Ferdowsi University of Mashhad

Iranian Journal of
Accounting, Auditing & Finance

Received: 2021-04-03
Accepted after revision: 2021-05-10
Published online: 2021-05-30

RESEARCH ARTICLE DOI: 10.22067/ijaaf.2021.69329.1024

Intellectual Capital Measurement Model for Iran by Fuzzy Delphi

Ali Saghafi, Mohammad Mahdi Mirzaei Abbas Abad

Department of Accounting, Allameh Tabatabaei University, Tehran, Iran

Abstract

The portion of non-physical capital like knowledge in the corporations' value has been consistently increasing in the last three decades. However, the measurement for these factors has always been under question. The Intellectual Capital (IC) measurement models were a solution for the measurement. This study proposed a measurement model for IC in Iran. After reviewing and summarizing the other methods' dimensions and measures, it used two qualitative methods. In the first step, some in-depth interviews were done. The interviewees were provided with the detail of the previous models' summary. Their ideas were used to limit the number of variables in the next step. Then a group of 97 experts was asked to fulfill a questionnaire. Finally, the questionnaires were analyzed by the Fuzzy Delphi method. The result shows a measurement model with three dimensions (human, relational and structural capital), eight components, and 21 indicators (measures). This model is the first model, which is designed based on the Iranian experts' ideas. Furthermore, the first model provides all the model's indicators, components, and dimensions.

Keywords: intellectual capital, human capital, relational capital, structural capital

Corresponding author: Mohammad Mahdi Mirzaei Abbas Abad
Email: *mirzaeeabbasabad@gmail.com*

Number of Figures: 1
Number of Tables: 8
Number of References: 19
Pages: 49-61

1. Introduction

Increasing the company's value depends on its performance, which will ultimately increase the wealth of shareholders. Today, intellectual capital is considered one of the most influential factors in improving performance. Thus, value creation and knowledge have been identified as the most crucial intangible capital for financial and physical capital. The knowledge-based business environment requires an approach that includes new intangible organizational assets, such as human resource competencies and innovations, customer relations, administrative systems, structures, etc. In this regard, the theory of intellectual capital has attracted increasing attention from academic researchers and administrators. The role of intellectual capital in creating value for organizations and business units is much more significant than financial and physical capital. Financial statements' limitations in explaining the firm's value also reflect that resources' economic value is not limited to the value of material goods and includes intellectual capital (Mention and Bontis, 2013).

1.1. Intellectual Capital Measurement

Marr, Schiuma and Neely (2004) first proposed a model for measuring intellectual capital. After that, various methods and criteria were presented, which Sveiby (2010) classified into four main groups as follows:

1. Direct Intellectual Capital (DIC): These methods deal with the value of intangible assets. They insist on identifying their components. The result of these methods is the amount or ratio that determines the components of human capital.
2. Market Capitalization Models (MCM): These methods are based on the difference between the company's stock market value and the equity's book value.
3. Return On Assets (ROA): In these methods, based on subtracting the organization's return on assets from industry ratios and multiplying it by its average assets, the amount of annual profit earned is determined by the location of intangible assets. Dividing this profit by the average cost of the company's capital indicates the company's intellectual capital.
4. Balanced Score Card (BSC) methods: These methods are similar to the first group methods, except that they do not announce an amount for intellectual capital but provide indicators (Ferenhof et al., 2015). In the balanced scorecard model, customers' perspective provides indicators related to communication capital. The internal processes' view expresses indicators related to structural capital and training indicators about human capital.

One of the most important models for measuring intellectual capital is the Skandia model. This model was designed in 1997 by Edvinson for the Swedish insurance company Skandia. According to this model, the organization's total value is divided into financial capital and intellectual capital. Intellectual capital also includes two parts: human capital and structural capital. Human capital can be summarized in employees' ability, competence, and ability to communicate within their organization. The structural capital considers everything in the organization except human resources, such as brands, processes, structure, and organization concepts. This model can be regarded as a traditional model of intellectual capital.

