basis of comparison is used for the selection of students and also for the faculty members of universities and other stakeholders of the society (Sanchez et al., 2009) to find out the performance of the university. On the other hand, the universities of Iran, like other universities of the world, look for the best students and best faculty members. Following the independence of universities and the limitation of receiving budgets, these universities need a report which includes both quantity and quality scales. These scales can become available through intellectual capital reporting of universities so that they can be useful for the stakeholders and also can be used for answering any relate question.

The main aim of this research is to identify and to rank the important indicators of intellectual capital in the universities of Iran by using Fuzzy Delphi technique.

To do this, the intellectual capital reporting indicators for universities published by Europe universities (Leitner et al., 2014) were used in this research. Then through the help of the university experts, interview, and sending questionnaires and using Fuzzy Delphi technique, the important indicators of intellectual capital in the universities of Iran are identified and are ranked.

2. LITERATURE REVIEW

2.1. Intellectual capital

Intellectual capital is a set of intangibles that "permit an organization to convey a set of human resources, financial resources, and material resources to a system that can be beneficial for the stakeholders" (European Commission 2006). Although the term 'intellectual capital' is not a new concept and its role in the performance of companies has been studied a lot, its application and its role for universities are relatively new concepts.

During the recent years, the means of intellectual capital reporting has been important for research organizations. Without any doubt, intellectual capital is more related to the knowledge-based organizations such as universities, because their most important resources and outputs are intangible and should be managed more systematically to communicate with different stakeholders, like budget givers, companies, and as a whole all people (Leitner et al., 2014).

2.2. Intellectual Capital in Universities

The term 'intellectual capital in universities' consists of all intangible and nonphysical assets of the universities such as processes, innovation capacity, patents, tacit knowledge and members' capabilities, talents and skills, identifying the society, cooperation network and contacts (European Commission 2006).

Intellectual capital components of the universities have been classified in different ways. In most of the research literature, the three step classification has been used which includes:

1-Human capital: The sum of clear and tacit knowledge of the university staff, professors, researchers, managers, and clerk staff, that has been achieved through formal and informal education and also through learning processes during their activities.

2-Structural capital: clear knowledge related to internal process of dissemination, communication, and technical and scientific management in universities, management and processes of organization, organizational affairs, culture and common values, internal procedures, quality and information system, available resources of technology in universities such as documentary and library resources, patents, licenses, software, databases and so on.

3-Relational capital: A vast set of economic, political, and organizational relations established and verified between universities and non-university partners: companies, non-financial organizations, provinces and as a whole society, and also it includes the perception of others from the university, i.e. image, reliability and so on. (Ramirez and Gordillo, 2014).

Beside this three-step classification, there are some other classifications. For example Leitner (2002) classified the intellectual capital reporting of universities as human capital, structural capital, relational capital, research, education, training, commercializing of research, knowledge transfer to the public, and services.

Bezhani (2010) classified the intellectual capital reporting of universities as human capital, structural capital, relational capital, research, education, commercializing, and knowledge transfer to the public, and services.

Because of the importance of intellectual capital, Austria government decided in 2002 that the intellectual capital reporting of the year 2007 should be compulsory for all universities. Nowadays, in the universities of some countries such as UK, the intellectual capital reporting indicators which are used legally in the universities of Austria are used. The evaluation model of intellectual capital of Leitner is used in many universities including Austria and UK (Bezhani, 2010).

Leitner (2002) and Promburger et al., (2004) pointed out that the intellectual capital reporting for

universities needs the discussion of aims and strategies and should achieve the following two goals:

First, it must provide information for the management of intangible resources.

Second, it must provide the information related to the development and vast application of intellectual capital to the outside stakeholders (Bezhani, 2010).

Ramirz et al., (2013) believe that disclosure of the information of intellectual capital can cause the government universities to be clear and also the stakeholders can achieve easily the information related to their decision making.

The intellectual capital reporting can be used as a suitable means of reporting for measuring, publishing, evaluating the efforts and successes of universities (Altenburger and Schaffhauser-Linzatti, 2015).

Sanchez et al., (2009) and Muritson (2005) and Leitner (2004) believe that the framework of intellectual capital is a valid effort for meeting the new demand of public institutions and also intellectual capital reporting is a suitable means for inside and outside goals.

The report by RICARDIS (2004) shows that universities should be encouraged to see the benefits of the intellectual capita reporting management in their internal management (Sanchez et al., 2006).

The intellectual capital reporting can help to find out the structural and personal weaknesses and strengths and can clear the different present missions of the universities. It can be used as a means of control and supervision (Altenburger et al., 2006).

The intellectual capital reporting can integrate the non-financial values of intangible assets such as human capital, structural capital and relational capital (Altenburger et al., 2015).

In spite of all the mentioned benefits, there is not any force or recommendation in most of the countries to measure and present their intellectual capital information (Ramirez and Gordillo, 2014).

