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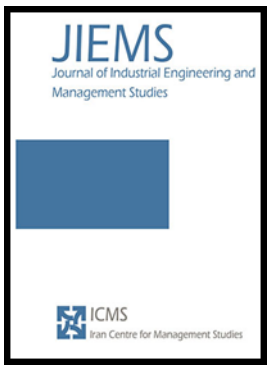

Analysis of interaction among the intellectual capital components using interpretive structural modeling and MICMAC approach

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Abstract

In the age of a knowledge-based economy, identifying, measuring, and managing the intellectual capital (IC) of organizations has become very significant. These depend on identifying the main components of intellectual capital and their relationships. So far, however, no study has been conducted to clarify the interactions among those components or to develop a model for laying out a hierarchy of IC components. There is, indeed, an urgent need to analyze the behavior of IC components so that the corresponding policies may be successfully implemented. This paper aims to prioritize the IC components based on the identified relationships among the IC components with a focus on the banking industry. A literature review was used to identify the 16 most important IC components. At the first stage, the Interpretive Structural Modeling technique was practiced to determine the interrelationships among these components, based on the data gathered from the Export Development Bank of Iran. The interconnections between the components were clarified. At the second stage, the application of Analytic Network Process for the prioritizing of IC components has been demonstrated. MICMAC analysis and classifying them into four categories including the autonomous, driver, dependent, and linkage components regarding their driving and dependence power is a new effort in the field of IC. A hierarchical structure was proposed through leveling of the components. And finally, the importance and priorities of the components are calculated with the help of the fuzzy analytic network process. The adoption of such an ISM-ANP model of IC components in the banking industry would provide insights for managers, decision-makers and policymakers for a better understanding of these components and to focus on the major components while managing their IC in their organizations.

Keywords: intellectual capital; banking industry; interpretive structural modeling; analytic network process; MICMAC analysis.

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1. Introduction

Nowadays, in perfectly competitive markets, intellectual capital (IC) is taken into account as a key issue to gain and maintain a competitive advantage (2008). In this regard, IC refers to knowledge, work experience, organizational technology, customer relationships, and professional abilities that establish a competitive advantage in markets (Sydler et al., 2014). From the perspective of Ordonez De Pablos (2002), intellectual capital can correspondingly get involved in value creation for organizations through improving the foundations for growth, flexibility, and innovation. Therefore, organizations are expected to understand their own intellectual capitals and make out their roles in the domain of organizational success. Such organizations can benefit from this kind of capital to make the most important decisions, adopt appropriate policies, and allocate their resources so as to achieve a sustainable competitive advantage (Sydler et al., 2014).

This is so true in knowledge-based industries such as the financial industry such as banks, as the main resources in these industries are non-tangible and intellectual in nature (Shih et al., 2010). According to Ahuja and Ahuja (2012), an efficient utilization of IC is more crucial for accomplishing success in banking than other industries, asserting that delivering of high quality services by a bank depends on its investment in items related to IC such as its human resources, brand building, systems and processes. Goh (2005) further states, "Though physical capital is essential for banks to operate, it is the intellectual capital that determines the quality of services provided to customers." (p.386). Therefore, it becomes necessary for banks to manage their IC as efficiently as possible.

Furthermore, intellectual capital is known as a broad concept with various dimensions and components. Most studies in this respect have confirmed the impact of the main dimensions of intellectual capital on organizational financial performance. Nonetheless, a more detailed understanding of intellectual capital components is needed to effectively manage this valuable asset and use its advantages, especially in knowledge-based organizations such as banks. In other words, each of the three main dimensions of human capital, structural capital, and relational capital is composed of components whose accurate identification and proper management can be of help for an organization to accomplish its goals.

However, even though there is a great deal of research on IC, there are very few earlier studies that systematically consider and analyze the dependencies between components. Most of the intellectual capital models and the evolutionary methods used for categorizing intellectual capital components ignored the dependencies between them. The purpose of this study is to identify, analyze and model the intellectual capital's components by consideration of their dependencies; and determine their relative importance.

First of all, the Export Development Bank of Iran was selected. During the interviews with top managers, they emphasized that there are lots of dependencies between IC components. Then the interpretive structural modeling was applied and determining the contextual relationships by using an ISM-based questionnaire was done. After that, determining the relative importance by using an ANP-based questionnaire was accomplished.

This study contributes to the existing literature by providing an additional experience of using ISM and an integrated approach of using ISM and ANP of the IC components in a bank. It attempts to provide some insights on the causal relationships and relative importance of the components. The other three achievements of this research study are to:

- Model the IC components in a hierarchical diagram
- Classify the IC components in four groups regarding their autonomous degree and driving power
- Determine the relative importance of IC components

Our focus is on IC components interactives and the result of this study could assist the management of the banks in the design and practice of IC policies, investment decisions, and strategies to improve bank efficiency.
Section 2 of this article provides a brief overview of the definitions, tenets, and domains of intellectual capital as reported in the literature. In Section 3, the relevant literature is explored to identify intellectual components. Section 4 presents the details of the integrated approach of ISM and ANP. The classification of IC components in banks and the development of a structural diagram for them make up Sections 5 and 6 respectively. Component's priorities are expressed in section7. Section 8 is dedicated to the discussion of the results. Finally, a summary of the research, the achievements and implications of the study, the research limitations, and recommendations for future research are offered in Section 9.

2. Literature review

Knowledge-related assets as the primary drivers for a sustainable competitive advantage are often acknowledged as intellectual capitals (Sydler et al., 2014). These types of capitals consist of assets created through intellectual activities (Wiig, 1997) and have an impact on value creation and organizational performance (Roos and Roos, 1997, Bontis, 1998, Bontis et al., 2000). According to Edvinsson and Malone (1997), knowledge, experience, technology, customer relationships, and supplier relationships are examples of intellectual capitals in an organization. Itami and Roehl (1991) considered intellectual capitals as forms of intangible assets in a company including items such as intellectual rights, firm experience, firm reputation, customer relationships, and organizational culture. These items would be valuable in terms of organizational competitive power. Furthermore, Stewart and Ruckdeschel (1998) pointed to intellectual items such as knowledge, information, intellectual assets, and experience that would be of use for value creation.
Most researchers believe that there are three levels of intellectual capitals including individual level (human capital), organizational level (structural capital), and group level (relational capital) (Ordonez de Pablos, 2004).
Human capital is considered as the main component of intellectual capital (Cabrita and Vaz, 2006) representing the storage of individual knowledge among the personnel in an organization (Ordonez de Pablos, 2004, Bontis et al., 2002). This capital is not owned by the organization; it can be excluded as individuals withdraw. It is also mainly tacit and is rooted in the talent of the personnel (Sydler et al., 2014). Its value depends on its potentials for participation in achieving competitive advantages for an organization (Ordonez de Pablos and Lytras, 2008).
The structural capital refers to knowledge at the level of organization. It can be created through institutionalizing individual and collective knowledge available in a company and via learning processes (Ordonez de Pablos, 2004). The input of such processes comes from human resources, indicating the interaction of two types of intellectual capital (Ordonez de Pablos, 2004). Based on the consensus among the majority of scholars, structural capital can be defined as "the knowledge that remains in the company when employees go home" (Sydler et al., 2014, Ordonez de Pablos, 2002, Ordonez de Pablos, 2004). This kind of capital forms a part of the assets of an organization (Boisot, 2002) and can be created as an intellectual content owned by that organization. Therefore, such a capital belonging to the organization can be shared and reported (Sydler et al., 2014).
The relational capital is the available tacit knowledge possessed by an organization to have relations with its environment (Ordonez de Pablos, 2004). Some researchers have labeled such a capital as customer capital, but most scholars have pointed to the value of

organizational relations with all individuals and organizations (Sydler et al., 2014) including shareholders, customers, suppliers, partners, and others involved. In simple words, relational capital is what occurs between internal and external stakeholders (Roos et al., 1997), and this relation is a necessary condition for construction, maintenance, and renovation of resources, structures, and processes over time. It has been noted that external relations can help companies gain access to important and complementary resources (Cabrita and Vaz, 2006).
Intellectual capital in banks have been evaluated and measured in several studies designed with different methods and goals. From the point of level of study, as shown in Table 1, they can be divided into three groups.

