



Investigating the relationship between intellectual capital and organizational performance in the University of Applied science and Technology

Shams al Molok GITYNEJAD¹, Hamid MALEKI^{2*}, Shahram HASHEMNIA²

¹Department of Management, Saveh Branch, Islamic Azad University, Saveh, Iran.

²Department of Management, Payame Noor University, PO BOX 19395-3697, Tehran, Iran.

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Abstract. Achievement of an organization depends on its ability to manage intellectual capital in order to increase organizational value. This study can help authorities of educational systems and educational planners to provide the basis of increasing growth and development of the holly system of Islamic Republic of Iran. University of Applied science and Technology is one of the academic units where plays an important role to grow up human resources as one of the main elements of intellectual and organizational capital. Thus, considering the importance of these two components and since there has not been any research in this respect, performing this kind of research seemed to be necessary. The purpose of this study was to investigate the relationship between intellectual capital and organizational performance in the University of Applied science and Technology. The method used in this study was a correlation type research. Population of the research consisted of all human resources employed in University of Applied science and Technology staff, including official staff of managers (71 individuals) and non- managers (307 individuals). Based on Cochran formula, 196 individuals were selected. In order to collect data, organizational performance questionnaire that was designed by Hersey and Goldsmith (2001) with reliability coefficient 86% and also intellectual capital questionnaire by Bontis (1998) with reliability coefficient 0.84 were applied. Summarizing and categorizing data, descriptive statistics and analyzing data, Pearson correlation coefficient, using SPSS 17 with significant level $\alpha \leq 0/01$ were applied. Results of the research showed that there was a positive correlation between communication capital and organizational performance ($r= 0.504$, $p < 0.05$), human resources and organizational performance ($r= 0.492$, $p < 0.05$), structural capital and organizational performance ($r= 0.521$, $p < 0.05$) and intellectual capital and organizational performance ($r= 0.530$, $p < 0.05$) of University of Applied science and Technology.

Keywords: intellectual capital and organizational performance

Introduction

Intellectual capital includes intellectual materials (knowledge, information, experimental and intellectual possession) that results in creating wealth (Stewart, 2006 cited in Rothberg, 2009, 26). By definition of Europe Union, intellectual capital is made up of intangible resources and activities that divert an organization to a collection of human, financial and physical resources, a system that creates a value for shareholders (Chin Chen et al. 2012, 87). Findings of a research has showed that organizations which manage efficiently intellectual capital, they are more successful and improve their status. Bontis (1996) stated that in a research that there was a positive correlation between intellectual capital (human, structural and relational capital) and organizational performance. Human resources, regardless of the type of industry, effect on organizational performance. There is a positive relationship between structural capital and organizational performance (Bontis, 1996). Findings of Liu (2001) showed that 80% of companies' market value is influenced by intangible assets. Kujansivu and Lönnqvist (2003) studied intellectual capital for 11 companies of the largest industries in Finland. Results showed that public utility companies enjoy more their intellectual capital. Considering the broad studies that researcher conducted in this regard, there have not been yet any studies in this field in University of Applied science and Technology of Iran, one of the major centers where connects industry to knowledge or science to practice, despite the importance of

* Corresponding author. E-mail: Mehdi4rasht@yahoo.com

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intellectual capital as one the main sources of capital in enhancing the performance of universities. All studies were about the relationship between intellectual capital and organizational performance rather than studying universities as a provider of our country's future workforce. Thus, this research has brought forth the main question about whether there is relationship between intellectual capital and organizational performance of University of Applied science and Technology.

Importance of the study

Today is known as the age of wisdom and economy across the world is called Knowledge Based Economy. Nowadays, we are in the fifth development program. With entering into Knowledge- Based Economy, intellectual capitals are more preferred over the physical capitals, in other words, one of the necessities of scientific, technological and economy development of countries is intellectual capitals.