The review of the usual procedures in other countries and the research fulfilled about them can help to produce a solution for intellectual capital reporting.

In Iran, because of economic sanctions, and the high effect of the oil price on the budget of Iran, it is better for universities to be independent more than before and have less dependence on the budget. They can develop the growth centers, knowledge-based companies, and research towns so that more employment and less usage of budget is achieved. Therefore, we should look for a way to measure intellectual capital of intangibles and give importance to them. Furthermore, because a main portion of human capital in Iran is taught through universities so that than can find employment chances, the issue that intellectual capital consists of which items and how they should be reported is a matter of importance.

2.3. Intellectual Capital Researches of Universities out of Iran

Ramirez and Gordillo (2014) in a research named "Recognition and measurement of intellectual capital in Spanish universities" produced a model for the intellectual capital indicators. They classified the intellectual capital indicators of the universities of Spain as human capital, structural capital, and relational capital which included as a whole 42 indicators. They analyzed these indicators which had been sent to the social council of the universities through questionnaires and finally found and offered a framework of 30 intellectual capital indicators.

Veltri et al., (2014) measured intellectual capital in the universities using a fuzzy logic expert system. The model they used in their research was a pilot model that was made by data taken from intellectual capital reporting of the universities of Austria.

Siboni et al., (2013) in their research named 'Italian state university contemporary performance plans: an intellectual capital focus' studied the performance of the government universities of Italy from the point of view of intellectual capital. They evaluated 44 plans of the performance of universities of Italy using the Danish IC guideline. The result of their research showed that in the government universities of Italy, the most frequent actions and innovations are related to the classifications of structural/organizational capital and relational capital, while there was little attention to human capital.

Ramirez and Vanderdonckt (2013) in their research named 'empirical evidence for the increasing importance of intellectual capital reporting in higher education institutions', concluded that the university stakeholders believed that it was necessary that the government universities of Spain to publish intellectual capital reporting. Also from the point of view of the university stakeholders, relational capital, human capital, and structural capital had the highest value respectively.

Bezhani (2010) in his research named 'intellectual capital reporting at UK universities', studied the measurement and nature of volunteer intellectual capital disclosure in the universities of UK. He also studied in this research the relationship between performance and measurement of intellectual capital disclosure and the point of view of the universities of UK in compulsory intellectual capital disclosure.

As a whole, he studied 39 indictors. His findings showed that the amount of the disclosed information of intellectual capital by the universities of UK in their annual reports was very little. He also showed that the universities of UK were among those universities which were controlled more than usual and had a very little awareness about the intellectual capital.

Sanchez et al., (2009) in their research named 'intellectual capital dynamics in universities: a reporting model', proposed a reporting model of intellectual capital for universities in which they proposed the indicators stimulator for the resources of research activities. They classified the indicators in a vast classification of human, organizational, and relational capital. Inside each classification, strategic defined subjects according to the guideline of the universities of Europe (OEU) existed which included 43 financial and non-financial indicators.

Austrian Research Centers (ARC) published the intellectual capital report (2007). This report included the structural investigation of the data

related to human resources and the intangible assets of research centers of Austria and also the relational and structural capital during the year 2007.

2.4. Intellectual Capital Researches of Universities in Iran

Salimi and Rasian (2011) presented a conceptual framework of intellectual capital evaluation in higher education named: 'Approaches for higher technical and engineering centers'. They reviewed the measuring methods of intellectual capital, the intellectual capital evaluation models of Leitner (2002) and Secundo et al (2010). Then they presented the conceptual model of intellectual capital in the universities of Iran using the intellectual capital evaluation indicators of Leitner (2002) and Secundo (2010).

Mirkamali and Zohoorparvandeh (2009) developed a model for measuring intellectual capital of universities of Iran in a case study for Ferdowsi University. They concluded that intellectual capital of universities consist of three main parts: human capital, structural capital, and relational capital. They also concluded that there was a positive and significant relationship between these three prats. The intellectual capital indicators of this research were qualification, capability, approach, creativity, relationship with customers, cooperation and networking, systems, infrastructure assets, organizational routines, and organizational structure.

Nazaripour and Parvizi (2010) proposed a conceptual framework for measuring and reporting intellectual capital in universities. While emphasizing the importance of intellectual capital of universities in their research, they showed the intellectual capital statement and intellectual capital reporting of Elena Suzana (2004).

3. METHODOLOGY

3.1 Research Questions

The main questions of this research are:

What are the intellectual capital indicators in the universities of Iran?

How can we rank the intellectual capital indicators in the universities of Iran using Delphi fuzzy technique?

3.2. Community Expertise

Some of the features for selecting the experts are: dealing with the discussed question, having the continuous information of the question for cooperation, having stimulus for entering this process, and feeling that the acquired information form an agreement are valuable for them too (Asgharpour, 2008).