Table 1. List of studies conducted in the banking industry on intellectual capital

Studies at the bank level	Studies at the dimensions level	Studies at the components level
Bakar and Yusop (2011)	Aminbeidokhti and Darvishkhadem (2012)	Khan and Ali (2010)
Goh (2005)	Cabrita and Vaz (2006)	
El-Bannany (2008)	Mention and Bontis(2013)	
Mondal and Ghosh (2012)	Al-Musali and Ismail (2014)	
Al-Musali and Ismail (2012)		
El-Bannany (2012)		
Joshi(2010)		
Mavridis(2004)		
Yalama and Coskun (2007)		

A group of them have considered the study and measurement of intellectual capital at the bank level. This group, which includes Bakar and Yusop (2011), Goh (2005), El-Bannany (2008), Mondal and Ghosh (2012), Al-Musali and Ismail (2012), El-Bannany (2012), Joshi (2010), Mavridis (2004), and Yalama and Coskun (2007), has all reviewed the efficiency of intellectual capital using the VAIC method.
Another group of works has considered the study of the state of intellectual capital in the bank at the level of the three main dimensions of human capital, structural capital and relational capital. Aminbeidokhti and Darvishkhadem (2012), Cabrita and Vaz (2006), and Mention and Bontis (2013) examine the impact of intellectual capital dimensions on each other, and Al-Musali and Ismail (2014) is dedicated to examining the impact of each of the three dimensions on bank performance.
IF the status of intellectual capital in the bank is considered at the level of components, we can refer to Khan and Ali (2010), which provides a report on the status of components of intellectual capital.
As can be seen, although several works are devoted to the study of IC in the bank, the study of the components of each of the dimensions of human capital, structural capital, and relational capital has been neglected.
On the other hand, as can be seen, most IC studies in the bank are dedicated to measuring and evaluating the effectiveness of IC. However, accurate cognition of IC components, interactions among them, and their relative importance are important issues that have been forgotten. Thus, this paper is defined with the aim of prioritizing IC components via examining the interactions between IC components on each other and intends to cover the gap in this area.

3. Identification of intellectual capital components

Through a review of the literature and from expert opinions, we identified various intellectual components in the banking industry. Since the literature is not sufficiently rich in IC

components in the banking industry context, we had to refer to the literature on other organizations and industries as well. Thus, 66 models in the field of human capital, 56 models in the area of relational capital and 55 models in the structural capital dimension were investigated.

In this way, value drivers were extracted and identified and then refined in several steps. To do the refinement, duplicated value drivers were removed, conceptually equivalent value drivers were merged, indicators used to measure intellectual capital were deleted, and the final list was prepared. In the next step, using the expert opinions, the knowledge of intellectual capital components was synthesized in order to classify the components and gain a better understanding of the dimensions of intellectual capital (Roshani, 2018).

Totally, 16 intellectual components were identified in three main dimensions in banks. The human capital consists of five main components including employee knowledge, employee skill, employee attributes, employee intellectual agility and employee attitude. Five main components constitute the structural capital, including management policies, corporate culture, processes and systems, technology infrastructure, and intellectual property. Finally, the relational capital is structured with six major components including customers, suppliers, stakeholders, environmental and community issues, diffusion and networking, alliances, licensing and agreements. The definitions of these components are as follows:

1- **Employee knowledge**: In an organizational context, it is the combination of what is known to exist in the intelligence and in the competence of people. It is composed of education, work-related knowledge, training, learning, and management knowledge.
2- **Employee skill**: It is an ability acquired through deliberate, systematic, and sustained efforts to smoothly and adaptively carry out complex activities or job functions involving IT skills, professional skills, general skills, relational skills, and management skills.
3- **Employee attributes**: They are the characteristics that lead to certain behaviors and can be strong predictors of how someone will respond in a given situation. It is established by the third-order constructs of personality trait, managerial attributes, intelligence, and employee health.
4- **Intellectual agility**: One of the most complicated components in human capital is intellectual agility which indicates the ability to transfer knowledge from one context to another, the ability to see common factors in two distinct pieces of information and link them together, and the ability to improve both knowledge and company output through innovation and adaptation. It refers to innovation, imitation, and adaptation
5- **Employee attitude:** It refers to the motivation of employees for work and their satisfaction with the work. It is regarded as a prerequisite for employees to give full play to their competence and move to action. Skill and knowledge coupled with a positive attitude, which is translated into a positive behavior, create value for the organization. Employee attitude comprises such third-order constructs as values, motivation of the employee, employee attitudes, cultural relevance, satisfaction of the employee, employee behavior, loyalty, and commitment.
6- **Management policies:** They are a set of guiding principles used to set a direction in an organization. They can be a course of action to guide and influence decisions. They should be used as a guide to decision making under a given set of circumstances within the framework of objectives, goals and management philosophies as determined by senior managers. They are composed of social policies, financial policies, legal policies, human management policies, environmental policies, R&D policies, and organizational structure.

7- **Technology infrastructure:** It is defined broadly as a set of components that make the foundation of an information technology service. It comprises typical physical components including computer and networking hardware and facilities as well as various software and network components. This covers the whole information technology, but not the associated people, processes, and documentation. A favorable information system enables a company to quicken the flow of the inner information, heighten the operational efficiency, and hasten to learn within the company. This component encompasses computer network systems, information systems, computer software, and computer hardware.

8- **Processes and systems:** System, procedures, and processes are practiced or used by companies to configure the organizational operations dedicated to internal or external clients. They show the organizational efficiency and should be designed as a series of steps to follow. Practicing them serves as a consistent and repetitive approach to accomplish an end result. This component is established by several third-order constructs including production process and systems, management process and systems, knowledge process and systems, and R&D process and systems.

9- **Corporate culture:** One of the most complicated components in structural capital is corporate culture which serves as the pattern or arrangement of behaviors adopted by a corporation, group or team as the accepted way of solving problems or establishing visions and values to improve the efficiency and effectiveness of collaboration, creativity, communication, trust and sharing throughout an enterprise for economic gain.

10- **Intellectual property:** Intellectual property is the volume of knowledge legally protected or naturally available in the organization. It is related to the internal development of innovations. The main constructs that form this component are patents, registered trademarks, licenses and internet domains.

11- **Customer:** This kind of capital is the knowledge embedded in the marketing channels and customer relationships that an organization develops through the course of conducting business. It leads to the economic value that results from the association (loyalty, satisfaction, longevity) that an enterprise has built with consumers of its goods and services. This component is comprised of 10 main constructs including handling customers, relationships with customer, customer loyalty, customer satisfaction, customer database, customer base, market orientation, marketing, reputation, and brand image.

12- **Suppliers:** A supplier is an entity that supplies goods and services to another organization. This entity is part of the supply chain of a business, and economic value results from the association (financial, strategic, authority, power) an enterprise has established with its suppliers in pursuit of advantageous outcomes. To reach this goal, supplier's capabilities to meet the needs of the organization are critical. Along with supplier capabilities, the existence of a database of suppliers in the organization and relationships with suppliers are the most frequent third-order constructs of this component.

13- **Stakeholders:** A stakeholder is a party that has an interest in a company and can either affect or be affected by the organization actions, objectives and policies. The primary stakeholders in a typical corporation are its investors, employees, customers, suppliers, consultant and professional associations, allies, board members, citizens, government agencies, and unions. Therefore, the community has responsibilities toward it and is interested in its success. Not all stakeholders are equal. Some have a much greater influence on the success of the business than others, or are more influenced by the decisions and policies of the organization than others, like employees, customers and

suppliers. Hence, to focus more on these stakeholders, these three groups are not included in this component. Human capital has many components defined in items 1 to 5. Customers and suppliers were also discussed in components 11 and 12.

14- **Alliances, licensing and agreements:** These are a kind of business partnering between two or more players to share assets, resources, knowledge, expertise or any core competence of benefit for all the parties involved. This kind of partnering helps the parties by covering the weaknesses and enhancing their businesses while remaining as independent organizations. It is established by a few third-order constructs including alliances, licensing, contracts, and agreements.