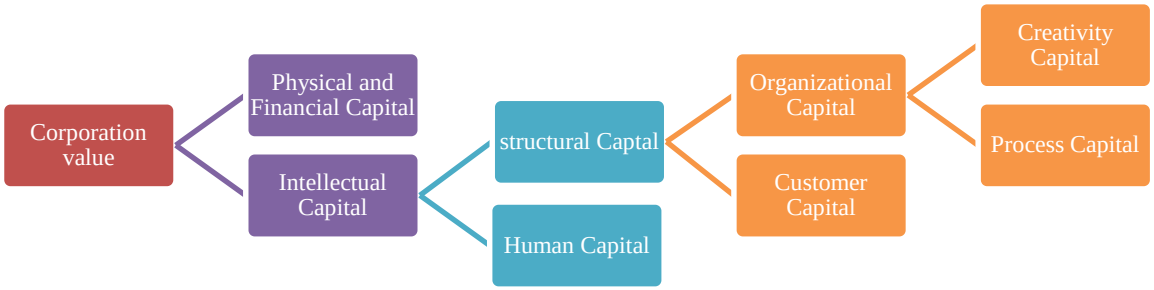

Fig 1. Traditional model of intellectual capital

The evolution of the Skandia model led to the creation of new models that briefly divide intellectual capital into the following three sections:

- Human capital: includes the knowledge, skills, and experience of employees (Subramaniam and Youndt, 2005).
- Structural capital: is related to the codified knowledge of the organization, its sources of information, and culture (Menor, Kristal and Rosenzweig, 2007).
- Communication capital means the knowledge accumulated in the organization's internal and external communication network (Buenechea, 2017).

Regarding the models of measuring intellectual capital, two groups of models can be distinguished. The first group includes models that measure the components of intellectual capital (Nazari, 2014). In this group, most constituent micro-items are considered and often have applications within the organization and management. Calculating some of these indicators requires the distribution of questionnaires among different parts of the organization. As the research limitations will be mentioned, such cases are outside the scope of this research. The second group is the indicators that calculate the intellectual capital at the level of the whole organization.

So far in Iran, various researches on intellectual capital have been conducted. However, no one has conducted any research that fully and comprehensively evaluates the various existing measurement models and provides a suitable Iran model. Therefore, this study's problem is to determine the model of measuring intellectual capital in Iran.

2. Literature Review

Marr, Schiuma and Neely (2004) stated that intellectual capital includes many invisible factors that help the organization pursue its strategies. He presented three main dimensions to the concept of intellectual capital. These dimensions are (1) human capital, (2) communication capital, and (3) structural capital. Stewart (1998) lists intellectual capital as the knowledge, information, intelligence, and experience used by an organization to create wealth. He considers the components of intellectual capital to include the following three components: (1) human capital, (2) structural capital, and (3) customer capital. Edvinsson (2002) considers intellectual capital as a combination of human capital and structural capital. Human capital includes the organization's current employees' knowledge and consists of customer relations' structural capital, the production process's efficiency, internal databases, and other institutionalized knowledge structures.

Guthrie, Ricceri and Dumay (2012) stated four components for intellectual capital. These components are (1) human capital, (2) organizational capital: related to the structure of formal and informal systems used by the organization, (3) marketing capital: related to marketing relationships

DOI: 10.22067/ijaaf.2021.69329.1024

and its networks, and (4) production capital, which Includes a specialized production process developed over time.

Jacobsen, Hofman-Bang and Nordby (2005) emphasized that not measuring intellectual capital leads to irrelevant balance sheet information and challenges the full disclosure principle. Williams (2001) stated that current financial reporting provides an inappropriate accounting method for intellectual property. They argue that if we look at the usefulness of financial statements for valuation, the organization's knowledge assets' total value must be disclosed in the financial statements.

Andriessen (2004) concluded that accountants should include information about unreported intellectual property in financial statements or financial risk reports. Otherwise, these reports will no longer be suitable for shareholders to assess the value of the company. Montemari and Nielsen (2013) state that a balance sheet that does not include intellectual capital would be misleading in measuring firm value.