In the meantime, universities are characterized by good resources of intellectual capitals which play an efficient role in providing systems of supply and demand of information and directing intellectual and information ideologies of society. Universities and higher education institutions are considered as the main resources of information and knowledge required for progress and development of a society, center activities related to production, distribution, transition and spreading knowledge and also producing wealth in knowledge-based environment. Therefore, it is required that universities identify and manage systematically their intellectual capitals otherwise vital activities of development would not be achieved (Beikzade, 2010, 34).

Purposes of Research

General purpose:

Identifying relationship between intellectual capital and organizational performance in the University of Applied science and Technology

Subsidiary purposes:

1. Identifying relationship between relational capitals and organizational performance in the University of Applied science and Technology.
2. Identifying relationship between human capitals and organizational performance in the University of Applied science and Technology.
3. Identifying relationship between structural capitals and organizational performance in the University of Applied science and Technology.

Research hypotheses

Main hypotheses:

There is a significant relationship between intellectual capital and organizational performance in the University of Applied science and Technology.

Subsidiary hypotheses:

1. There is a relationship between relational capitals and organizational performance in the University of Applied science and Technology.

2. There is a relationship between human capitals and organizational performance in the University of Applied science and Technology.
3. There is a relationship between structural capitals and organizational performance in the University of Applied science and Technology.

Definition of intellectual capital

One of the applicable definitions of intellectual capital was offered by Organization for Economic Cooperation and Development (OECD) in 1993. And it is the economic value of intangible assets of each company:

1. Organizational capital (structural)
2. The capitals of human resources inside the organization (personnel of organization) and human resources outside the organization (customers and suppliers).

Often, the term "intellectual capital" is considered synonym with "intangible assets". While, based on the Organization of Economic Cooperation and Development, intellectual capital is not considered as a synonym but a subset of public database intangible assets of a business, namely, there are intangible items that are not logically taken into account part of intellectual capital of an organization. For instance, reputation of an organization, as a subsidiary product, that may be resulted from logical application of intellectual capital of an organization but not considered a part of it. Value of differentiation has been blurred between intangible assets and intellectual capital. Intangible assets under the goodwill and intellectual capital have been considered as part of goodwill. Very recently, a number of contemporary categories have clearly modified this differentiation by dividing the intellectual capital to external capital (customers), internal capital (structural) and human capital (Stewart, 2006, 74).

The researchers who have revised literature of intellectual capital were Stewart (1997), Sayvan and Hariyon (2000).

Following definitions were proposed by prominent researchers:

Intellectual capital is a complicated term. However, when it is utilized, it provides a base of new resources by which an organization competes. Alternatively, Bontis (1998) believes that intellectual capital is a challenge to use efficiently knowledge (final production) against the information (raw material) (Bontis, 1998, 116).

Intellectual capital is a term to describe intangible assets of intellectual capital market, human capital and structural capital that make organization empower to activate. Intellectual capital includes all processes and capitals which have not usually been indicated to and also, contains all intangible assets (brands, registration right and exploitation and commercial brands and products) that are considered in modern accounting practices. Intellectual capital is total knowledge of organization members.

Broking classification (1997)

Broking (1997) in his classification referred to human-centered, sub-structural, market assets and intellectual property. Human-centered assets are skills, capabilities, expertise, and the ability of problem solving and leadership styles.

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Sub-structural assets are all technologies, processes and methodologies that enable an organization to activate. Intellectual property means franchise and trademarks with commercial brands and technical knowledge. Market assets refer to customers, customer loyalty and distribution channels (Bontis, 2000, 45).

Human capital denotes storage (saving) of knowledge in corporative collective capacity to extract and exploit the optimal solutions from each of personnel's minds and properties. Chen et al. (2004) believes that human capital is the most important part of the intellectual capital and two other capitals are function of human capital. In fact, there will be never development without human capital (Ashna et al 2009, 37).