15- **Environmental and community issues:** It is the institution's commitment to social and environmental improvement. It is an intangible asset which protects the environment and takes care of the society. Being socially responsible results in an improved image. Firms give information about the impact of their work on the environment and on the society at large.

16- **Diffusion and networking:** They refer to the act or process of interacting with other businesses, intermediaries, wholesalers, retailers, distributors, and even the Internet to deliver goods and services to the intended consumers and to cash payments from the end consumer. Meanwhile, information is exchanged among individuals, groups, or institutions to develop mutually beneficial relationships. This component is composed of networking capability, distribution channel, and on-line distribution

A brief summary of various intellectual capital components as reported in the literature is presented in Table 2.

Table 2. List of research works on IC components as reported in the literature

Human Capital	
1- Employee knowledge	(Petty and Guthrie, 2000), (Ordonez de Pablos, 2003), , (Bozbura, 2004), (Chen et al., 2004), , (Han and Han, 2004), (Marr et al., 2004), (McGregor et al., 2004), , (Bueno Campos et al., 2006), (Guthrie et al., 2006), (Lytras et al., 2008), (Ax and Marton, 2008), (Shih et al., 2010), (Beattie and Smith, 2010), (Campbell and Abdul Rahman, 2010), (Ahmed Haji and Mubaraq, 2012), (Tsui et al., 2013), (Anatolievna Molodchik et al., 2014), (Liu et al., 2014)
2- Employee skill	(Bontis et al., 2000), (Bozbura, 2004),)Baxter and Matear, 2004(, (Chen et al., 2004), (Han and Han, 2004), (McGregor et al., 2004), (Bueno Campos et al., 2006), (Bozbura et al., 2007), (Campbell and Abdul Rahman, 2010), (Ahmed Haji and Mubaraq, 2012), (Grimaldi et al., 2013), (Anatolievna Molodchik et al., 2014), (Liu et al., 2014)
3- Employee attribute	(Petty and Guthrie, 2000), (Bontis et al., 2000), (Ordonez de Pablos, 2003), (Marr et al., 2004), (McGregor et al., 2004), (Bozbura, 2004), (Guthrie et al., 2006), (Bueno Campos et al., 2006), (Ax and Marton, 2008), (Lytras et al., 2008), (Beattie and Smith, 2010), (Ahmed Haji and Mubaraq, 2012),(Grimaldi et al., 2013), (Tsui et al., 2013), (Liu et al., 2014)
4- Intellectual agility	(Baxter and Matear, 2004), (Beattie and Smith, 2010), (Bueno Campos et al., 2006), (Grimaldi et al., 2013), (Guthrie et al., 2006), (Lytras et al., 2008), (McGregor et al., 2004), (Petty and Guthrie, 2000)
5- Employee attitude	(Ordonez de Pablos, 2003),)Chen et al., 2004(,)Baxter and Matear, 2004(, (Han and Han, 2004),)McGregor et al., 2004(,)Bozbura, 2004(,)Bueno Campos et al., 2006(, ,)Ax and Marton, 2008(,)Lytras et al., 2008(,)Shih et al., 2010(,)Campbell and Abdul Rahman, 2010(,)Beattie and Smith, 2010(, (Grajkowska, 2011), (Ahmed Haji and Mubaraq, 2012),)Yi, 2012(,)Tsui et al., 2013(,)Grimaldi et al., 2013(, (Anatolievna Molodchik et al., 2014), (Liu et al., 2014)
Structural capital	
6- Management policies	(Chen et al., 2004), (Moon and Kym, 2006), (Adams et al., 2006), (Bueno Campos et al., 2006), (Bozbura and Beskese, 2007), (Lytras et al., 2008), (St-Pierre and Audet, 2011), (Tsui et al., 2013), (Anatolievna Molodchik et al., 2014)
7- Corporate culture	(Petty and Guthrie, 2000), (Bozzolan et al., 2003), (Chen et al., 2004), (Seetharaman et al., 2004), (Adams et al., 2006), (Bueno Campos et al., 2006), (Moon and Kym, 2006), (Bozbura and Beskese, 2007), (Shih et al., 2010), (Grajkowska, 2011), (Ahmed Haji and Mubaraq, 2012), (Mat Husin et al., 2012), (Grimaldi et al., 2013), (Tsui et al., 2013), (Yildiz et al., 2014), (Liu et al., 2014), (Lentjusenkova and Lapina, 2016)

8- Processes and systems	(Petty and Guthrie, 2000), (Bozzolan et al., 2003), (Seetharaman et al., 2004), (Chen et al., 2004), (Adams et al., 2006), (Moon and Kym, 2006), (Shih et al., 2010), (St-Pierre and Audet, 2011), (Grajkowska, 2011), (Mat Husin et al., 2012), (Tsui et al., 2013), (Grimaldi et al., 2013), (Anatolievna Molodchik et al., 2014), (Liu et al., 2014), (Yildiz et al., 2014), (Lentjusenkova and Lapina, 2016)
9- Technology infrastructure	(Petty and Guthrie, 2000), (Bozzolan et al., 2003), (Chen et al., 2004), (Adams et al., 2006), (Moon and Kym, 2006), (St-Pierre and Audet, 2011), (Grajkowska, 2011), (Mat Husin et al., 2012), (Ahmed Haji and Mubaraq, 2012), (Grimaldi et al., 2013), (Tsui et al., 2013), (Liu et al., 2014), (Yildiz et al., 2014), (Lentjusenkova and Lapina, 2016)
10- Intellectual property	(Petty and Guthrie, 2000), (Bozzolan et al., 2003), (Moon and Kym, 2006),, (Shih et al., 2010), (Grajkowska, 2011), (Yi, 2012), (Grimaldi et al., 2013), (Lentjusenkova and Lapina, 2016)
Relational capital	
11- Customers	(Petty and Guthrie, 2000), (Ordonez de Pablos, 2003), (Seetharaman et al., 2004), (Bozbura, 2004), (Chen et al., 2004), (Han and Han, 2004), (Guthrie et al., 2006), (Moon and Kym, 2006), (Campbell and Abdul Rahman, 2010), (Shih et al., 2010), (St-Pierre and Audet, 2011), (Grajkowska, 2011), (Ahmed Haji and Mubaraq, 2012), (Mat Husin et al., 2012), (Grimaldi et al., 2013), (Tsui et al., 2013), (Gogan, 2014), (Anatolievna Molodchik et al., 2014), (Liu et al., 2014), (Bianchi Martini et al., 2016), (Hosseini and Owlia, 2016), (Lentjusenkova and Lapina, 2016), (Sadatrasoul and Hajimohammadi, 2018)
12- Suppliers	(Bozbura, 2004), (Campbell and Abdul Rahman, 2010), (Grajkowska, 2011), (Tsui et al., 2013), (Grimaldi et al., 2013), (Hosseini and Owlia, 2016), (Bianchi Martini et al., 2016), (Lentjusenkova and Lapina, 2016)
13-Stakeholders	(Cohen Kalafut and Low, 2001), (Moon and Kym, 2006), (Campbell and Abdul Rahman, 2010), (St-Pierre and Audet, 2011), (Grajkowska, 2011), (Mat Husin et al., 2012), (Grimaldi et al., 2013), (Tsui et al., 2013), (Anatolievna Molodchik et al., 2014), (Hosseini and Owlia, 2016), (Bianchi Martini et al., 2016), (Lentjusenkova and Lapina, 2016)
14- Alliances, licensing and agreements	(Petty and Guthrie, 2000), (Cohen Kalafut and Low, 2001), (Seetharaman et al., 2004), (Guthrie et al., 2006),, (Campbell and Abdul Rahman, 2010), (Grajkowska, 2011), (Mat Husin et al., 2012), (Ahmed Haji and Mubaraq, 2012), (Grimaldi et al., 2013), (Bianchi Martini et al., 2016), (Hosseini and Owlia, 2016),
15- Environmental and community issues	(Cohen Kalafut and Low, 2001), (Bozbura, 2004), (Campbell and Abdul Rahman, 2010), (Tsui et al., 2013), (Hosseini and Owlia, 2016), (Bianchi Martini et al., 2016)
16- Diffusion and networking	(Petty and Guthrie, 2000), (Ordonez de Pablos, 2003), (Seetharaman et al., 2004), , (Guthrie et al., 2006), (Campbell and Abdul Rahman, 2010), (Grajkowska, 2011), (Mat Husin et al., 2012), (Ahmed Haji and Mubaraq, 2012), (Grimaldi et al., 2013), (Anatolievna Molodchik et al., 2014), (Bianchi Martini et al., 2016), (Hosseini and Owlia, 2016)