According to Statement of Accounting Concepts No. 8, the most crucial purpose of financial reporting is to provide helpful information for actual and potential suppliers of resources for the organization (Financial Accounting Standards Board, 2010). This information should determine the status of the resources available to the organization. One of the most important resources at the disposal of the organization is its intellectual capital. Based on the above, accounting does not currently provide complete information about intellectual capital.

Garanina and Dumay (2017) introduced the following three models for measuring intellectual capital:

1. Models based on market capital value: These models consider the difference between market value and the book value of owners' rights as intellectual capital.
2. Models based on the return on assets: According to these models, whenever a company's return on assets is higher than its industry, there is a difference in the value of this unregistered intellectual capital in that company.
3. Models based on a specific element: these models differentiate the different groups of existing knowledge, awareness assets and allocate an amount to that asset on a particular basis. Some of these fundamentals of value are the historical cost of creating the asset, the asset's replacement value, and the asset's discounted future cash flows.

3. Research Methodology

As mentioned, the questions of the present study have been answered in three steps. To design the model, in the first step, the research examined and analyzed the existing theoretical foundations, the theoretical model of measurement was presented. In the second step of the study, the initial model is reviewed, approved, and developed to present a modified conceptual model. Finally, in the third step, the model obtained from the second stage is reviewed and evaluated, and the final model is proposed and reviewed.

Step 1: Study the existing models

The paper discussed the previous models to analyze the similarities and differences, compare them, and propose the initial theoretical model.

Step 2: Get the opinion of experts in the form of interviews

This section designed semi-structured interviews and conducted them according to the commonalities and differences identified in the first step. Then, due to the novelty of the subject in Iran and the lack of access to knowledgeable people, we prepared the final questionnaire by the opinions of the research leadership team, the views of 3 people from universities in Australia, Canada,

and Spain (six people in total), and the literature of the topic.

Step 3: Descriptive survey research method by Fuzzy Delphi method

This section collected the experts' opinions by the Fuzzy Delphi method. Experts in this section include the following groups:

- Faculty members of universities and graduate students of accounting and finance,
- Independent auditors (members of the Iranian Society of Certified Public Accountants)
- Professional experts in relevant organizations

Also, due to the topic's multidisciplinary nature, another essential feature of the selected experts is to have a comprehensive view of various specialized dimensions and positions on the subject of intellectual capital. The results of this section are described in detail.

4. Research Results

4.1. Results of the First Step of model design

Table 1. Dimensions, Components, and Indicators of Intellectual Capital

Dimension	Component	Indicator
Human Capital	Employees' Characteristics	Number of Employees
		Labour Force Productivity
		Employees' Education Level
		Average Employees' Experience
	Training	Annual Training Hours
		Training Cost
	Work Environment	Employees' Job Satisfaction
Structural Capital	Processes	Accuracy of Information and Documentation
		Level of Information Sharing
		ISO Certificates
		Process Effectiveness
	Innovation	Innovation Capacity
		Time to Market for New Products
		Rate of New Technologies Use
		New Product and Service Resilience
		Research and Development Cost
	Resources Usage	Level and Situation of the Inventories
		Good and Service Delivery Time
		Inventory Turnover
		Productivity
		Machinery Utilization Rate
		Timeliness of Information
		Transparency of Information
		Reliability of Information
Relational Capital	Customer service	Variety of Services
		Customer Service Level
		Customer Inquiry Respond Time
		Responding and Solving Customer Problems
		Customer complaints
	Customer Relationship	Flexibility in Responding to Customers' Needs
		Level of relationships and partnerships
		Customers' Loyalty
		Trust and commitment to partners
		Customer and partner satisfaction
	Market Relationship	Market Portion
		Social Responsibility

this section reviewed the theoretical foundations to provide a basic theoretical model; after

Saghafi and Mirzaei Abbas Abad. IJAAF: Vol. 5 No. 1 winter 2021
DOI: 10.22067/ijaaf.2021.69329.1024

examining different models and matching them, the dimensions, components, and intellectual capital indicators based on theoretical foundations are shown in Table 1.