The expert society of this research includes 17 faculty members of government universities of the ministry of science, research and technology of Iran. The questionnaires were distributed to them and they were asked to fill out them and write their opinions. The selected experts were those who had scientific background, were familiar with the research subject, and besides had executive working experiences such as group manager or Dean of University. Sixteen questionnaires out of seventeen distributed ones were answered. Therefore the valid answers amount equals 94%.

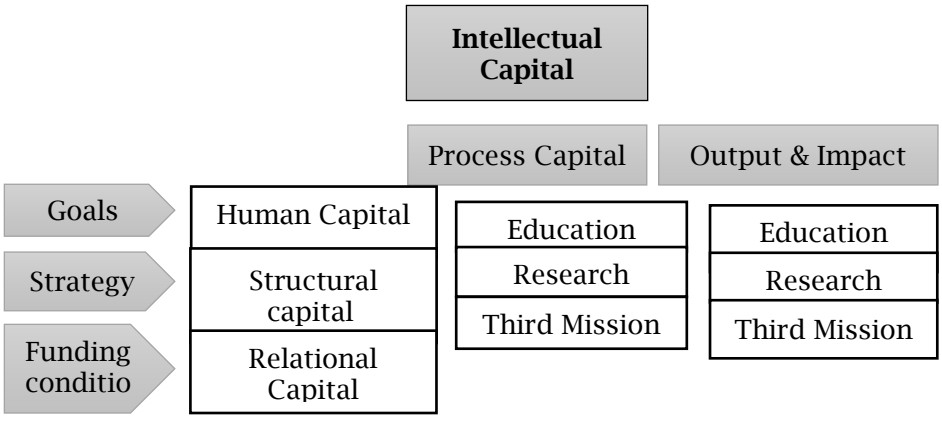
3.3. The Means of Collecting Data

In order to organize and design the questionnaires, the research which was done about this subject was completely investigated. After studying the intellectual capital reporting in the research literature, the intellectual capital reporting of universities of Europe (Leitner et al 2014) was used to provide the questions. Then the questionnaire was given to the experts to point out their opinions about the indicators.

The type of the questions of the questionnaire was of the closed one. The experts were asked to give values from 1 to 10, from the low value to very high one, to each question; and introduce new effective score considering the research goal if necessary. Then after investigating these indictors through Fuzzy Delphi, were finally accepted. The distributed questionnaires included two parts: first they had the personal characteristics of the experts such as age, sex, education, and scientific rank in the university; and second the questions related to the intellectual capital of universities based on the model of Leitner et al., (2014). The distributions of the questionnaires were done in two ways: personal delivery and e-mail.

3.4 Conceptual Model

Figure 1. Conceptual Model



Source: (Leitner et al., 2014)

The conceptual model of this research was prepared on the basis of the main model of Intellectual capital of universities which was proposed by universities of Europe in 2014. This model causes the process of intangible resources to change their forms. This conceptual model is a process approach that shows how universities use intellectual capital and its effects on the outputs of the universities. This model also shows different kinds of intellectual capital. According to Leitner et al (2014), this model is a developing Maturity Model which can be used for different vast universities of Europe.

In fact in this model, when different activities, such as research, teaching and so on, are done, the different outputs will be based on general and special goals. Research and education are two important outputs of universities which should be reported. There may also be some other aims of outputs, such as teaching and commercializing the researches. The intellectual capital reporting, in this model, includes 44 indicators which are classified as follows:

Human capital, 8 indicators; structural capital, 5 indicators; relational capital, 3 indicators; process capital: education, 9 indicators; process capital: research, 2 indicators; process capital: third mission, 1 indicator; results and effects: education, 4 indicators; results and effects: research, 8 indicators; and results and effects: third mission, 4 indicators.

According to Leitner et al., (2014), the advantages of doing intellectual capital in universities have some effects on two levels of inside and outside of the universities. In the inside level, they determine the main purposes of the university, they unite the individual goals with the organizational goals, and they help to identify preferences on the basis of research and teaching and make a strategic relationship in the whole organization and show the factors of success, they relate the strategic goals with the long-term goals and annual budgets, and make the control and supervision of the goals and performance of the university to be done during the time.

In the outside level of the university, they increase the clarity, they provide comprehensive information for the stakeholders, they absorb budget, and finally they produce suitable competition.

In this research, after studying the research literature and reviewing different models of intellectual capital of universities and considering the above mentioned conceptual model, the universities of Europe intellectual capital reporting model (2014) was used.

3.5. Validity

The Validity of the questionnaire, in fact, shows that how much the questions and the variables are investigated and how much the content area of the variables and the subject is covered. On this basis, in this research the method of validity and concentration on the subject literature and also using the experts' points of view were used for the evaluation of the questionnaires. Therefore we can be sure about the validity of the questionnaire.