4. Research methodology and model development

ISM is known as a process for the transition of vague intellectual models into structured systems, which can help people better understand their beliefs and take in what they do not know (Attri et al., 2013). The ISM method can also enable individuals and groups to identify and map the direct or indirect relations among large numbers of items in a complex decision-making position. In this case, it actually serves as a means of disciplining and directing the complexity of relations among variables. In addition to ordering and directing the relations among the items of a system, the method helps to analyze and evaluate the impact of an item on other items. Thereby, the relational complexity among the items is coped with, and the variables are ultimately classified on the basis of their driving-dependence power.

ISM has been employed in several contexts. Khan and Rahman (2015) used ISM in brand experience anatomy in retailing and modeled its variables by this method. Kanungo and Bhatnagar (2002) applied this methodology to present a framework for assessing and synthesizing information system (IS) quality. Thakkar et al. (2007) developed a balanced scorecard (BSC) through ISM and showed its appropriateness for development of performance measurement systems. In the research by Chang et al. (2013), ISM is utilized to identify the interactive causal relationships of critical agility factors when launching a new

product into mass production. Singh et al. (2003) developed interrelationships among knowledge management variables using this methodology.
Although the inter-relationship of all components can be classified using the ISM method, it is difficult to present the importance of the components using the same approach. Therefore, the ANP method is employed to rank the importance of the components.
The ANP was proposed by Saaty (2004)) to overcome the problem of interdependence and feedback between criteria or alternatives. The ANP is the general form of the analytic hierarchy process (AHP) (Saaty, 1986) which has been used in multicriteria decision making (MCDM) to release the restriction of hierarchical structure, and has been applied to evaluate the Intellectual capital in a Dairy Company (Nedjati and Izbirak, 2013), Analyzing and prioritization of HSE performance evaluation measures (Soleimani and Fattahi Ferdos, 2017) evaluating and select key performance Indicators (Carlucci, 2010), partner selection for strategic alliance (Chen et al., 2008) and so on.
The integrated approach of ISM and ANP has been applied by Thakkar et.al (2007) to develop a balanced scorecard and Chang et.al (2013) for identifying key agile factors in launching a new product into mass production.
The various steps involved in the methodology are shown in Figure 1.
The main aim of this study is to find the individual interactions of the components of intellectual capital and their relative importance in the banking industry. ISM can be appropriately employed as a tool under such an individual interaction state of affairs because the basis of the relationship between the components and the overall structure can be extracted from the system under consideration. Based on the extracted interactions, the network is constructed and ANP can be used to prioritize the components. Therefore, this integrated approach can map the model of intellectual capital and the priorities in a bank.

a. Structural Self-Interaction Matrix (SSIM)

A team of experts consisting of 13 senior managers of the Export Development Bank of Iran, all having master's and postgraduate degrees and also familiar with the concept of intellectual capital, was consulted to identify the nature of contextual relationships among the IC components identified in Section 3. These experts had several years of work experience in banking and related areas of management, human resources and performance. ISM methodology suggests the use of expert opinions alone (based on management techniques such as brainstorming and nominal group technique) to develop contextual relationships.

To analyze the components and develop an SSIM, paired comparisons were performed and the following four symbols were used to denote the direction of the relationships among the components (i and j):

V: It is used for the relation from component i to component j (i.e. if component i "will help achieve" or "will help enhance" component j)

A: It is used for the relation from component j to component i (i.e. if component j "will be achieved by" or "will be enhanced by component i)

X: It is used for both direction relations (i.e. if components i and j "help achieve each other")

O: It is used for no relation between the two components (i.e. if components i and j are not related)

Given the dimensions of the problem, 120 comparisons were made in this way and the SSIM was developed based on the contextual relationships (Table 3).

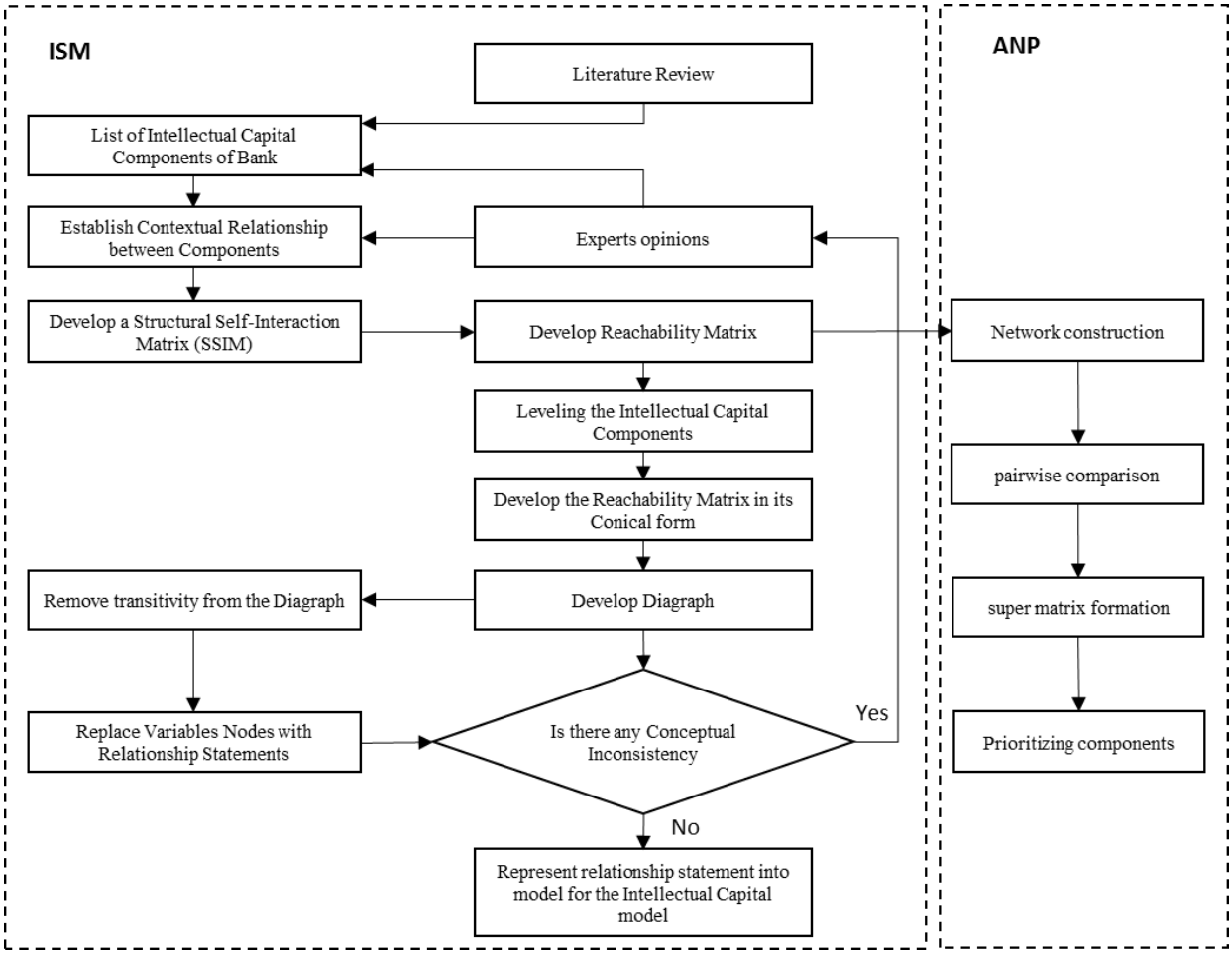

Figure 1. Flow diagram for integrated approach of ISM (Kannan et al., 2009) and ANP

The following would explain the use of symbols V, A, X, and O in the SSIM (Table III):

(i) Component 1 helps increase component 8. This means that, as efforts are made to raise employee knowledge, the effectiveness of processes and systems improves. Thus, the relationship between components 1 and 8 is denoted by "V" in the SSIM (Table III).

