

## The influence of intellectual capitals management on productivity

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**Abstract:** Today and from a strategic point of view, intellectual capital is applied to create and improve organizational worthiness and organizational success depends on how this crucial capital is used and managed in the system. This study investigates the influence of intellectual capital on productivity in 'Behnoosh' Company. The results -which are obtained through the Pierson correlation and regression – represent the positive effects and meaningful aspects of intellectual capital to gain more productivity. In continue and with the Friedman test applied, two main variables were ranked that in intellectual capital components, human capital and relational capital were more powerful than organizational capital. Then, the 'Average' test results showed that all variables considered in this study were placed in satisfactory levels. In the end, some suggestions to better intellectual capital management and achieve more productivity were presented.

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**Keywords:** Intellectual capital; human capital; organizational capital; relational capital; productivity

### 1. Introduction and problem statement

Today organizations are challenged to leverage and make knowledge more productive as a competitive resource in the complex and unpredictable environment. Factors of production from the industrial economy like land, labor and capital, continue to remain significant, but they no longer present any obstructions to enter the market. Organizations who are competing in the knowledge-based economy sustain their competitive advantage by harnessing their own unique knowledge and building on their ability to learn faster than their rivals (Daud and Wan Yusoff, 2011).

The firms may utilize both tangible and intangible assets in creating value for their stakeholders. This argument is supported by the resource-based view (RBV) of the firms since RBV identifies resources as the main drive behind firms' compatibility and performance. Traditionally, tangible assets were been considered as significant in the value creation process, whilst, intangible assets have not been recognized as such important in creating value for stakeholders. According to this view, physical assets such as land, labor, and capital were given the priority in the production economy. The importance of intangible assets is growing in the last few decades. Moreover, the intellectual capital, knowledge-related intangible assets, has become more important than physical assets during the last two decades within the growing knowledge-based economy (Yalama & Coskun, 2007). Similarly, much of the wealth of firms that exist in so-called knowledge-based economy is created by intellectual capital as the real competitive edge is located in the quality of relationships,

structures and people (Tayles, Pike & Sofian, 2007). Kaufmann and Schneider (2004) believe that the growing importance of intangibles among other resources has been able to attract the interest of the business community, and also the scientific community. In addition to the scientific community, shareholders, institutional investors, scholars, policymakers and managers, widely, the stakeholders are among the interest groups on intellectual capital too (Tan, Plowman & Hancock, 2007). Moreover, the above-discussed transformation can be notified as a result of the emergence of applying intangibles as strategic assets to survive in a highly competitive business environment in which business firms and other groups are competing for exceptionally limited resources, and the growing importance of knowledge as a commodity.

Nowadays firms intentionally are attempting to invest more resources on intangibles, taking initiatives to find out avenues to measure and disclose value creation through intangible assets. In consequence to the utilization of intangible assets as, the process of valuation of intangibles, practices of measuring, and reporting of value created by intangible assets lead to develop the 'intellectual capital' as a distinct discipline in business.

Based on above-discussed, the management techniques of intellectual capital play a crucial role in organizations' efficiency (Almasi et al, 2010) and of course productivity.

So this study investigates the intellectual capital and its dimensions -Human capital, structural capital, and relational capital – and the effects of those factors on Behnoosh Company's productivity.

Therefore the main question of this research is whether there is a meaningful correlation between intellectual capital factors (Human capital, organizational capital, and relational capital) and productivity.

## 2. Literature review

### 2.1. Intellectual Capital: Definitions and concepts

The development pattern of global economy has been changed, in regard to advent of information technology revolution, Information communities and networks formation and also growth and rapid development of 'higher' technology. Knowledge has become the alternative for financial and physical resources as the result of those changes. In knowledge-based organizations, the traditional accounting methods that are based on tangible resources of those organizations seem to be inadequate for intellectual capital evaluation. Today these recent resources are the most worthwhile intangible properties that organizations possess. Intellectual capital as a new discipline for researchers focuses on new measuring mechanisms for measurement of important, intangible variables in organizations such as human capital, structural capital, customer satisfaction, and innovation (Almasi et al, 2010).