3.6 Analysis Method

Delphi Fuzzy Technique

Ishikawa et al. (1993) proposed a method named 'Fuzzy Delphi Method', which was derived from the traditional Delphi technique and fuzzy set theory. In 1995, Noordenhaben pointed out that the fuzziness of the common understanding of experts' opinions can be solved by using Fuzzy Delphi technique to group discussions. Previous researches for selecting fuzzy membership functions usually used triangular fuzzy number, trapezoidal fuzzy number and Gaussian fuzzy number, but in this study the triangular membership functions and the fuzzy theory were applied to solve the group decision. The fuzzy theory could solve the fuzziness of common understanding of experts and could evaluate it on a more flexible scale. This method could improve the efficiency and quality of questionnaires. Thus, the statistical results could lead to more objective evaluation factors (Hsu et al., 2010).

The steps of the applying Delphi Fuzzy technique was first collecting the opinions of the decision group: calculating and finding the scores of evaluating the importance of each indicator by each expert by using language variables of the questionnaires, second setting up triangular fuzzy numbers: calculating the evaluation value of triangular fuzzy number of each alternate factor given by experts, finding out the significance triangular fuzzy number of the alternate factor. The formula is as follows:

We assume that the evaluation value of No. j element given by No. i expert of n experts is $\widetilde{W}ij = (a_{ij}, b_{ij}, c_{ij})$, $i = 1,2,\dots,n$, $j = 1,2,\dots,m$ Then the fuzzy weighting $\widetilde{W}ij$ of No.j element is $\widetilde{W}j = (a_j, b_j, c_j)$ (Hsu et al., 2010).

Third Defuzzification: Using simple center of gravity method in order to defuzzify the fuzzy weight w fj of each alternate element to definite value 'Sj, then the followings will be achieved:

$$a_j = \min\{a_{ij}\}$$

$$b_j = \frac{1}{n}\sum_{i=1}^{n} b_{ij}$$

$$c_j = \max\{c_{ij}\}$$

$$S_j = \frac{a_j + 4b_j + c_j}{6} \quad , \qquad j = 1,2,\dots,m$$

Fourth Screen evaluation indexes: Proper factors can be screened out from a lot of factors by setting the score a. So the principle of screening will be: If $S_j \geq a$, then No. j factor is the evaluation index. If $S_j < a$, then delete No. j factor.

In fact in order to get our considered score, we consider a limit to accept or reject that score. In this research the acceptable border is about 7 (Hsu et al., 2010 and Nunnally, 1978). If the defuzzified amount of the fuzzy number based on the experts' opinions is 7 or more, it will be considered as acceptable score, otherwise it will be rejected. As triangular fuzzy numbers have the highest usage in comparison with other fuzzy numbers, they have been used in this research.

In the table 3, the acceptable range in triangular Delphi Fuzzy technique is shown.

Figure 2. A triangular fuzzy number (Hsu et al., 2010)

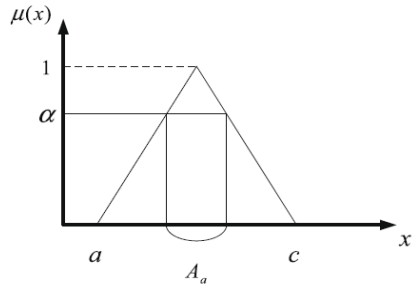


Fig.2 shows the triangular Fuzzy numbers used in this research.

Table 1 shows how linguistic scales have been changed to Fuzzy scores in this research.

The advantages of this technique are that first of all it has flexibility which can solve many problems. This Delphi Fuzzy technique is much better than Fuzzy technique, because in these technique linguistic scales, i.e. vocal scales are changed to Fuzzy numbers. The opinions of the experts that are abstract are changed to Fuzzy numbers. In this research because of the mentioned reasons, the Delphi Fuzzy technique was used.

Table 1. Linguistic variables for the preference of each alternative

Linguistic scales	Fuzzy score
Very Poor	(0,1,2) (1,2,3) (2,3,4) (3,4,5)
Relatively strong and appropriate	(4,5,6) (5,6,7) (6,7,8) (7,8,9) (8,9,10)
Very strong and fit perfectly	(9,10,10)

Figure 3. The steps of the research

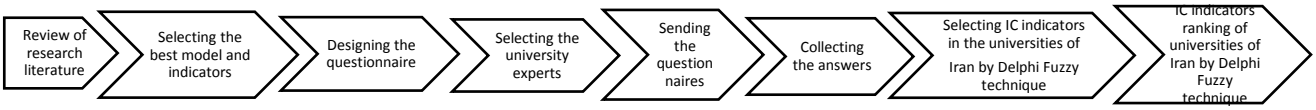


Fig. 3 simply shows the different processes of the researches which were as follows:

The review of research literature, selecting the best model and indicators, designing the questionnaire, selecting the university experts, sending the questionnaire to the experts, collecting the answers from the experts, selecting the intellectual capital indicators in the universities of Iran on the basis of Delphi Fuzzy technique, and finally intellectual capital indicators ranking of universities of Iran.