4.2.Results of the second step of designing the model

As the second step stated, to provide a modified conceptual model, this step collected the interviewees' opinions on each item in the initial model to determine whether each item is approved or not. Based on the results obtained from the content of the interviews conducted in the second stage, the first stage's theoretical model was improved to present a modified conceptual model and used in the third stage of the research to become the final model. Table 2 illustrates the results of this step.

Table 2. Dimensions, Components, and Indicators of Modified Model

Dimension	Component	Indicator	Result
Human Capital	Employees' Characteristics	Number of Employees	Approve
		Labour Force Productivity	Approve
		Employees' Education Level	Reject
		Average Employees' Experience	Approve
	Training	Annual Training Hours	Approve
		Training Cost	Approve
	Work Environment	Employees' Job Satisfaction	Approve
Structural Capital	Processes	Accuracy of Information and Documentation	Reject
		Level of Information Sharing	Approve
		ISO Certificates	Approve
		Process Effectiveness	Approve
	Innovation	Innovation Capacity	Approve
		Time to Market for New Products	Approve
		Rate of New Technologies Use	Reject
		New Product and Service Resilience	Approve
		Research and Development Cost	Approve
	Resources Usage	Level and Situation of the Inventories	Approve
		Good and Service Delivery Time	Approve
		Inventory Turnover	Approve
		Productivity	Approve
		Machinery Utilization Rate	Approve
		Timeliness of Information	Approve
		Transparency of Information	Approve
		Reliability of Information	Approve
Relational Capital	Customer service	Variety of Services	Approve
		Customer Service Level	Approve
		Customer Inquiry Respond Time	Approve
		Responding and Solving Customer Problems	Approve
		Customer complaints	Approve
		Flexibility in Responding to Customers' Needs	Approve
	Customer Relationship	Level of relationships and partnerships	Approve
		Customers' Loyalty	Approve
		Trust and commitment to partners	Approve
		Customer and partner satisfaction	Approve
	Market Relationship	Market Portion	Approve
		Social Responsibility	Approve

4.3. Results of the Third Step of model design the final conceptual model

In the third step and present the final model, the respondents' answers about the distributed questionnaires' questions based on the second step's modified conceptual model have been studied. Ultimately, the final conceptual model for measuring intellectual capital in Iran is presented. Based on the review of theoretical and empirical foundations in the first step and specialist interviews

conducted in the second step, the indicators in the third stage of the research have been identified and screened. The second step identified 34 indicators to start the third step of the study, which Table 3 illustrates.

Table 3. Dimensions, Components, and Indicators of Modified Model codes

Dimension	Component	Indicator	Code
Human Capital	Employees' Characteristics	Number of Employees	C01
		Labour Force Productivity	C02
		Employees' Education Level	C03
		Average Employees' Experience	C04
	Training	Annual Training Hours	C05
		Training Cost	C06
	Work Environment	Employees' Job Satisfaction	C07
Structural Capital	Processes	Level of Information Sharing	C08
		ISO Certificates	C09
		Process Effectiveness	C10
	Innovation	Innovation Capacity	C11
		Time to Market for New Products	C12
		New Product and Service Resilience	C13
		Research and Development Cost	C14
	Resources Usage	Level and Situation of the Inventories	C15
		Good and Service Delivery Time	C16
		Inventory Turnover	C17
		Productivity	C18
		Machinery Utilization Rate	C19
		Timeliness of Information	C20
		Transparency of Information	C21
		Reliability of Information	C22
Relational Capital	Customer service	Variety of Services	C23
		Customer Service Level	C24
		Customer Inquiry Respond Time	C25
		Responding and Solving Customer Problems	C26
		Customer complaints	C27
		Flexibility in Responding to Customers' Needs	C28
	Customer Relationship	Level of relationships and partnerships	C29
		Customers' Loyalty	C30
		Trust and commitment to partners	C31
		Customer and partner satisfaction	C32
	Market Relationship	Market Portion	C33
		Social Responsibility	C34