(ii) Component 2 can be enhanced by component 9, i.e. progress of component 9, namely technology infrastructure, improves the employee skill (component 2). Thus, the relationship between these components is denoted by "A" in the SSIM (Table III).

(iii) Components 1 and 6 help achieve each other. Component 1, namely employee knowledge, and component 6, namely management policies, help achieve each other. Thus, the relationship between these components is denoted by "X" in the SSIM (Table III).

(iv) No relationship exists between intellectual property (component 10) and suppliers (component 12) and, hence, the relationship between these components is denoted by "O" in the SSIM (Table 3).

Table 3. Structural self-interaction matrix (SSIM)

C. No	Components	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2
1	Employee knowledge	V	O	O	O	O	X	O	O	V	V	X	V	X	X	V
2	Employee skill	V	V	O	V	O	V	O	A	V	A	A	V	X	X	
3	Employee attributes	V	O	V	O	O	V	O	O	O	V	V	V	X		
4	Employee intellectual agility	V	V	O	V	O	V	O	O	V	V	V	V			
5	Employee attitude	V	V	X	X	O	X	V	O	O	X	X				
6	Management policies	V	V	X	X	X	X	V	X	X	X					
7	Corporate culture	V	V	V	V	V	V	V	O	X						
8	Processes and systems	V	V	V	V	V	V	O	X							
9	Technology infrastructure	O	V	O	O	V	V	O								
10	Intellectual property	V	O	V	V	O	O									
11	Customers	O	X	X	O	A										
12	Suppliers	O	O	O	X											
13	Stakeholders	A	O	O												
14	Environmental and community	V	V													
15	Diffusion and networking	V														
16	Alliances, licensing and															

b. Reachability matrix

In the second step of ISM, the SSIM was converted into a binary matrix, called the initial reachability matrix, which is a square matrix whose entries can be considered 1 once the item i with length 1 can have access to elements j; otherwise, the entries are 0.

The substitution of 1s and 0s were as per the following rules:

- If the (i, j) entry in the SSIM is V, the (i, j) entry in the reachability matrix becomes 1, and the (j,i) entry becomes 0.
- If the (i, j) entry in the SSIM is A, the (i, j) entry in the reachability matrix becomes 0, and the (j,i) entry becomes 1.
- If the (i, j) entry in the SSIM is X, the (i, j) entry in the reachability matrix becomes 1, and the (j,i) entry also becomes 1.
- If the (i, j) entry in the SSIM is O, the (i, j) entry in the reachability matrix becomes 0, and the (j,i) entry also becomes 0.
- If i = j, the (i, j) entry in the reachability matrix becomes 1.

Based on the rules above, the initial reachability matrix for the components emerged as shown in Table 4.

Table 4. Initial reachability matrix

C. No	Components	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	Employee knowledge	1	1	1	1	1	1	1	1	0	0	1	0	0	0	0	1
2	Employee skill	0	1	1	1	1	0	0	1	0	0	1	0	1	0	1	1
3	Employee attributes	1	1	1	1	1	1	1	0	0	0	1	0	0	1	0	1
4	Employee intellectual agility	1	1	1	1	1	1	1	1	0	0	1	0	1	0	1	1
5	Employee attitude	0	0	0	0	1	1	1	0	0	1	1	0	1	1	1	1
6	Management policies	1	1	0	0	1	1	1	1	1	0	1	1	1	1	1	1
7	Corporate culture	0	1	0	0	1	1	1	1	0	1	1	1	1	1	1	1
8	Processes and systems	0	0	0	0	0	1	1	1	1	0	1	1	1	1	1	1
9	Technology infrastructure	0	1	0	0	0	1	0	1	1	0	1	1	0	0	1	0
10	Intellectual property	0	0	0	0	0	0	0	0	0	1	0	0	1	1	0	1
11	Customers	1	0	0	0	1	1	0	0	0	0	1	0	0	1	1	0
12	Suppliers	0	0	0	0	0	1	0	0	0	0	1	1	1	0	0	0
13	Stakeholders	0	0	0	0	1	1	0	0	0	0	0	1	1	0	0	0
14	Environmental and community issues	0	0	0	0	1	1	0	0	0	0	1	0	0	1	1	1
15	Diffusion and networking	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1
16	Alliances, licensing and agreements	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1

After the initial reachability matrix was obtained, the final reachability matrix could be acquired by inserting transitivity into the variable relations. This is a square matrix whose entries are considered 1 otherwise 0, wherein the item *i* with any length has access to the element *j*. The common approach to achieve this matrix is to allow raising the initial reachability matrix repeatedly as long as none of its entries changes. Equation (1) illustrates this method.

$$(B+I)^{n-1} < (B+I)^n = (B+I)^{n+1} = M \quad (1)$$

Warfield (1974b) emphasized that the development of the initial reachability matrix and its conversion into the final one would be likely to encounter a serious threat, i.e. inconsistency to completing the SSIM. According to him, if there is such inconsistency, a universal matrix all of whose entries are assumed 1 will be created when converting the initial reachability matrix into the final one. It, thus, does not allow the ranking and the complementary analysis of the ISMs. In order to avoid this inconsistency, only relations of length 1 should be used to complete the SSIM even though recognizing relations only with length 1 can be difficult for experts. Therefore, as Warfield (1974b) suggested, the final reachability matrix needs to be created from the very beginning (i.e. after obtaining the SSIM). Since many entries in reachability matrices can be derived on the basis of inferences, this method is assumed shorter and more reliable. In this method, two groups of sub-matrices are completed to achieve a reachability matrix. In this respect, the sub-system matrix is developed based on the method described by Warfield (ibid), and the intersection matrices are then calculated according to the method explained in (Warfield, 1974a). What results from this method is a fully consistent reachability matrix which can be further analyzed.

The final reachability matrix in the present study was obtained by using the method described above. In other words, the SSIM data were first converted into 0 and 1. Then, sub-system matrices were developed based on the resulting matrix. After that, intersection matrices were created on the basis of this matrix. Finally, a reachability matrix was obtained from the aggregation of these two matrices according to Table 5.

c. Level partitioning

After the final reachability matrix is obtained, it should be divided into different levels. The partitioning of the system into different levels can help to clarify the role of individual components as well as their mutual interactions and facilitate their analysis process. In other words, using the level partitioning method and divisions into systems and sub-systems can reduce the existing complexity of large systems and improve their analysis. At this stage, reachability and antecedent sets are obtained for each variable through the final reachability matrix.

A reachability set consists of the components of the system derived from the relevant variable. To do the derivation, the row of this variable must be checked. Number 1 in this row indicates the driving power of the variable, and its location can show the antecedent variables and the directional lines exiting from it. The antecedent set of a variable comprises the system components that can lead to that variable. For this to occur, the column of the variable must be examined. Number 1 in this column shows the dependence power of the variable, its location, its antecedent variables, and the directional lines entering into it.

Table 5. Final reachability matrix

C. No	Components	16	8	5	2	7	11	6	3	4	1	13	12	15	14	10	9	Driving power
16	Alliances, licensing and agreements	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
8	Processes and systems	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
5	Employee attitude	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	2
2	Employee skill	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	4
7	Corporate culture	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	5
11	Customers	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	10
6	Management policies	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	10
3	Employee attributes	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	10
4	Employee intellectual agility	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	10
1	Employee knowledge	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	10
13	Stakeholders	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	2
12	Suppliers	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	2
15	Diffusion and networking	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1
14	Environmental and community issues	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	2
10	Intellectual property	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	3
9	Technology infrastructure	1	1	1	1	0	0	0	0	0	0	1	1	1	0	0	1	8
Dependence power		11	9	9	8	6	5	5	5	5	5	3	3	4	2	1	1	

For example, the reachability set for component 7, namely corporate culture, consists of the component itself and the other variables which it may help to achieve. As Table 5 shows, components 2, 5, 8 and 16 make its reachability set. Moreover, its antecedent set consists of the component itself and the other components which it may help to achieve. As the column related to component 7 in Table 5 shows, components 2, 5, 8 and 16 consist of the antecedent set of component 7.