4. RESULTS

4.1 Descriptive Data

The following table shows sex, education level, academic ranking, working experiences, and the age of the experts in this research.

Table 2. Frequency distribution of experts' gender, education level, academic rank, work experience & age

Frequency distribution			
Variable	**Variable Levels**	**Frequency**	**Percent**
Gender	Male	15	**93.75**
	Female	1	**6.25**
	Total	16	**100**
Education Level	PhD of Accounting	11	**68.75**
	PhD of Management	4	**25**
	PhD in Educational Planning	1	**6.25**
	Total	16	**100**
Academic rank	Full Professor	3	**18.75**
	Associate Professor	4	**25**
	Assistant Professor	9	**56.25**
	Total	16	**100**
Work Experience	Over 30 years	1	**6.25**
	25 to 30 years	5	**31.25**
	20 to 25 years	3	**18.75**
	15 to 20 years	1	**6.25**
	10 to 15 years	2	**12.5**
	5 to 10 years	4	**25**
	Total	16	**100**
Age	Over 60 years	2	**12.5**
	50 to 60 years	4	**25**
	40 to 50 years	6	**37.5**
	30 to 40 years	4	**25**
	Total	16	**100**

Frequency distribution of experts' gender, education level, academic rank, work experience and age and results of them are showed in table 1.

This table shows that 93.75% of experts are male and 6.25% are female. It also indicates that their education levels are: 68.75% PhD of accounting, 25% PhD of management, and 6.25% PhD in educational planning. The academic ranks of the research experts are: 18.75% full professor, 25% associate professor, and 56.25% assistant professor. The experts' years of work experiences are: 6.25%: over 30 years, 31.25%: 25 to 30 years, 18.75%: 20 to 25 years, 6.25%: 15 to 20 years, 12.5%:10 to 15 years, 25%: 5 to 10 years. The experts' ages are: 12.5%: over 60 years, 25%: 50 to 60 years, 37.5%:40 to 50 years, and 25%: 30 to 40 years.

4.2 Results of research questions

The first question of the research is:
What are the intellectual capital indicators in the universities of Iran?

The following table indicates the answer to the first question of the research:

Table 3. Accepted indicators of the experts based on Delphi Fuzzy technique

Indicator	a_j	b_j	c_j	S_j	*Accepted/rejected*
Human capital					
Number of academic staff	5	8.75	10	8.33	Accepted
Academic staff with PhDs (%)	5	8.604	10	8.23	Accepted
Academic staff in non-formal training (no. of days)	3	7.65	10	7.26	Accepted
Female academic staff (%)	2	5.085	9	5.22	
Females in grade A academic positions (%)	2	6.55	10	6.37	
Student to academic staff ratios	3	8.39	10	7.76	Accepted
New research staff	2	5.85	10	5.9000	
Academic staff separation rate	2	4.85	10	5.23	
Structural capital					
Capital investment (% of operating revenues)	0	6.28	10	5.85	
Number of courses/modules	3	7.65	10	7.27	Accepted
Number of new courses/modules	1	6.57	10	6.21	
Capital investment in major research equipment	3	7.34	10	7.06	Accepted
Number of research programs	3	7.85	10	7.405	Accepted
Relational capital					
Foreign students (%).	3	7.409	10	7.106	Accepted
Academic staff with degrees obtained in other institution (alternative: obtained abroad) (%)	2	6.72	10	6.48	
Value research contracts (% of contracts with new clients; % of contracts with clients from abroad; % of contracts with business enterprise clients).	4	8.16	10	7.77	Accepted
Process capital: education					
Programs offered in a foreign language (%)	4	7.402	10	7.26	Accepted
Students satisfied with contacts with teachers/professors (%).	5	7.802	10	7.701	Accepted
Students satisfied with classrooms, laboratories and libraries (%)	4	7.95	10	7.63	Accepted
Students satisfied the course structure (%)	4	7.88	10	7.59	Accepted
Average number of library visits per student	3	7.504	10	7.16	Accepted
Occupancy of lecture and seminar halls.	3	7.3	10	7.033	Accepted
Students in joint degree programs (%)	4	7.14	10	7.09	Accepted
Internationally mobile students (%)	3	6.707	10	6.63	
Students satisfied with international mobility experience (%)	2	6.77	10	6.51	
Process capital: research					
Occupancy of laboratories. (alternative: waiting times)	2	6.93	10	6.62	
Mobile academic staff (%).	1	5.44	10	5.46	
Process capital: third Mission					
University – business collaborative research projects	3	8.32	10	7.71	Accepted
Outputs and Impacts: education					
Completion rate (Graduates as % of all accepted students)	3	7.301	10	7.03	Accepted
Average time to graduation for PhD students	3	6.78	10	6.69	
Degree of teaching specialization	3	6.71	10	6.64	
Unemployment of graduates	3	6.72	10	6.48	
Outputs and Impacts: research					
Number of peer reviewed publications per academic staff	2	6.76	10	6.508	
Degree of research specialization	3	7.43	10	7.12	Accepted
Scientific publications among the top 10% most cited publications worldwide (%)	4	7.92	10	7.61	Accepted
Average number of citations per publication (past 5 years)	3	7.94	10	7.46	Accepted
International scientific co-publications per researcher.	3	8.25	10	7.67	Accepted
Number and value of nationally funded research projects	4	8.46	10	7.97	Accepted
Number and value of internationally funded research projects	4	8.33	10	7.88	Accepted
Conference papers per academic staff	2	7.53	10	7.02	Accepted
Outputs and Impacts: third mission					
Income from open-access research infrastructures	2	6.88	10	6.58	
Patents granted	5	8.71	10	8.31	Accepted
License and patent revenues	3	7.93	10	7.45	Accepted
Number of public-private co-publications	4	7.82	10	7.55	Accepted