Human capital is very important, because it is considered as origin of innovation and strategic reconstruction (renewal) in certain organization. And organization, using knowledge-based economy attempts to produce knowledge and identify value. Some have defined human capital, resulting from human intellect and talent in organization. The range of human capital is limited to the knowledge in the mind of staff that is measurable with regard to size, time and place. Human capital includes factors, staff knowledge, skill, abilities and their attitudes. Furthermore, human capital indicates of implicit knowledge of individuals. Meantime, staff's competency and ability are referred to hardware and their attitude is belonged to software of human capital. Thus, different components of human capital are attitude, competency, experiences, skills, innovations, talents and implicit knowledge existing in individuals' mind of organization. Human capital with higher level is associated with more efficiency and revenue or higher salaries and benefits (Ashna et al 2009, 39).

Intellectual capital management model

In order to determine intangible and vital resources of a company, it is required management to achieve the strategic goals or promote the primary benefits. Then, it is necessary to identify specified persons enjoy useful information about real value of organization. The management area of intellectual capital consists of 3 important stages: identification, measurement and management of resources that are described as follow:

- Identification

In this stage, companies concentrate on variable, making current value of company. Ultimately, there, a network creates resources and intangible activities related to strategic purposes of company. There are always a collection of vital intangible resources in organizations that helps to maintain and promote competitive advantages and achieve strategic purposes.

- Measurement

After identifying, there should be criteria for measurement of available resources. There are various methods to divide both criteria and intangible resources at the analysis level

1. Intangible resources level
2. Intangible activities level

Table1 has presented network of intangible resources and activities and main features of developed measurement system (Khavandkar et al. 2009, 31)

Table 1. Main features of developed measurement system.

Level of analysis	Classification of intellectual capital	Classification of criteria (indicators)
intangible resources intangible activities	Human capital Structural capital Relational capital Strategic unit capital	General criteria and indicators Specific criteria and indicators of industry Specific criteria and indicators of company

Organizational performance

Evaluation of performance is a controversial issue which is influenced by disciplines and theorists and there are recent reports and articles written about it. Moreover, market applications software has developed in this field. However, existing numerous model and frameworks, conceptual models have mostly been influenced in this field. It requires representing definitions for investigating performance evaluation model.

Evaluation of performance means quantifying process of efficiency and operations effectiveness (Chen, 2000) that could be divided into 3 groups through the review on literature of subject:

1. Strategic purposes: including strategic management and revise their strategies.
2. Relational purposes: including control of current status, offering future direction, feedback and modeling from other organizations.
3. Motivation purposes: including codification the bonus system as well as encourage the improvement and learning. Performance evaluation (the factor studied and evaluation method) has been controversial issue for many years (Seyyed Naghavi et al 2012, 47).

Studying different approaches of performance evaluation

Approaches of performance evaluation could be classified as follow according to type of information used for accounting criteria:

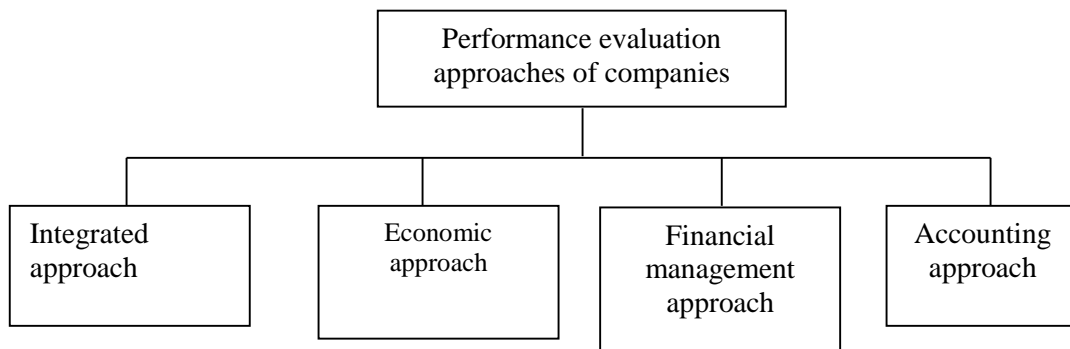


Diagram 1. Performance evaluation approaches.