After determining the reachability and antecedent sets, the intersection sets can be determined for each variable. For example, for component 7, the intersection set is limited to the component itself. Accordingly, the variables whose reachability and intersection sets are the same can be placed at the highest levels of the ISM hierarchy. To find the next levels of the system components, the highest level components can be separated out from the other

components in the related table, and the operation associated with determining the components of the next level can be performed in the same way as to specify the components of the highest level. This operation is continued until the system components at all the levels are determined. After this stage, a basic model can be mapped considering the variables' levels and the final reachability matrix. The final model can be achieved by eliminating transitivity from the initial model.
In this study, these procedures were performed on the final reachability matrix. As shown in Table 6, components 12, 13, 15, and 16 have the same set of reachability and intersection sets and are placed at the first level of the ISM. Thus, they were positioned at the top of the ISM model. After these components were removed, the stages continued until the level partitioning of all the components was done, as illustrated in Table 6.

Table 6. Levels of IC components

Component	Reachability set	Antecedent set	Intersection	Level
Employee knowledge (1)	1,2,3,4,5,6,7,8,11,16	1,3,4,6,11	1,3,4,6,11	V
Employee skill (2)	2,5,8,16	1,2,3,4,6,7,9,11	2	III
Employee attributes (3)	1,2,3,4,5,6,7,8,11,16	1,3,4,6,11	1,3,4,6,11	V
Employee intellectual agility (4)	1,2,3,4,5,6,7,8,11,16	1,3,4,6,11	1,3,4,6,11	V
Employee attitude (5)	5,TC6	1,2,3,4,5,6,7,9,11	5	II
Management policies (6)	1,2,3,4,5,6,7,8,11,16	1,3,4,6,11	1,3,4,6,11	V
Corporate culture (7)	2,5,7,8,16	1,3,4,6,7,11	7	IV
Processes and systems (8)	8,16	1,2,3,4,6,7,8,9,11	8	II
Technology infrastructure (9)	2,5,8,9,12,13,15,16	9	9	IV
Intellectual property (10)	10,14,15	10	10	III
Customers (11)	1,2,3,4,5,6,7,8,11,16	1,3,4,6,11	1,3,4,6,11	V
Suppliers (12)	12,13	9,12,13	12,13	I
Stakeholders (13)	12,13	9,12,14	12,13	I
Environmental and... (14)	14,15	10,14	14	II
Diffusion and networking (15)	15	9,10,14,15	15	I
Alliances, licensing and… (16)	16	1,2,3,4,5,6,7,8,9,11,16	16	I

d. Network construction

In this step, the decision problem should clearly be stated and constructed as a network. Previous studies show the influence of the main dimensions of intellectual capital on each other. Since these dimensions are composed of several components, the influence between them is also due to the lower levels. In this way, it can be accepted that the components of intellectual capital are not independent of each other. Applying ISM led to the extraction of these interdependencies. Accordingly, Human capital, Structural capital and relational capital are the clusters, and IC components are the nodes and the connections are based on the table 4.

e. Pairwise comparison

To identify the relative importance of IC dimensions and components questionnaires were provided based on 1 to 9 point scale proposed by Saaty. The experts who participated in the ISM stage performed pairwise comparisons of the ANP. The first questionnaire asks about dimension comparisons with respect to one of the dimensions. In the same way, the second questionnaire asks about the components comparisons within one dimension, with respect to every other node one by one. The third questionnaire asks about the component comparisons with respect to the other interconnected components. During the assessment process, there

may occur a problem in consistency. Therefore, it is important to examine the consistency of judgments. In this regard, the consistency ratio was checked for each matrix.

f. Super matrix formation

The supermatrix represents the tool by which determining global priorities in a network system. The supermatrix is a partitioned matrix, where each submatrix is composed of a set of relationships dealing with two levels in the network model. The ANP involves three kinds of supermatrix, i.e. unweighted supermatrix, weighted supermatrix, and limit supermatrix, which are respectively formed one after the other, through proper computations. The unweighted supermatrix is presented in table 7.

5. Classification of intellectual capital components: Micmac analysis

After a reachability matrix is obtained, driving-dependence power can be calculated for each component. In the corresponding table, the total quantity in a row is the driving power of a component, and the sum of the values in a column equals the dependence power of a component. To analyze driving-dependence power in the ISM (MICMAC diagram), the variables are classified into four groups as follows:
I) Autonomous variables, which have a weak driver power and weak dependence. These components are relatively disconnected from the system; there are only a few links that may be strong.
(II) Dependent variables that have a weak driver power but strong dependence.
(III) Linkage variables that have a strong driving power and strong dependence. These components are unstable in that any action on these components will have an effect on the others and on their own feedbacks.
(IV) Independent variables which have a strong driving power but weak dependence.
As it can be seen in Table 5, component 10 has a driver power of 3 and a dependence power of 1. Therefore, in Figure 2, it is positioned in a place corresponding to the driver power of 3 and the dependency of 1.
In this way, all the intellectual capital components of the bank were classified into four groups of autonomous, dependent, linkage, and independent variables with reference to their driving-dependence power. The driving-dependence power values of the intellectual capital components of the bank are presented in Figure 2. As it can be seen, the variables of intellectual property, suppliers, stakeholders, environmental and community issues, as well as diffusion and networking have been placed in the autonomous area, representing weak driving-dependence power. In other words, the six intellectual capital components of the bank were somewhat isolated from the other components, and they had poor relations. The other variables such as employee attitudes and perceptions, processes, systems, as well as alliances, licensing and agreements also had a low driving power while they were highly dependent on the other variables. The independent area only included the variable of technology infrastructure with a high driving power but very low dependence on the other components. In other words, the impact of this component on the other ones was very high in terms of achieving returns on equity and earnings. In the end, the components in the linkage area were found to be endowed with a high driving-dependence power. These components were unstable, and they could easily affect the other intellectual capital components. They also had a feedback effect on themselves. As shown in the diagram of the intellectual capital components, the variables of employee knowledge, employee skills, employee attributes, employee intellectual agility, management policies, customers, and corporate culture are placed in this area.

Table 7. Unweighted supermatrix

Goal		Dimensions			Components															
	G	HC	SC	RC	HC1	HC2	HC3	HC4	HC5	SC1	SC2	SC3	SC4	SC5	RC1	RC2	RC3	RC4	RC5	RC6
goal	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
HC	0.413	0.000	0.750	0.750	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
SC	0.260	0.500	0.000	0.250	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
RC	0.327	0.500	0.250	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
HC1	0.000	0.171	0.000	0.000	0.000	0.207	0.395	0.385	0.123	0.340	0.186	0.104	0.000	0.000	0.227	0.000	0.000	0.000	0.000	0.058
HC2	0.000	0.225	0.000	0.000	0.000	0.000	0.000	0.000	0.113	0.000	0.000	0.092	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.058
HC3	0.000	0.149	0.000	0.000	0.333	0.188	0.000	0.385	0.219	0.140	0.186	0.062	0.000	0.000	0.227	0.000	0.000	0.000	0.000	0.055
HC4	0.000	0.196	0.000	0.000	0.333	0.207	0.278	0.000	0.145	0.281	0.115	0.092	0.000	0.000	0.122	0.000	0.000	0.000	0.000	0.055
HC5	0.000	0.259	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.103
SC1	0.000	0.000	0.264	0.000	0.167	0.108	0.163	0.143	0.165	0.000	0.349	0.235	0.000	0.000	0.424	0.000	0.000	0.000	0.000	0.237
SC2	0.000	0.000	0.171	0.000	0.000	0.089	0.000	0.000	0.121	0.000	0.000	0.115	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.076
SC3	0.000	0.000	0.171	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.127
SC4	0.000	0.000	0.197	0.000	0.000	0.134	0.000	0.000	0.053	0.000	0.000	0.200	0.000	0.000	0.000	0.500	0.500	0.000	0.600	0.113
SC5	0.000	0.000	0.197	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.200	0.000
RC1	0.000	0.000	0.000	0.296	0.167	0.067	0.163	0.087	0.061	0.239	0.163	0.099	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.117
RC2	0.000	0.000	0.000	0.175	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.500	0.000	0.000	0.000
RC3	0.000	0.000	0.000	0.175	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.500	0.000	0.000	0.000
RC4	0.000	0.000	0.000	0.103	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.200	0.000
RC5	0.000	0.000	0.000	0.140	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
RC6	0.000	0.000	0.000	0.111	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