In the third stage of the research, the Fuzzy Delphi approach was used to screen the indicators and identify the final indicators. As mentioned earlier, in the third step, the researcher first summarizes the concept of intellectual capital to the respondents to review the theoretical content of the topic for the audience. Then the respondents were asked to answer the questionnaire. This step used the Internet platform and Google questionnaire tools to complete the questionnaires. The questionnaire was sent by email to 270 people and sent to social networks related to accountants, auditors, and capital market activists, making it difficult to determine the exact number of questionnaires sent. However, the total number of responses received from all the mentioned sources was 105, of which 97 were identifiable.

Descriptions presented no items related to the questions' subject (measurement models, dimensions, components, and indicators) to maintain neutrality and not comment on conceptual information presentation. Based on the questionnaires' results, the final conceptual model of research measuring intellectual capital in Iran was proposed.

DOI: 10.22067/ijaaf.2021.69329.1024

Experts were asked to comment on the mentioned factors in the form of relevant components and indicators. Then, the Fuzzy Delphi approach was used to screen and identify the final indicators. Thus, using the Delphi questionnaire, 97 experts' views on each index were collected. This step took the following steps to analyze the opinions received to identify the final indicators.

Step 1: Identify the appropriate spectrum for Fuzzy verbal expressions,

Step 2: Fuzzy aggregation of Fuzzy values,

Step 3: Fuzzy de-Fuzzy values and

Step 4: Select the tolerance threshold and sift through the effective indicators.

Step 1: Identify the appropriate spectrum for Fuzzy verbal expressions

Experts' perspectives have been used to assess the importance of the indicators. Although experts use their competencies and mental abilities to make comparisons, it should be noted that the traditional process of quantifying people's perspectives does not fully reflect the human thinking style. In other words, the use of Fuzzy sets is more compatible with linguistic and sometimes ambiguous human explanations. Therefore it is better to use Fuzzy sets (using Fuzzy numbers) to make long-term predictions and real-world decisions (Kahraman, 2008).

In this research, Fuzzy triangular numbers have been used to Fuzzy the view of experts. Experts' views on the importance of each indicator are collected with a 7-degree Fuzzy spectrum. In this study, the single-phase Fuzzy Delphi method is used to better and more accurately collect experts' opinions; a 7-point Likert scale with corresponding Fuzzy triangle numbers is used as described in Table 4

Table 4. 7-point Likert scale with corresponding Fuzzy triangle numbers for value evaluation

Definitive equivalent	Verbal Variable	Fuzzy Number
1	Completely Insignificant	(0, 0, 0.1)
2	Very Insignificant	(0, 0.1, 0.3)
3	Insignificant	(0.1, 0.3, 0.5)
4	Medium	(0.3, 0.5, 0.75)
5	Significant	(0.5, 0.75, 0.9)
6	Very Significant	(0.75, 0.9, 1)
7	Completely Significant	(0.9, 1, 1)

Step 2: Fuzzy aggregation of Fuzzy values

After selecting the appropriate Fuzzy spectrum, experts' opinions were collected and recorded fuzzily (here in the form of Fuzzy triangle numbers). First, the expert panel view was Fuzzy for each research indicator, using the Fuzzy average method. Table 5 summarizes opinions and describes results as a Fuzzy triangle.

Step 3: De-fuzzification of Fuzzy values

To sum up, it is usually the mean of triangular and trapezoidal Fuzzy numbers by a definite value that is the best corresponding mean. This operation is called de-fuzzing. There are several ways to de-Fuzzy. In this research, the surface center method has been used for de-fuzzing. In this step, after the Fuzzy aggregation of the experts' point of view, the values obtained for each index de-fuzzification using the surface center method. Table 6 shows the results of de-fuzzification and determination of the definite value of each indicator.