The columns of the table 3 explains $\mathbf{a_j}$ for the minimum scale of the experts' opinions, $\mathbf{b_j}$ for their average scale, $\mathbf{c_j}$ for their high scale, and $\mathbf{S_j}$ for the final defuzzified number which is taken by Delphi Fuzzy formula.

In order to answer the first question of the research, a questionnaire was designed on the basis of the intellectual capital indicators of the Europe universities (Leitner et al., 2014) and was sent to the experts. They were asked to find the indictors which were appropriate for the universities of Iran on the basis of Likert ten point scales. Then the experts' answers were gathered and were calculated on the basis of Delphi Fuzzy technique. So the final result of each indicator was found (column $\mathbf{S_j}$). The intended scale was 7. Therefore the numbers above 7 were accepted and selected as the final indicators that were suitable for the universities of Iran. As a result, as it is clear from table 3, the indicators below 7 were not accepted and scores above 7 were accepted so that the scores of the accepted indicators were between 7 and 8.33. This score of 8.33 Delphi Fuzzy was related to the academic staff.

The second question of the research is:

How can we rank the intellectual capital indicators in the universities of Iran using Delphi fuzzy technique?

The following table is the answer of the second question of the research:

Table 4. Intellectual Capital accepted indicators ranking of Iran universities based on Delphi Fuzzy technique

Rank	Indicator	Intellectual Capital	Score
1	Number of academic staff	Human capital	8.33
2	Patents granted	Outputs and Impacts: third mission	8.31
3	Academic staff with PhDs (%)	Human capital	8.23
4	Number and value of nationally funded research projects	Outputs and Impacts: research	7.97
5	Number and value of internationally funded research projects	Outputs and Impacts: research	7.88
6	Value research contracts (% of contracts with new clients; % of contracts with clients from abroad; % of contracts with business enterprise clients)	Relational capital	7.77
7	Student to academic staff ratios	Human capital	7.76
8	University – business collaborative research projects	Process capital: third Mission	7.71
9	Students satisfied with contacts with teachers/ professors (%).	Process capital: education	7.701
10	International scientific co-publications per researcher.	Outputs and Impacts: research	7.67
11	Students satisfied with classrooms, laboratories and libraries (%)	Process capital: education	7.63
12	Scientific publications among the top 10% most cited publications worldwide (%)	Outputs and Impacts: research	7.61
13	Students satisfied the course structure (%)	Process capital: education	7.59
14	Number of public-private co-publications	Outputs and Impacts: third mission	7.55
15	Average number of citations per publication (past 5 years)	Outputs and Impacts: research	7.46
16	License and patent revenues	Outputs and Impacts: third mission	7.45
17	Number of research programs	Structural capital	7.405
18	Number of courses/modules	Structural capital	7.27
19	Academic staff in non-formal training (no. of days)	Human capital	7.26
19	Programs offered in a foreign language (%)	Process capital: education	7.26
20	Average number of library visits per student	Process capital: education	7.16
21	Degree of research specialization	Outputs and Impacts: research	7.12
22	Foreign students (%).	Relational capital	7.106
23	Students in joint degree programs (%)	Process capital: education	7.09
24	Capital investment in major research equipment	Structural capital	7.06
25	Occupancy of lecture and seminar halls.	Process capital: education	7.033
26	Completion rate (Graduates as % of all accepted students)	Outputs and Impacts: education	7.03
27	Conference papers per academic staff	Outputs and Impacts: research	7.02

Intellectual Capital accepted indicators ranking of Iran universities based on Delphi Fuzzy technique were showed in the table 3. In table 3, the indicators above 7 were accepted, but in table 4, the accepted indicators of table 3, were ranked on the basis of Delphi Fuzzy ranking. So 28 out of 44 Leitner indicators accepted and ranked. The highest score of intellectual capital indicator of the universities of Iran was related to the academic staff with 8.33, and the lowest one was related to conference papers per academic staff with 7.02.