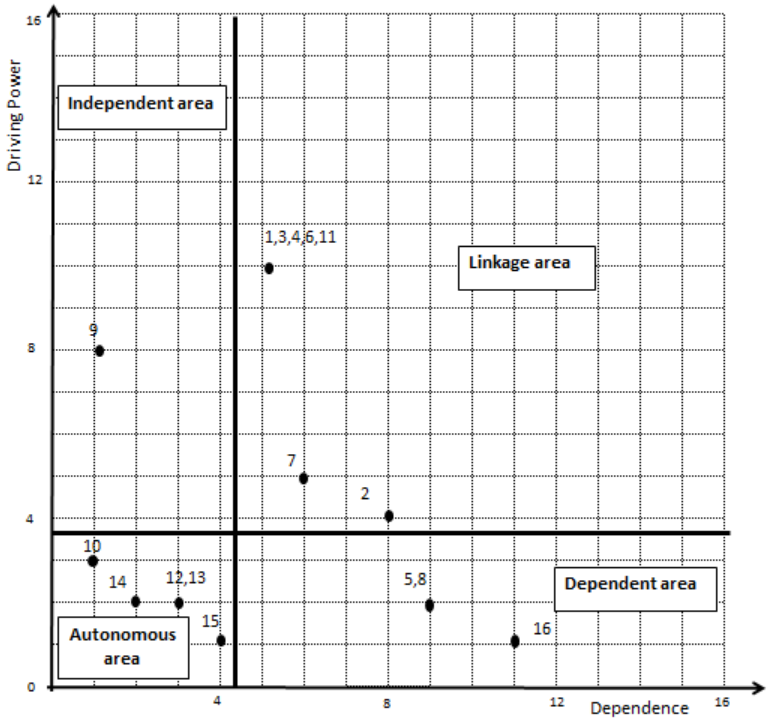

Figure 2. Diagram for the driving and dependence power of the components

6. Formation of the ISM diagram and model

Based on the level partitioning at the fourth stage of the ISM (Table VI) and considering the final reachability matrix relations (Table V), a structural diagram was drawn for the intellectual capital components of the bank, as shown in Figure 3. The variables appearing at the lower levels of this diagram were those that were also located in the linkage and driving areas according to the MICMAC diagram. The dependent variables and, to some extent, the autonomous variables were at the top of this diagram, showing their low impact on the other components.

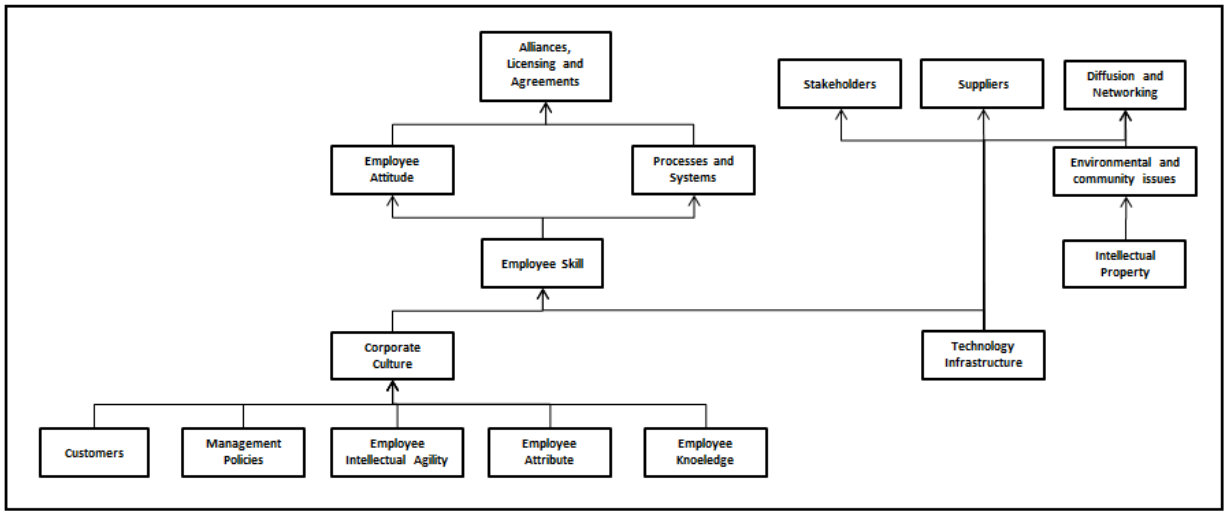

Figure 3. ISM-based model of the intellectual capital components of the bank

As observed in Figure 3, employee knowledge, employee attributes, employee intellectual agility, management policies and customers are very significant components of intellectual capital as they lie at the base of the ISM hierarchy. The four components of the relational capital dimension (i.e. 12, 13, 15 and 16) have appeared at the top of the hierarchy. It shows that this dimension is the most dependent one among the intellectual capital dimensions of the Export Development Bank of Iran. The diagram shows intellectual property, suppliers, stakeholders, environmental and community issues as well as diffusion and networking are somewhat isolated from the other components. This confirms the result of the MICMAC analysis in Figure 2. Employee skill is influenced by technology infrastructure and corporate culture, leading to better employee attitude and process and systems.

7. Prioritizing the intellectual capital components

The prioritization of components is shown in Table 8. It's obvious that the human capital has the upper rank among the three dimensions. In this dimension Employee knowledge, Intellectual agility, Employee attributes, Employee attitude, and Employee skill, are in sequence the important components of HC. In the structural capital, Management policies was evaluated first and Technology infrastructure, Corporate culture, Intellectual property, and Processes and systems are in order next important components. In the same way, the components of relational capital have been prioritized. Customers, suppliers, and Stakeholders are the most important components sequentially. Diffusion and networking, Environmental and community issues and Alliances, licensing and agreements are in the next order.

Table 8. Levels of IC components

Dimensions	Priorities	Components	Priorities from Limit Matrix	Priorities Normalized by Cluster	Ranking
Human capital	0.493	Employee knowledge (1)	0.260	0.132	1
		Employee skill (2)	0.121	0.060	7
		Employee attributes (3)	0.231	0.117	3
		Intellectual agility (4)	0.247	0.122	2
		Employee attitude (5)	0.126	0.062	6
Structural capital	0.290	Management policies (6)	0.404	0.117	3
		Technology infrastructure (7)	0.132	0.038	8
		Processes and systems (8)	0.103	0.030	11
		Corporate culture (9)	0.235	0.068	5
		Intellectual property (10)	0.125	0.036	9
Relational capital	0.217	Customer (11)	0.431	0.094	4
		Suppliers (12)	0.157	0.034	10
		Stakeholders (13)	0.157	0.034	10
		Alliances, licensing and agreements (14)	0.078	0.017	13
		Environmental and community issues (15)	0.098	0.021	12
		Diffusion and networking (16)	0.078	0.017	13

8. Results and discussion

The importance of intellectual capital stems from the fact that the modern economy with its specific characteristics, such as e-commerce, globalization, intense competition, the rapid

growth of new technologies, and rapid changes in customer demand, postulates special requirements for organizations. In such a situation, companies need to develop perfectly transparent strategies that give them a competitive advantage. Also, organizations have to understand how much capability they need to achieve and maintain competitive advantages (Marr et al., 2004). Abilities derive from knowledge; therefore, organizations seeking to improve their ability must manage their knowledge assets and capitals. However, the matter is that not all sources of knowledge are of the same importance or impact (Perez and Ordonez de Pablos, 2003). Therefore, identifying the sources of intellectual capital, the relationships among them, and managing them is one of the most important requirements for achieving a sustainable competitive advantage. The results of this research help to identify the components of the intellectual capital in the banking industry, the relationships among them, and their influences.