Table 5. The Fuzzy mean of the panel of experts for each of the research indicators

Code	Low	Medium	Up	mean
C01	0.90	0.79	0.60	(0.896,0.786,0.597)
C02	0.93	0.82	0.63	(0.93,0.819,0.63)
C03	0.93	0.81	0.63	(0.926,0.811,0.625)
C04	0.93	0.83	0.65	(0.934,0.827,0.65)
C05	0.93	0.84	0.67	(0.93,0.837,0.668)
C06	0.96	0.88	0.71	(0.964,0.875,0.708)
C07	0.81	0.65	0.47	(0.809,0.654,0.47)
C08	0.94	0.82	0.64	(0.936,0.822,0.644)
C09	0.95	0.86	0.70	(0.947,0.864,0.698)
C10	0.71	0.53	0.35	(0.71,0.531,0.353)
C11	0.71	0.53	0.36	(0.707,0.531,0.358)
C12	0.94	0.85	0.68	(0.943,0.847,0.677)
C13	0.94	0.84	0.67	(0.935,0.835,0.668)
C14	0.83	0.67	0.49	(0.831,0.673,0.488)
C15	0.76	0.58	0.39	(0.763,0.576,0.388)
C16	0.95	0.87	0.71	(0.951,0.87,0.709)
C17	0.97	0.89	0.72	(0.97,0.886,0.722)
C18	0.78	0.59	0.40	(0.778,0.59,0.402)
C19	0.95	0.84	0.66	(0.945,0.835,0.66)
C20	0.92	0.79	0.61	(0.916,0.792,0.61)
C21	0.93	0.81	0.64	(0.926,0.812,0.635)
C22	0.86	0.74	0.56	(0.86,0.735,0.557)
C23	0.71	0.53	0.36	(0.707,0.531,0.358)
C24	0.84	0.69	0.50	(0.843,0.686,0.495)
C25	0.76	0.58	0.39	(0.763,0.576,0.388)
C26	0.95	0.86	0.68	(0.954,0.857,0.684)
C27	0.79	0.63	0.45	(0.79,0.634,0.451)
C28	0.81	0.66	0.47	(0.811,0.656,0.466)
C29	0.75	0.59	0.42	(0.749,0.591,0.416)
C30	0.91	0.79	0.60	(0.912,0.787,0.601)
C31	0.79	0.64	0.46	(0.792,0.639,0.458)
C32	0.93	0.81	0.63	(0.928,0.811,0.628)
C33	0.88	0.76	0.59	(0.88,0.76,0.585)
C34	0.94	0.83	0.66	(0.941,0.833,0.658)

Step 4: Select the tolerance threshold and sift through the effective indicators

After de-fuzzification and determination of each indicator's definite values, a tolerance threshold should be considered to screen the final indicators. According to the type of research and following the study, the tolerance threshold is considered 0.7. If the definite value obtained from the fuzziness of the experts' aggregated view is greater than the tolerance threshold, the desired indicator is approved as an appropriate indicator. Otherwise, it is rejected. Thus, the de-Fuzzy value greater than 0.7 is acceptable, and an index with a score below 0.7 is rejected (Wu & Fang, 2011). Table 7 shows the final results of this section.

As the table shows, out of 34 indicators, in the form of 9 components, 25 indicators have been accepted by experts. It shows that experts leading indicators of measuring intellectual capital are perceived as useful due to their impact.

5. Conclusion

After performing the above steps and modifying the model, the final model for measuring intellectual capital in Iran is described in Table 10.