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Research literature

Internal studies

1. Roshani Asl et al (2013) studied the role of intellectual capital in organizational performance of Mellat bank staff of Ardebil city. In this descriptive type study, they used from Bontis (2004) questionnaire and performance of Yavatas and Karatepeh bank (2003). Results showed that there was a significant relationship between intellectual capital and performance of Mellat bank staff of Ardebil city.
2. Dehgan Harati et al (2013) studied the relationship between intellectual capital of board of management and financial and value performance of listed companies in Tehran stock exchange. They found out that the number of specialists of board of management effects on value and financial performance of knowledge-based companies.
3. Ganbarzade et al (2013) in a research titled as explanation of corporate entrepreneurship based on the intellectual capital components as an effective strategy to increase national production showed that intellectual capital is a prominent factor, increasing corporate entrepreneurship.
4. Hasanpoor and Yazdani (2012) studied in a research titled as investigating the relationship between value-added intellectual capital and financial and economic performance and stock market listed companies in Tehran stock exchange and found out that there was a positive and significant relationship between value-added intellectual capital and financial and economic performance and stock market of companies.
5. Poorzamani et al (2012) investigated the effect of intellectual capital on market value and the financial performance of 90 companies and found out that there was not significant relationship between coefficient efficiency of intellectual capital and market value; however coefficient efficiency of intellectual capital had positive and significant impact on financial performance of company.

External research

1. Chin Chen et al (2012) studied the relationship between intellectual capital and performance of stock companies of Taiwan. They applied value added of intellectual capital (Pulic model) to measure intellectual capital and by implementing Regression model showed that high intellectual capital promotes financial performance of companies.
2. Chang & Hsieh (2011) studied the relationship between intellectual capital and 3 performances operational, financial and market in electronic industry stock of Taiwan. In order to measure intellectual capital, modified intellectual value added coefficient model was used. Results showed that there was a positive relationship between operational performance and intellectual capital. However, there was not relationship between operational performance and structural capital and human capital. As well, there was a negative relationship between intellectual capital and financial and market performance. There was a positive relationship between research expenses and development and 3 performances, while there was a positive relationship between intellectual assets and operational performance.
3. Maditinos et al (2011) examined the relationship between intellectual capital components and financial and market performance of Greece stock exchange. Intellectual value added coefficient was used to account intellectual capital. Results denoted to this fact that there was not a significant relationship between intellectual capital and financial and market performance and only the relationship between human capital and return on shareholders' equity was approved.
4. Piotan et al (2009) studied relationship between intellectual capital and performance of financial institutions in stock exchange of Singapore on the basis of 3 financial indicators (earnings per share, return on shareholders' equity and annual return). Findings showed that there is a positive

relationship between intellectual capital and financial performance indicators as well as a significant difference between intellectual capital coefficients in different industries.

5. Rudez and Mihalic (2007) in a research titled as investigating effect of intellectual capital components in financial performance of hospitality industry found out that there was a significant relationship between intellectual capital components and financial performance of this industry which indicates of high effect of relational capital on performance in comparison with other components of intellectual capital.

Methodology

Based on the purpose, the research was a cross sectional research in terms of time, investigating relationship between variables and a descriptive or non-experimental one due to the way of collecting data. Research population selected from all the employed human forces of University of Applied science and Technology, including official staff of managers (71 individuals) and non- managers (307 individuals).

Sampling

In this research, we enjoyed simple random sampling. Since in present research population was determined and data scales were quantitative type, to estimate size of sample we used 30 variance introductory questionnaires due to lack of access to the specific variance and for the large population size Cochran formula at 95% level confidence was applied to identify size of sample.

In this research “n” stands for number of sample.

“t” refers to 95% level of confidence that was 1.92.

“p” refers to proportion of an attribute that was 0.5 in this research.

“q” refers to lack of attribute that was 0.5 in this research.

Population variance was 0.25.

“d” is the acceptable margin of error for proportion being estimated that was 0.05 in the research.

$$n = \frac{Z^2 \alpha / 2 \quad P(1-P)}{d^2} = \frac{(1/96)^2 \times 0/50 \times 0/50}{(0/05)^2} \cong 196 \quad \alpha = \%50$$

According to above equation, the numbers of sample were considered 196 individuals that were selected from among the population.