Intellectual capital deals with articular, reasonable, knowledgeable and substantial fruits of the mind. It claims intangible (tacit) and tangible (explicit) dimensions that do not mutually exclude, but actually complement each other. The conversion of knowledge into a valuable asset has come to be known as an intellectual asset or intellectual capital. Also it has been defined as the new wealth of organizations (Stewart, 1997) and material that has been formalized, captured and leveraged to produce a higher valued asset (Klein and Prusak, 1994).

While many authors apply the terms "intellectual asset" and "intellectual capital" interchangeably, there are subtle differences between the meanings of these two words. In balance sheet terms, intellectual assets are those knowledge-based items which the organization owns which will produce a future stream of benefits for the organizations. They are the "debits" or individual items which comprise intellectual assets on the balance sheet, whereas intellectual capital is the total stock of balancing "capital" or knowledge-based equity ("credits") which the organizations possess. Ideally, the total value of intellectual assets should be equal to the total intellectual capital. The distinction between these two terms is subtle but not unimportant (Kok, 2007).

Nowadays intellectual capital is recognized as a key strategic asset for organizational performance and its management is critical for the organizations compatibility. The management of intellectual capital includes:

- Identifying key intellectual capital that drive the organization's strategic performance;
- Visualizing the value creation pathways and transformations of key intellectual capital;
- measuring performance and in particular the dynamic transformations;
- Cultivating the key intellectual capital applying knowledge management processes; and
- The internal and external performance reporting (Marr et al, 2003).

To define intellectual capital in a simple way, it involves of the difference between its market price and its clerical properties price of organizations (Seetharaman et al, 2002). Jelcic (2007) has been defined the intellectual capital in this way: Intangible mercantile properties and measurements of an organization that effectively influence operations and other success factors, while actually are not reflected on balance sheets.

Intellectual capital, also has been mentioned with other terms such as 'intangible properties', 'knowledge-based properties', 'knowledge capital', 'informative properties', 'human capital, and 'Hidden values' (Bontis, 2001; Razafindrambina & Kariodimedjo, 2011) and it includes all of the innovations, ideas, fundamental knowledge, the different ways of designing a product, computer programs and publications. By other means, intellectual capital consists of properties which are hidden, unseeable and intangible but they will result in profitability of an organization (Gharoie Ahangar, 2011).

Various models have been proposed for intellectual capital modeling, in which of them different dimensions have been considered (Vaskeliene, 2007). Based on every defined dimension, there employ different techniques and benchmarks (Uziene, 2010). In the most important model, the intellectual capital has been separated to three dimensions: human capital, organizational (structural) capital, and relational capital (Bontis, 1998).

#### 2.1.1. Human Capital

Human capital -or sometimes mentioned as human enterprise capital- is considered as the backbone for intellectual capital and is a very crucial factor for creating value in organizations (Royal & O'Donnell, 2008). Human capital consists of all the intellectual properties of organizations (Roos et al, 1997) such as knowledge, proficiencies, skills, competencies and employees' other abilities, which help the organizations to fix the organizational and customer-related problems (Skandia, 1997; Sullivan, 1998). This kind of capital encompasses all the existing employees' knowledge (Bontis et al, 2001), and can exhibit the

organization's ability to find the best solutions (to solve the problems and overcome the hardihood) through its members (Bontis, 1998).

### 2.1.2. Organizational Capital

This dimension of capital include non-intellectual capital (Roos et al, 1997) that consist of such factors as information databases, customers' information, trademarks and organizational structure. By that mean when workers leave to their home, they actually stay in the organization through all the information in the system (Skandia, 1994). This kind of capital belongs to the organization itself rather than individuals (Edvinson and Malone, 1997) and it does have capabilities to respond the market needs (Saint-Onge, 1996).