DOI: 10.22067/ijaaf.2021.69329.1024

Table 6. Determining the definite value of each indicator

Code	mean	Crisp
C01	(0.896,0.786,0.597)	0.76
C02	(0.93,0.819,0.63)	0.79
C03	(0.926,0.811,0.625)	0.79
C04	(0.934,0.827,0.65)	0.80
C05	(0.93,0.837,0.668)	0.81
C06	(0.964,0.875,0.708)	0.85
C07	(0.809,0.654,0.47)	0.64
C08	(0.936,0.822,0.644)	0.80
C09	(0.947,0.864,0.698)	0.84
C10	(0.71,0.531,0.353)	0.53
C11	(0.707,0.531,0.358)	0.53
C12	(0.943,0.847,0.677)	0.82
C13	(0.935,0.835,0.668)	0.81
C14	(0.831,0.673,0.488)	0.66
C15	(0.763,0.576,0.388)	0.58
C16	(0.951,0.87,0.709)	0.84
C17	(0.97,0.886,0.722)	0.86
C18	(0.778,0.59,0.402)	0.59
C19	(0.945,0.835,0.66)	0.81
C20	(0.916,0.792,0.61)	0.77
C21	(0.926,0.812,0.635)	0.79
C22	(0.86,0.735,0.557)	0.72
C23	(0.707,0.531,0.358)	0.53
C24	(0.843,0.686,0.495)	0.67
C25	(0.763,0.576,0.388)	0.58
C26	(0.954,0.857,0.684)	0.83
C27	(0.79,0.634,0.451)	0.63
C28	(0.811,0.656,0.466)	0.64
C29	(0.749,0.591,0.416)	0.59
C30	(0.912,0.787,0.601)	0.77
C31	(0.792,0.639,0.458)	0.63
C32	(0.928,0.811,0.628)	0.79
C33	(0.88,0.76,0.585)	0.74
C34	(0.941,0.833,0.658)	0.81

For the first time, this study, using experts' opinions and the world's theoretical foundations, developed a model for measuring intellectual capital in Iran. This research, which results from gathering theoretical and experimental evidence in this field, can help increase the depth of the existing literature in the field and provide a tool for researchers to measure intellectual capital. In addition, the proposed model can also help valuation activists (including capital markets and financial and credit institutions) have a more accurate estimate of the actual value of intellectual capital hidden within organizations.

Table 7. Results of screening of research indicators

Code	Indicator	Crisp	Result
C01	Number of Employees	0.76	Approve
C02	Labour Force Productivity	0.79	Approve
C03	Employees' Education Level	0.79	Approve
C04	Average Employees' Experience	0.80	Approve
C05	Annual Training Hours	0.81	Approve
C06	Training Cost	0.85	Approve
C07	Employees' Job Satisfaction	0.64	Reject
C08	Level of Information Sharing	0.80	Approve
C09	ISO Certificates	0.84	Approve
C10	Process Effectiveness	0.53	Reject
C11	Innovation Capacity	0.53	Reject
C12	Time to Market for New Products	0.82	Approve
C13	New Product and Service Resilience	0.81	Approve
C14	Research and Development Cost	0.66	Reject
C15	Level and Situation of the Inventories	0.58	Reject
C16	Good and Service Delivery Time	0.84	Approve
C17	Inventory Turnover	0.86	Approve
C18	Productivity	0.59	Reject
C19	Machinery Utilization Rate	0.81	Approve
C20	Timeliness of Information	0.77	Approve
C21	Transparency of Information	0.79	Approve
C22	Reliability of Information	0.72	Approve
C23	Variety of Services	0.53	Reject
C24	Customer Service Level	0.67	Reject
C25	Customer Inquiry Respond Time	0.58	Reject
C26	Responding and Solving Customer Problems	0.83	Approve
C27	Customer complaints	0.63	Reject
C28	Flexibility in Responding to Customers' Needs	0.64	Reject
C29	Level of relationships and partnerships	0.59	Reject
C30	Customers' Loyalty	0.77	Approve
C31	Trust and commitment to partners	0.63	Reject
C32	Customer and partner satisfaction	0.79	Approve
C33	Market Portion	0.74	Approve
C34	Social Responsibility	0.81	Approve