Research variables

In this research, intellectual capital was a criterion variable. Dependent variable is a response variable or output and involves aspects of an organism behavior which is stimulated. Dependent variable is measurable and available on which effect of independent variable was estimated (Delavar, 2001). Thus, organizational performance was dependent or predictable variable in the research.

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Research questionnaire

Standard evaluation questionnaire of intellectual capital that was provided by Bontis (1998) included 42 questions. This questionnaire involved 3 components, human capital, structural capital and relational capital (customer). Human capital contained of 8 questions, structural capital 7 questions and relational capital 14 questions. Standard Achieve organizational performance questionnaire that was designed by Hersey and Goldsmith (2001) included 42 questions and 7 capability components (4 questions), clarity (7 questions), help (5 questions), encourager (6 questions), evaluation (9 questions), validity (6 questions) and environment (5 questions). This questionnaire was translated by Rahimian in 2010. And the reliability of questionnaire was estimated 0.90 and it was on the basis of Likert scale (very low: 1; Low: 2; Moderate: 3; High: 4; very high: 5).

Validity and reliability of questionnaire

The research done by Asadi et al (2009) reliability of organizational performance questionnaire was 0.86. And reliability of intellectual capital questionnaire done by Anvari (2005) on the basis of Cronbach's alpha was 0.84 that indicated of acceptable validity (Anvari, 2005).

Data analysis

Correlation test

Correlation test examines the correlation between 2 or more variables and estimates their coefficient. The correlation between variables may be positive or negative. If changes of a variable is associated with changes of another variable or on the other hand increasing of one variable leads to enhancing another or vice versa reducing of one results in reducing another variable, correlation between them will be positive, while increasing of a variable is associated with reducing of another, the correlation between them will be negative and finally, when there is no any correlation between two variables, correlation coefficient will be zero. Range of positive correlation varies from zero to +1, while negative correlation varies from -1 to zero. Based on measurement scale, there are various methods appropriated to account correlation (Delavar, 2001).

Since, data in the research were quantitative type along with interval scale, Pearson correlation coefficient was applied. Analyzing data, SPSS17 at significant level $\alpha \leq 0/01$ and EXCEL for drawing diagrams were used.

Inferential statistics:

After descriptive indicators, on the basis of research variables the hypotheses were studied in this research separately. Pearson correlation test was used to extract results of test.

Research hypotheses

Hypothesis1

H₀: there is not a significant relationship between relational capital and organizational performance of University of Applied science and Technology.

Examining the relationship between relational capital and organizational performance, Pearson correlation coefficient was used. Null hypothesis (H₀) was rejected due to value of p that was lower than significance

level ($\alpha < 0/05$), that is, there is a significant relationship between relational capital and organizational performance of University of Applied science and Technology.

Table 6. Results of hypothesis1.

		Organizational performance
Relational capital	Correlation coefficient	0.504
	Sig. level	0.000
	number	196

Hypothesis2

H0: there isn't significant relationship between human capital and organizational performance of University of Applied science and Technology.

Examining the relationship between human capital and organizational performance, Pearson correlation coefficient was used. Null hypothesis (H_0) was rejected due to value of p that was lower than significance level ($\alpha < 0/05$), that is, there is a significant relationship between human capital and organizational performance of University of Applied science and Technology.

		Organizational performance
Human capital	Correlation coefficient	0.492
	Sig. level	0.000
	number	196

Hypothesis3

H0: there isn't significant relationship between structural capital and organizational performance of University of Applied science and Technology.

Examining the relationship between structural capital and organizational performance, Pearson correlation coefficient was used. Null hypothesis (H_0) was rejected due to value of p that was lower than significance level ($\alpha < 0/05$), that is, there is a significant relationship between structural capital and organizational performance of University of Applied science and Technology.

