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The Effect of Efficiency Coefficient of the Intellectual Capital on Increase of Market Value of Firms

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ABSTRACT

Considering the emergence of knowledge-based economy and changes in nature of the firms' activities at international trade level, the intellectual capital is considered as one of the fundamental pillars of any firm to generate the returns. On the other hand, the increased gap between market value and the book value of the firms has caused many researches to be done for recognizing the factors omitted from financial statements of the firms. Among the factors influencing on the value of firms but not included in the financial statements are brand value, intellectual capital and etc. This study examines the relationship between the intellectual capital and market value of the firms. In order to measure the intellectual capital, the value-added coefficient of intellectual capital method proposed by Palk (2000) was used. In order achieve the research objectives, the data relevant to the audited financial statements of the companies listed in Tehran Stock Exchange during the years 2003 to 2009 was gathered. Statistical method used in the study is Spearman correlation coefficient non-parametric test, Pearson correlation coefficient parametric tests and univariate and multivariate regression analysis. The results obtained through testing the research hypotheses show that there is a positive and meaningful relationship between the efficiency coefficient of physical capital, human capital and structural capital in relevant to the ratio of market to the book value showing that there is a positive and meaningful relationship between the efficiency coefficient of intellectual capital and the ratio of market to book value.
Key words: intellectual capital, physical capital, structural capital, human capital, ratio of market value to book value.

1. INTRODUCTION

The contemporary world has left the industrial economy behind itself and entered into the knowledge-based economy. The knowledge-based economy is an economy in which production and use of the knowledge plays a significant role major role in creating wealth (Chen, 2005). Massive investment in human capital and information and communication technology is one of the distinguishing features of the knowledge-based economy. It potentially provides unlimited resources because there is no limited human capacity for the knowledge. Intangible assets and intellectual capital are quickly complemented with the physical assets (Bontis, 1998). Since in the third millennium in which the intellectual capital and not financial capital is considered as the main infrastructure for future dynamism and success of any company in knowledge-based economy, managers are required to decide for key resources and value motives in organizations, because any increased recognition and applying the intellectual capital will help the firms to be more the efficient, effective, innovative and with higher rates of productivity. The main objective of this research is to study the effect of intellectual capital on the value of companies listed in Tehran Stock Exchange. As the intellectual capital is paid attention by several groups such as shareholders, managers, researchers and politicians, since the importance of the present study is for highlighting the role of intellectual capital in making advantages for the firms as much as possible. Also, the research findings are useful to manage the intellectual capital better.

2. Theoretical Principals and Research Background

Numerous researches have been done on intellectual capital in recent years, and they have been led to different frameworks for its definition, classification and measurement. All researchers agree that the intellectual capital reflects the intangible value of any organization and all definitions are based on the principle that the intellectual capital is total intangible assets of organizations including human capital, structural capital, communication capital, organizational capital, domestic capital and foreign capital (Jafari et al., 2006).

A summary of the definitions and components forming the intellectual capital provided by researchers is described as follows:

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The name of researcher	*The components forming the intellectual capital*	*The definition provided for intellectual capital*
Bentise (1996) and (1999)	Human Capital Structural Capital Communication Capital	Intellectual capital is considered as a new source for the organization to compete and succeed in the market. In another definition, he argues that the intellectual capital is to try for effective use of the knowledge against information (Bontis, 1996).
Ross and Ross (1997)	Human Capital Structural Capital	Intellectual capital is the total intangible assets of the firm such as commercial symbols, patents and etc. including all assets that are not included in financial statements. Intellectual capital is considered as one of the major resources for making the competitive advantages in the firm (Ross, 1997).
Stewart (1997)	Human Capital Structural Capital Customer Capital	Intellectual capital includes knowledge, information, intellectual property and experience and it is considered as a superior mind or key knowledge (Stewart, 1997).
Edvinsson and Malone (1997)	Human Capital Structural Capital Customer Capital	Intellectual capital refers to the difference between market value and the book value of the firm (Edvinsson, 1997).
Sveiby (1997)	Competence of Employer Internal Structure External Structure	Intellectual capital is a knowledge employed in direction of making a value. According the definition, the intellectual capital is knowledge, skills and abilities converted into wealth and values which its result is making a value (Sveiby, 1997).
Andriessen and Stem (2004)	Human Resources Organizational Resource Communication Resources	Intellectual capital includes intangible assets controlled by a firm that has provided proportional advantage for the firm and their merge will result in future profits (Andriesson, 2009).