The following chart shows the comparison among the Intellectual Capital categories of proposed model for universities of Iran:

Figure 4. Ranking of Intellectual Capital Categories of proposed model of universities of Iran

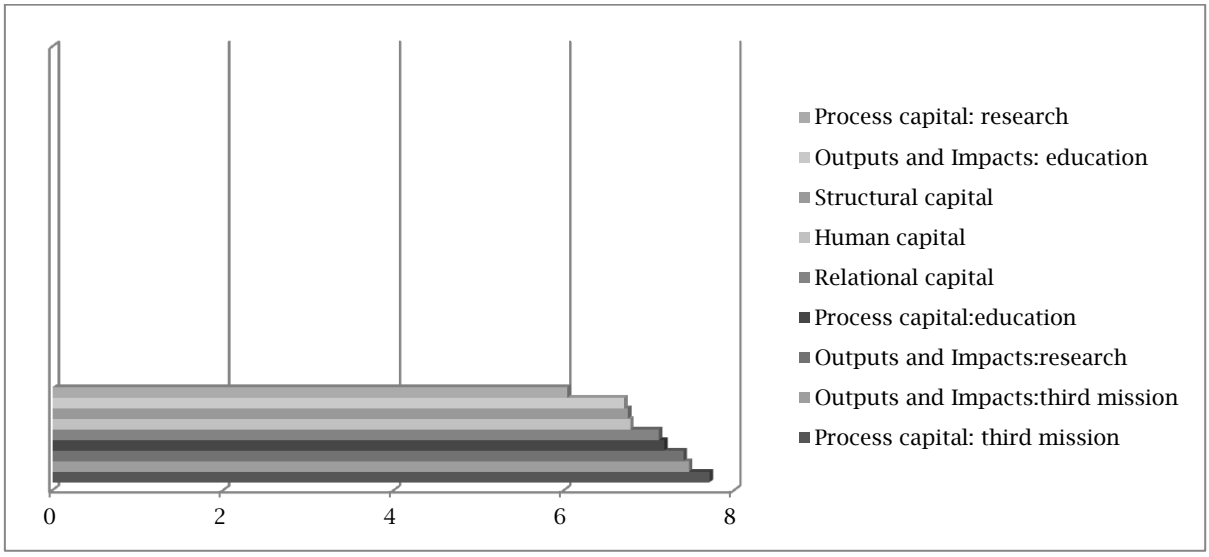


Figure 4 indicates the ranking of Intellectual Capital Categories of proposed model of universities of Iran. The categories of intellectual capital of the universities of Iran according to highest scores are as follows:

1- Process capital: third Mission (7.71), 2- Outputs and Impacts: third mission (7.47), 3- Outputs and Impacts: research (7.404), 4- Process capital: education (7.178), 5- Relational capital (7.118), 6- Human capital (6.78), 7- Structural capital (6.75), 8- Outputs and Impacts: education (6.71), and 9- Process capital: research (6.04).

The selected scores of the table 4 are the average scores of the intellectual capital indicators of the universities of Iran on the basis of Delphi Fuzzy technique which was calculated for each category.

5. CONCLUSION

As it is clear from the table 3, out of 44 indicators according to universities of Europe (2014), 28 indicators on the basis of score 7 verified by the experts which must be disclosed in the reporting of intellectual capital of the universities of Iran. Out of the verified indicators, the highest scores are related to the academic staff, i.e. the faculty members who work in the educational and research departments of the university and have the highest effect on the reporting of intellectual capital. So the highest effects on intellectual capital are successively as follows:

Number of academic staff, Patents granted, Academic staff with PhDs (%), Number and value of nationally funded research projects, Number and value of internationally funded research projects, Value research contracts, Student to academic staff ratios, University – business collaborative research projects, Students satisfied with contacts with teachers/ professors, International scientific co-publications per researcher, Students satisfied with classrooms, laboratories and libraries, Scientific publications among the top 10% most cited publications worldwide, Students satisfied the course structure, Number of public-private co-publications, Average number of citations per publication, License and patent revenues, Number of research programs, Number of courses/modules, Academic staff in non-formal training, Programs offered in a foreign language, Average number of library visits per student, Degree of research specialization, Foreign students, Students in joint degree programs, Capital investment in major research equipment, Occupancy of lecture and seminar halls, Completion rate, and Conference papers per academic staff.