DOI: 10.22067/ijaaf.2021.69329.1024

Table 8. The final model for measuring intellectual capital in Iran

Dimension	Component	Indicator
Human Capital	Employees' Characteristics	Number of Employees Labour Force Productivity Employees' Education Level Average Employees' Experience
	Training	Annual Training Hours Training Cost
Structural Capital	Processes	Level of Information Sharing ISO Certificates
	Innovation	Time to Market for New Products New Product and Service Resilience
	Resources Usage	Good and Service Delivery Time Inventory Turnover Machinery Utilization Rate Timeliness of Information Transparency of Information Reliability of Information
Relational Capital	Customer service	Responding and Solving Customer Problems
	Customer Relationship	Customers' Loyalty Customer and partner satisfaction
	Market Relationship	Market Portion Social Responsibility

References

1. Accounting Standards Board. (2010). IFRS 10 Goodwill and Intangible Assets. Accounting Standards Board, London.
2. Andriessen, D. (2004). IC valuation and measurement: classifying the state of the art. *Journal of intellectual capital*, 5(2), 230-242. https://doi.org/10.1108/14691930410533669
3. Buenechea-Elberdin, M. (2017). Structured literature review about intellectual capital and innovation. *Journal of Intellectual Capital*, 18(2), 262-285. https://doi.org/10.1108/JIC-07-2016-0069
4. Edvinsson, L. (2002). Developing intellectual capital at Skandia. *Long Range Planning*. 30(3), pp. 266-373.
5. Ferenhof, H.A. Durst, S. Zaniboni Bialecki, M. and Selig, P.M. (2015). Intellectual capital dimensions: state of the art in 2014. *Journal of Intellectual Capital*, 16(1), 58-100.
6. Garanina, T. and Dumay, J. (2017). Forward-looking intellectual capital disclosure in IPOs: implications for intellectual capital and integrated reporting. *Journal of Intellectual Capital*, 18(1), pp. 128-148.
7. Guthrie, J. Ricceri, F. and Dumay, J. (2012). Reflections and projections: a decade of intellectual capital accounting research. *The British accounting review*, 44(2), 68-82.
8. Jacobsen, K. Hofman-Bang, P. and Nordby J.R. (2005). The IC Ratinga. *Journal of Intellectual Capital*, 6(4), 570-587.
9. Kahraman, C. (2008). Fuzzy multi-criteria decision making: theory and applications with recent developments. Springer Science & Business Media, 16.
10. Marr, B. Schiuma, G. and Neely, A. (2004). The dynamics of value creation: mapping your intellectual performance drivers. *Journal of intellectual capital*, 5(2), 312-325.
11. Menor, L.J. Kristal, M.M. and Rosenzweig, E.D. (2007). Examining the influence of operational

intellectual capital on capabilities and performance. *Manufacturing & Service Operations Management*, 9(4), 559-578.

12. Mention, A.L. and Bontis, N. (2013). Intellectual capital and performance within the banking sector of Luxembourg and Belgium. *Journal of Intellectual capital*, 14(2), 286-309.
13. Montemari, M. and Nielsen, C. (2013). The role of causal maps in intellectual capital measurement and management. *Journal of Intellectual Capital*, 14(4), 522-546. https://doi.org/10.1108/JIC-01-2013-0008
14. Nazari, J.A. (2014). Intellectual capital measurement and reporting models. *In Knowledge Management for Competitive Advantage During Economic Crisis*. Hershey, PA: IGI Global. pp. 117-139
15. Stewart, T.A. (1998). Intellectual Capital: The Wealth of New Organisations, Nicholas Brealey Publishing Ltd., London.
16. Subramaniam, M. and Youndt, M.A. (2005). The influence of intellectual capital on the types of innovative capabilities. *Academy of Management Journal*, 48(3), 450-463.
17. Sveiby, K.E. (2010). Intellectual capital: Thinking ahead. Australian CPA, 68(5), pp. 18-22.
18. Williams, S.M. (2001). Is intellectual capital performance and disclosure practices related?. *Journal of Intellectual capital*, 2(3) https://doi.org/10.1108/14691930110399932
19. Wu, C.H. and Fang, W.C. (2011). Combining the Fuzzy Analytic Hierarchy Process and the fuzzy Delphi method for developing critical competencies of electronic commerce professional managers. *Quality & Quantity*, 45(4), 751-768.