### 2.1.3. Relational capital

The most important factor in creating added value for the organization is the relational capital (Kamath, 2008) and it includes internal and external relation with organization's beneficiaries (Roos et al, 1997). The distribution channels, customers' satisfaction and loyalty are some factors that influence on additional value creation (Bannany, 2008). This kind of capital exists in relation to suppliers, retailers, wholesaler, and specially customers. The customers' loyalty is also part of this capital (Haanes & Lawendahl, 1997). The concept of relational capital was primarily known as customer's capital and then gradually was extended as relational capital (Almasi et al, 2010) which consist of the relations with other beneficiaries and also market information in regard to attract and preserve customers (Stewart, 1997). This capital contains of all the properties that organize and manage the organization relation with the environment and comprise the relations with customers, stakeholders, supplier, government, public institutions and the competitors. Although the most important dimension for relational capital is customer's relation, but one should not ignore considering other dimensions (Bozbura, 2004).

## 2.2. Productivity

Productivity is a simple concept (Kok, 2007; Brynjolfsson, 1998), generally defined as the relationship between output of goods and services and the inputs of resources, human and non-human used in the production process (Kendrick, 1977), has been available for over two centuries and utilized in many different circumstances on different levels of aggregation in the economic system. It is argued that productivity is one of the basic variables which are governing economic production activities, perhaps the most important one. However, at the same time as productivity is seen as one of the most vital factors affecting a manufacturing company's compatibility,

researchers argue that productivity is often relegated to second rank, and neglected or ignored by those who affect production processes (Kok, 2007).

In industrial engineering productivity is defined as the relation of output (for example finished goods) to input (for example consumed resources) in the manufacturing transformation processes. So productivity is connected closely to apply and availability of resources. It means if a company's resources are not properly applied or if there is a shortage of them, productivity is reduced (Heidari et al, 2011).

While productivity is easy to define, it is really difficult to measure, especially in the modern economy. In particular, there are two aspects of productivity which have increasingly defied precise measurement: output, and input. Properly measured, output should include not just the number of widgets coming out of a factory, or the lines of code produced by a programming team, but rather the value created for consumers (Brynjolfsson, 1998).

## 2.3. Intellectual capital in relation to productivity

Recent studies in strategic management emphasize on knowledge management as a foundation for gaining more productivity in organizations. Various factors effect on organizations' productivity such as organizations' potentials development, and different products and services compare to their competitors. Although many studies propose knowledge as source for productivity, still this source is not being applied and managed in organizations properly and just a few percentages of organizations' managers believe in the implication and management of knowledge in their organizations (Saeedi, 2010).

Some experts believe that a company can compete and win the competition if it possesses the better and more appropriate knowledge rather than its competitors. In this viewpoint, productivity is fundamentally based on the company and the knowledge. Knowledge can be considered as a proper source for increasing productivity, because when one company owns it, it can uses the knowledge to reduce its final costs in many domains (Almasi et al, 2010).

The knowledge-based management doctrine is established on considerable empirical background. The studies have been done on this filed propose the direct effect employees' knowledge on competitiveness benefits, sales growth, Market's contribution, profitability and increasing value of staffs. In the knowledge-based viewpoint, a stable competitive benefit can be obtained just through the knowledge. It implies that the amount of knowledge outside of an organization is a way more than the existing knowledge inside it and therefore, the organizations are able to go further for a stable

competitiveness through the more and more learning and knowledge.

As mentioned before, knowledge is an important factor to attract resources, and to apply the abilities in efficient way and also to coordinate these abilities in the way to achieve competitiveness. In addition to those, knowledge is one of the most important sources for innovation in organizations, processes and products. It also is considered as a crucial strategic resource for stabilize the competitiveness in the organization. In this context, it seems necessary for those organizations - which are focused on innovation and better responding due the

market requirements to utilize technology and opportunities- to create the technical, marketing, and content abilities through producing a new knowledge combined with the existing knowledge.