In fact the results of this research showed that in the reporting of intellectual capital of the universities of Iran are as follows:

Human capital, according to importance and priority includes Number of academic staff, Academic staff with PhDs (%), Student to academic staff ratios, Academic staff in non-formal training; **Structural capital ,**according to importance and priority, includes the Number of research programs, Number of courses/modules, Capital investment in major research equipment; **Relational capital** according to importance and priority includes Value research contracts, foreign students (%); and **Process capital: education,** according to importance and priority includes Students satisfied with contacts with teachers/ professors (%), Students satisfied with classrooms, laboratories and libraries (%), Students satisfied the course structure (%), Programs offered in a foreign language (%), Average number of library visits per student, Students in joint degree programs (%),Occupancy of lecture and seminar halls)

Process capital: research (--)

Process capital: third Mission (University – business collaborative research projects)

Outputs and Impacts: education (Completion rate)

Outputs and Impacts: research (Number and value of nationally funded research projects, Number and value of internationally funded research projects, International scientific co-publications per researcher, Scientific publications among the top 10% most cited publications worldwide (%), Average number of citations per publication (past 5 years), Degree of research specialization, Conference papers per academic staff)

Outputs and Impacts: third mission (Patents granted, Number of public-private co-publications, License and patent revenues)

The comparison of the achieved indicators according to the table no.2 and the guideline of intellectual capital reporting of the universities of Europe shows that the university experts of Iran believe that the lowest scores are for **Human capital :** Female academic staff (%), Academic staff separation rate, New research staff, Females in grade A academic positions (%); **Structural capital:** Capital investment, Number of new courses/modules; **Relational capital:** Academic staff with degrees obtained in other institution; **Process capital: education:** Students satisfied with international mobility experience (%), Internationally mobile students (%); **Process capital: research:** Mobile academic staff (%),Occupancy of laboratories; **Outputs and Impacts: education:** Unemployment of graduates, Degree of teaching specialization, Average time to graduation for PhD students; **Outputs and Impacts: research :** Number of peer reviewed publications per academic staff; **Outputs and Impacts: third mission** : Income from open-access research infrastructures.

Compared with the other indicators, they had lower effect. So based on the experts' opinions they should not be presented in the intellectual capital reporting of universities of Iran.

The five indicators which had the lowest scores were:

Female academic staff (%) (5.22), Academic staff separation rate (5.23), Mobile academic staff (%) (5.46), Capital investment (5.85), new research staff (5.90).

The reasons why they are less important than the others are based on the cultural differences and the goals of universities of Iran and the other countries. For example, it is true that the main goal of universities in Iran, like other countries, are training of skilled force to enter the working market, but because of social and cultural reasons existing in Iran, all of the persons who enter the universities are not studying in order to find jobs and besides, the universities do not have so much role in finding any jobs for them.

The other result of this research showed that in the comparison between the main categories of intellectual capital reporting of universities of Iran, the following had the highest importance respectively:

Process capital: third mission, Outputs and Impacts: third mission, Outputs and Impacts: research, Process capital: education, Relational capita, Human capital, Structural capital, Outputs and Impacts: education, Process capital: research.

This is the first time that this research is fulfilled in Iran by using the European universities guideline (2014). This model is a maturity model which is comprehensive and can be used for the universities of Iran. As it was stated above, only some of the indicators are used in Iran depending on the cultural conditions of Iran. The results of this research can be the basis for future research on the relationships among the components of intellectual capital in the universities in Iran and ultimately the model of intellectual capital reporting suitable for the universities of Iran. This model can also be used as the basis for budgeting the universities in Iran and evaluating the performance of these universities and ultimately ranking the universities of Iran.

As it is clear from the table 2, from the point of view of the university experts, the most important factor which influence on intellectual capital reporting in the universities of Iran is related to the number of academic staff. In fact, the result of this research showed that out of the factors of intellectual capital affecting the intellectual capital reporting, human capital is the most important and the most affecting one, i.e. the faculty members of the universities. They are considered as the most significant capital of the universities. Their different scientific and behavioral aspects have essential role in attracting students and having relationships with other universities. The more the academic staff, the higher the value of the university. After the academic staff, the Patents granted and the percentage of the academic staff with PhD are considered as the second and third important factors.

If we look at the universities as the factories that produce science, we will see that the main factor of the running and producing the products of the factory, i.e. university, is the faculty members of the universities. By training the students, the faculty members of the universities produce the products, i.e. knowledge, publications, and patents. Also the students as the users of the university products want to be more satisfied with the university.

In fact the important challenge of the universities in 21st century is how to convey the value from human capital to structural and relational capital. For example, it is not enough to gather the most famous professors in one place to establish a university of worldwide category. The knowledge of all of the individuals who are related to knowledge should also be conveyed to the structure of the institution with higher education. Intellectual capital reporting provides the means of achieving this goal. (Leitner et al., 2014)

5.1. Limitations and Future Research

In order to find the factors effecting on intellectual capital reporting in the universities of Iran, the experts of the selected universities were asked to help in this research. If the domain of the research were all of the universities of Iran or the world, we would have better results. The target societies of this research were the experts who were the faculty members of selected universities of Iran. If the questionnaires were distributed to other stakeholders such as university students, financial managers of the universities, and some other related persons; we would have better and more interesting results.

Another issue which is proposed for future research is the determination of relationships between intellectual capital indicators in the universities of Iran by using different mathematical and statistical techniques.

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