Regarding the relationships among intellectual capital components, certain results were obtained. First of all, the position of various components of human capital and their relationship with those of structural capital in the ISM model (Figure 3) showed the impact of human capital on structural capital. This is in agreement with the results reached by Shih et al. (2010) who analyzed the correlation between the human capital and structural capital of the banking industry and found that human capital in this industry exerts positive and direct influence on structural capital. Secondly, the ISM model (Figure 3) developed in this study points to the direct impact of process and systems on alliances, licensing and agreements as well as technology infrastructure on suppliers, stakeholders and diffusion and networking and the impact of intellectual property on environmental and community issues. The relationships among the different constructs that make up the structural capital and relational capital can be confirmed with the study done by Martinez-Torres (2006). He developed and validated a procedure to identify and measure the intellectual capital in a knowledge-based organization. His study showed that structural capital is the component of the greatest importance, and the structural capital assets are used in contacts with people outside the organization (i.e. relational capital). Thirdly, it was found that suppliers and stakeholder are influenced by technological infrastructure, as shown in Figure 3. This is similar to the finding of Rindermann et al. (2015) who proposed a definition for "relationship with suppliers". In their definition, technological support is a variable that influences suppliers and stakeholders.

Regarding the position of intellectual capital components in the hierarchical structure, their driving and dependence power, and their category in the MICMAC diagram, certain results were obtained. First, as Figure 3 shows, three components of human capital, namely employee intellectual agility, employee knowledge, and employee attribute, lie at the bottom level while two of its components, namely employee skill and employee attitude, lie at the middle level of the ISM model. This indicates the influential role of human capital in the bank success. In a similar case, Perez and Ordonez de pablos (2003) state that employee knowledge, skill, and abilities constitute one of the most significant and renewable resources which a company can take advantages of. Secondly, the present study paid special attention to the specific features and the effective role of suppliers in the success of organizations. However, the results show that they are exactly in the same position as the stakeholders in Figure 2 and Figure 3. St-Pierre and Audet (2011) cite Bontis (1998), Grasenick (2004), Green and Ryan (2005) and Canibano (2000) for their definition of relational capital. As they have proposed, "relational capital includes all the resources involved in the relationships between the firm and its stakeholders (customers, investors, suppliers, etc.) and all knowledge embedded in these external relationships" (p. 204). In this definition, suppliers are considered as a group of stakeholders. Therefore, the identical position of suppliers and stakeholders is validated.

The third result is based on what is understood from Figure 2. According to the figure, the component of alliances, licensing and agreements is the most dependent one among 16 IC components. The MICMAC analysis, too, categorized this component as a dependent one. It lies at the top level of the IC model in the bank, which indicates that it is influenced by the other components. In this regard, Mat Husin et al. (2012) have gained similar results. They state that the initiatives of a company are developed to form an alliance with external parties in a search for resources that they are lacking (e.g. assets, knowledge, expertise or any core competence). In this situation, the alliance will create intellectual asset partners as a competitive advantage. Hence, it depends on the strength and weakness of the other components of the tangible or intangible assets of the organization.

The component of management policies is the subject of the next result. This component lies at the bottom level of the ISM model (Figure 3) and is one of the most driving components in Figure 2. The consequential function of management policies is confirmed by Moon and Kym (2006) who underline the importance of management policies in administrating the various components and subcomponents of intellectual capital. They argue that management policies are a set of guiding principles used to set a direction in an organization. With respect to human capital, organizations should enact programs and policies to enhance employee capabilities, employee satisfaction, and retention. For structural capital, managers must build and sustain a strong positive organizational culture, invest in effective and efficient work processes, enact strong information systems and safeguard intellectual properties. Finally, to build and sustain relational capital, organizations must nurture customer relationships, partnerships with other stakeholders of the organization, and ties with the community in which they are embedded (ibid). As described in Section3, management policies are composed of organizational structure and a few types of policies. One of its components is human management policies or human resource policies. They are, indeed, the continuous guidelines on the approach an organization intends to adopt in managing its people. They present specific guidelines to HR managers on various matters concerning employment and state the intent of the organization in different aspects of human resource management such as recruitment, promotion, compensation, training, and selections. Therefore, human capital is greatly influenced by those policies. This is evident from the close relevance of this component to employee knowledge, employee attribute and employee intellectual agility, all of which are in the linkage area of the MICMAC diagram. These variables are both driving and dependent and are affected by their own actions.

Finally, with regard to Figure 2, corporate culture is both driving and dependent. It is affected by many components and affects many components too. These properties make it unstable and difficult to address. The mediating role of culture has been considered in Moon and Kym's (2006) study. They suggest that culture is reflected in an organization's market orientation, strategy direction, human resources policies and practices, internal networks, and information sharing. So, an organization must expend extra attention, monitoring, and effort to address this component successfully.

9. Conclusion

The aim of the paper is to identify the relationships among the intellectual capital components and rank them in the bank and expand the approaches that exist on this topic.

The study has addressed causal relationships that have not been addressed in the literature, more particularly in the banking industry.

By using literature review, sixteen IC components have been identified. Then through using expert opinions and examining the designed questionnaire using ISM model, a hierarchical model of intellectual capital of the bank was obtained.

In this research, an attempt was made to identify, analyze and model the major components of intellectual capital in a bank using the ISM model and the MICMAC analysis. ISM modeling provides an understanding as how the various components interact with one another. This is an issue of importance because policy makers often focus on just a few components that they thinks are significant without considering the effects of other components. Enacting or adopting a policy may upgrade one or more key components that enhance the bank performance, but, at the same time, it may downgrade the other components rather than upgrade them.

This model can be used for any industry. However, the results obtained in the numerical example, reflect the situation of IC in the banking industry. The results of the study indicate that employee knowledge, employee attributes, employee intellectual agility, management policies, technology infrastructures and customers proved to be at the bottom of the structural model. It means that they are the most powerful components, and upgrading these components can enhance a maximum number of the other components. Except technology infrastructures, the other components were identified as linkage, components which are unstable and any action done on them can influence them as well as the other components. The component of alliances, licensing and agreements was found to lie at the top of the structural model and identified as a dependent variable. Employee attitude and processes and systems were also identified as dependent variables. The enhancement of these components depends more on the upgrading of the other components. The other five components, including intellectual property, suppliers, stakeholders, environmental and community issues and diffusion and networking are autonomous.

In other words, components with higher driving power are of more strategic orientation, while those categorized as dependent are oriented more toward performance and result. Thus, the best results can be achieved by continually improving the independent components.

In the other hand ANP model facilitates the process of assigning weights, because the interrelationship dependencies between IC components cannot be ignored. So, it helps managers to have a good comparison between the components.

The firms in the banking industry can apply the ISM model for managing their intellectual capital effectively and efficiently as well as making strategic and tactical decisions. On the other hand, the firms in other industries should start from the determination of contextual relationships according to their industries circumstances. Consequently, it is expected that this research will support the establishment of an IC model and classification of IC components for each organization.

For further research, this model can be applied in other industries and the differences in the hierarchical model and the component classification can constitute a basis for concluding the industrial characteristics.

The relationship model for the identified IC components was not statistically validated. Any future research in this case may benefit from Structural Equation Modeling (SEM), which is capable of testing the validity of such hypothetical models. The results obtained can be compared with the one of this paper.

In spite of the above-mentioned results, this study had its own limitations. ISM may claim an ability to describe a causal hierarchical structure for the factors involved in a problem, but it definitely cannot provide quantitative information for management decisions or demonstrate the statistical significance of the components. Accordingly, it is suggested for future studies to combine this method with the analytic network process (ANP) so as to achieve a complete model in terms of dimensions, intellectual capital components, and weight and importance of each component.

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