**2.4. Conceptual model of the research and hypotheses:**

Attention to research literature, the conceptual model below can be chose for the purpose of the current study. This model measures the effect of intellectual capital on Behnoosh company productivity. Within this model, intellectual capital is independent variable and productivity is the dependent variable

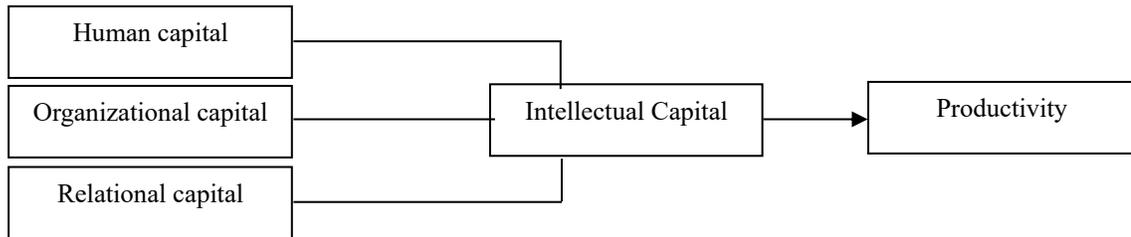


Chart 1: Conceptual framework of research

- H<sub>1</sub>:** There is positive and meaningful relationship between intellectual capital and productivity.
- H<sub>11</sub>:** There is positive and meaningful relationship between human capital and productivity.
- H<sub>12</sub>:** There is positive and meaningful relationship between organizational capital and productivity.
- H<sub>13</sub>:** There is positive and meaningful relationship between relational capital and productivity.

**3. Research methodology**

Society for this research is 597 employees who work in 'Behnoosh' Company, whereas this number seems

to be too much, so by utilizing the formula below the number statistical sample has been calculated:

$$n = \frac{NZ^2_{1-\frac{\alpha}{2}}pq}{(N-1)\epsilon^2 + Z^2_{1-\frac{\alpha}{2}}pq} \Rightarrow \frac{597 \times (1.96)^2 \times (0.5)^2}{596 \times (0.05)^2 + (1.96)^2 (0.5)^2} \cong 234$$

Current study can be considered as a descriptive survey if to view from data collection aspect and as an applied research if to investigate the goals of the study. To collect the data library method (to refer to books, articles, libraries, etc...) and fieldworks (questionnaire) was being used. The questionnaire was designed in two parts; 46 questions in intellectual capital, and 16 questions in productivity and then distributed within the samples (participants).

evaluate the validity of questionnaires. For this mean, the questionnaires were given to some professors and experts in management, and after their modifications were being applied and they confirmed it, the questionnaires were given to the participants.

To analyze the data SPSS 17 and Pearson, Regression, Average and Friedman tests were utilized.

To determine the questionnaires' reliability, the 'Cronbach Alfa technique' was applied. For this purpose, 30 people were chosen by random (from the participants) and the questionnaires were given to them. The 'Cronbach Alfa' values for all variables were calculated:

The management experts were being asked to

**Table 1: the results of reliability**

Variables	Cronbach Alfa
Intellectual capital	0.77
Human capital	0.72

Organizational capital	0.86
Relational capital	0.83
Productivity	0.78

These values support the reliability of questionnaires, because the calculated results for cronbach's alpha are more than 0.7 (Nunnally & Bernstein, 1994).

#### 4. Data Analysis and Discussion

As mentioned, the purpose of the paper is surveying the effect of intellectual capital on productivity. So for proving the relationship between intellectual capital with productivity Pearson test and for investigating how intense is the influence of intellectual capital on

productivity, multi-variable regression test were used.

Also Friedman and Average tests were applied to rank intellectual capital dimensions and to measure the intellectual capital and their dimensions levels in direct order.

##### 4.1. Pearsons correlation test

To investigate the relations of the variables the mentioned test was applied. The results are shown in table 2:

**Table 2: The correlation between intellectual capital and productivity**

Correlation	Pierson r	sig	Test result
Intellectual capital with productivity	0.59	0.000	H <sub>0</sub> hypothesis is rejected
Human capital with productivity	0.65	0.021	H <sub>0</sub> hypothesis is rejected
Organizational capital with productivity	0.51	0.000	H <sub>0</sub> hypothesis is rejected
Relational capital with productivity	0.58	0.033	H <sub>0</sub> hypothesis is rejected

As table 2 presents, there is a meaningful and positive correlation between intellectual capital and its dimensions with productivity.