Table 8. Results of hypothesis3.

		organizational performance
structural capital	Correlation coefficient	0.521
	Sig. level	0.000
	number	196

Hypothesis4 (main hypothesis)

H0: there isn't significant relationship between intellectual capital and organizational performance of University of Applied science and Technology.

Examining the relationship between intellectual capital and organizational performance, Pearson correlation coefficient was used. Null hypothesis (H_0) was rejected due to value of p that was lower than

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significance level ($\alpha < 0/05$), that is, there is a significant relationship between intellectual capital and organizational performance of University of Applied science and Technology.

Table 9. Results of hypothesis4.

		organizational performance
Intellectual capital	Correlation coefficient	0.530
	Sig. level	0.000
	number	196

Table 10 has showed the results of main hypothesis.

Table 10. Analysis of panel data with random effects.

variables	Estimated value	T value	Coefficient of determination	F value	Durbin-Watson value	Hausman test possible value
Constant value	13.195	57.535	0.079	0.000	1.730	1.000
CEE	0.016	1.671				
HCE	0.01	3.542				
SCE	-0.028	-4.187				

Result and discussion

1. Statistical analysis of data showed that there was a significant positive correlation between relational capital and organizational performance of University of Applied science and Technology, however it wasn't strong ($r = 0.504$, $p < 0.05$). Findings of the research were approved by results of researches done by Chin Chen et al (2012), Chen et al (2010), Rudez and Mihalic (2007), Bramhendkar et al (2007), Hoseinpoor and Azar (2011) and Mojtahedzade et al (2010), while it wasn't in line with research of Maditinos et al (2011).
2. Second hypothesis showed that there was a significant positive correlation between human capital and organizational performance of University of Applied science and Technology ($r = 0.492$, $p < 0.05$), which was approved by researches done by Chin Chen et al (2012), Rudez and Mihalic (2007), Maditinos et al (2011), Hoseinpoor and Azar (2011), Ghalichli et al (2010) and Mojtahedzade et al (2010), while it wasn't in line with research of Chang & Hsieh (2011).
3. Results of the data analysis showed that there was a significant positive correlation between structural capital and organizational performance of University of Applied science and Technology ($r = 0.521$, $p < 0.05$), however it was not enough strong. Findings of the research was confirmed with researches done by Rudez and Mihalic (2007), Bramhendkar et al (2007), Ghalichli et al (2010) and Mojtahedzade et al (2010), and it was not in line with research of Chang & Hsieh (2011).
4. Studying the main hypothesis denoted to this fact that there was a significant positive correlation between intellectual capital and organizational performance of University of Applied science and Technology ($r = 0.530$, $p < 0.05$). Results of researches done by Chin Chen et al (2012), Chang & Hsieh (2011), Piotan et al (2009), Roshani Asl et al (2013), Dehgan Harati et al (2013), Hoseinpoor and Yazdani (2012) approved the results of respective research while it was not in line with research of Maditinos et al (2011).

Practical suggestions

1. With regard to first hypothesis that indicated of positive significant relationship between relational capital and organizational performance, it is possible to attract managers' attention to internal resources of organization and its capabilities in relation with customers and level of knowledge and organizational structure to achieve more productivity.
2. Based on the second hypothesis that referred to positive relationship between human capital and organizational performance, it should be suggested to managers to pay more attention to their personnel and human forces to promote organizational performance.
3. According to third subsidiary hypothesis that indicated of relationship between structural capital and organizational performance, it is suggested to managers to take more attention to knowledge of human forces.

Suggestions

1. It is suggested to measure intellectual capital through the financial and non-financial combined models.
2. It is suggested to examine the relationship between intellectual capital and organizational performance from University of Applied science and Technology students' perspective.
3. It is suggested to conduct a similar research upon the managers and staff of other universities.
4. It is suggested to conduct a similar research to compare intellectual capital and organizational performance of University of Applied science and Technology with other universities'.

Limitations

1. Psychological conditions of respondent during the test could influence the research.
2. During the test procedure, some of the personal considerations of respondents could influence questions.
3. The status wherein some respondents were familiar with questions was not under the control of researcher.

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