To investigate how intense is the influence of intellectual capital on productivity, the regression test was applied. The results of applying Regression test are shown in table below:

##### 4.2. Regression test

**Table 3: multi-variables regression between intellectual capital and productivity**

Variables	Standardized Coefficients		Unstandardized Coefficients		T value	Sig
	Beta	Standard error	B			
Constant			3.733	0.626	10.218	0.000
Intellectual capital	0.571	0.081	0.585	4.374	0.029	
Constant			3.426	0.596	9.426	0.012
Human capital	0.619	0.076	0.624	5.618	0.000	
Organizational capital	0.537	0.216	0.524	4.539	0.019	
Relational capital	0.572	0.092	0.581	5.224	0.000	

Table 3 suggests the positive and meaningful linear correlation between intellectual capital and its dimensions with productivity. The linear correlation is shown below:

Productivity = 0.596 + 0.624 Human capital + 0.524 Organizational capital + 0.581 Relational capital.

#### 4.3. Friedman test

To categorize the intellectual capital dimensions the Friedman test was used and the results are shown in table 4:

**Table 4: Results from Friedman test application for categorizing the intellectual capital dimensions**

Dimensions	Mean Rank	Rank
Human capital	3.33	1
Organizational capital	2.87	3
Relational capital	3.04	2

$$P < 0.05, \text{Sig} = 0.000, N = 234, df = 4, \chi^2 = 116.429$$

In table 4, the calculated error is less than P-value. Among intellectual capital dimensions, the relational capital are placed in the first and organizational capital is placed as last.

#### 4.4. Average Test

This test has been applied to measure the intellectual capital levels and their dimensions in statistical society.

**Table 5: Results from Average test application**

Dimensions	Z <sub>0.05</sub>	Z value	Test result
Intellectual capital	1.645	2.226	High level ranking in application
Human capital	1.645	2.448	High level ranking in application
Organizational capital	1.645	1.739	High level ranking in application
Relational capital	1.645	1.912	High level ranking in application
Productivity	1.645	2.426	Favorable level ranking of Behnoosh Company

As it can be viewed, the entire variables are higher than Z-value. Therefore table 5 suggests that the 'Behnoosh' company is in favorite a level from productivity, intellectual capital and its dimensions.

#### 5. Conclusion and further suggestions

Current study is done in a community which includes of 234 employees in 'Behnoosh' co. In this sampled society 64.91 percent was men and 35.09 women. 23.23 percent were carried a diploma, 63.59 percent a bachelor degree and 37.74 percent master and doctorate. Meanwhile 62 percent of participants had work experience between 16 to 25 years and 8 percent more than 30 years of experience.

The results from correlation test propose a meaningful and positive relation between intellectual capital with gaining more productivity in 'Behnoosh' co. While the regression test shows how intense is the effect of every variables, in which the human capital was more effective than other variables in productivity.

In continue, with the Friedman test application, intellectual capital dimensions were ranked. In this ranking human capital and relational capital were having more strength than organizational capital.

Finally the average test was applied to the data, to investigate the level of every variable. The results show that the entire variable was on a desirable level. Considering the results, some managerial suggestions can be proposed:

The human capital had the biggest effect on productivity. Therefore it can be claimed that the next step to achieve more productivity are: giving education and consultation, and organizational opportunities to help human capital to improve. Utilizing the employees' ideas, performance management and enhancing employees' skills, capabilities, creativities and attitudes to improve human capital are other strategies to increase organizational productivity.

And give an appropriate customer-oriented education to those staff who are in close contact with the customers, and to continuing persistency and to respond on time to the customers' expectations and complaints are some suggestion to improve organizational capital.

##### 5.1. Other managerial recommendations

- As brand is one of relational capital components, managers are recommended to prevent to offer high prices relying on the strength and power of the corporate brand but instead strategically by delivering the lowest possible prices add value to their brand.

- Increasing efficiency in raw materials machineries and equipments, trying to make supportive culture to

creativity and innovation improvement, human resource development and learning, human resource productivity measurement are other suggestions to improve organizational capital.

- Creating an integrated software system to facilitate implementing knowledge management cycle and affective leadership.

- Focus more and more on trades with customers, suppliers, stockholders, etc to increase relational capital that leads to achieve more productivity.

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