Suggested descriptive models for evaluating intellectual capital

	types	**Manner of evaluation**	**Suggested descriptive models for evaluating intellectual capital**
These models can give a more comprehensive picture of current situations and the efficiency of the organization, as compared to models with an approach inclined to financial problems; and have financial capability in any organizational level. Therefore, reports from these models will function much more accurate and fast than reports from special financial evaluations.	(1996) Brocking - Technology functionary model - balanced appreciation - Registered scores model (1996) Bontis Hanson Jo - Calculating and human resources cost (1996) Ferson Mack - Comprehensive valorization model (1996) (2002) Ahonen - Human resources notification model (2000) Salivan - Intellectual capital valorization model (2000) Anderson - Absolute value-making model (2002) Rodro - Invisible assets financial method model	These models calculate monetary value by recognizing its different .components.	Direct intellectual capital model
These models are mostly used in situations such as the integration of two firms by the division of profit and in stock market, and are used by managers to report the function of the utilized intellectual capital.	(1997) Stwart - Economic value-added model (2004) Pakil - Intellectual capital value-added model (1997) Stwart - Calculated invisible value model (1991) Lo - Knowledge capital income model	These models calculate average income before tax deduction in a given period and divide it by average value of physical assets of the same period.	Asset outcome model
These models are mostly used in situations such as the integration of two firms by the division of profit and in stock market, and are used by managers to report the function of the utilized intellectual capital.		These models are based upon calculation of the difference between market investment of the company and the investor's capital, and on taking the difference as financial asset of intellectual property.	Market valorization model
These models are like direct intellectual capital models and since they do not generally need evaluation of financial problems, they are appropriate for being used in nongovernmental and governmental organizations, and for social and environmental ends.	(1992) Kapelan and Norton Balanced score card model (1994) Fitzaner - Human resources intelligence model (1997) Edwinvon - Scandia directing model (1997) Ross - Intellectual capital indicator model (1985) Svibi - Invisible assets indicator model (2001) Skioma - Knowledge auditing cycle model - Measuring and calculating intellectual capital model (2001) Wagner	In these models different parts of invisible assets or intellectual capital are recognized and the indicators made in score cards are reported or are shown in charts.	Score card models

Most effective researches on intellectual capital	**date**
Start of a project on intellectual capital by EN Publication of the balanced calculation knowledge by economy ministry of Netherlands	1999
Publication of the first number of intellectual capital magazine Publication of the first intellectual capital calculation guidance by Denmark government Publication of studies on intellectual capital in Malaysia by Nick Botis	2000
Selection of Lif Edinson as the first full professor of intellectual capital in Lond University Publication of the first mass report of invisible assets by EN Publication of the book of invisible assets, management, evaluation and reporting by Baroch Lav Publication of an article on intellectual capital by John Morrison, Hine Larson and Nicholas Bach Punlication of the book "invisible wealth" by Margaret Playr and Stone Walman from Brocking Institute Publication of the book "the tableau of science value, technology and industry of 2001 towards basic knowledge economy" by economic cooperation and development organization	

Advice of United States Stocks and Priced Bills Committee and Calculation Standards Committee on making reports of intellectual capital	
Publication of the book "strategic management of intellectual capital and organizational knowledge" by Vee Joe and Nick Botis Publication of the book management of intellectual capital: organizational, strategic and guidance dimensions by David Tees Publication of the book superhighway of innovation: catching intellectual property for cooperation advantage by Debra Amidon Publication of the series of intellectual capital valorization and capitalization by United Nations Commission of Europe .Publication of knowledge management and network spaces by Alfred Birley, Sonja Falk and Daniel Deimer	2002
Publication of the book making income from intellectual capital as a propellant of stockholders' value by Oliver Pfill Publication of the book knowledge giver and knowledge taker agencies by Mats Alonson Publication of the book giving meaning to intellectual capital: planning a method for valorizing invisible assets by Daniel Anderson	2004
Holding a conference on societies' intellectual assets in knowledge-based economy by Global Bank Publication of the book a view of intellectual capital by Bernard Maar Publication of the book intellectual capital for societies: countries, regions and cities by Ahmad Bonfor and Leef Edinson Publication of a draft of some standards on valorization of invisible assets and valorization of intellectual capital by American Society of Exchange finders	2005
Publication of the book management of intellectual capital in action by Goran Ross, Stephan Pik and Liza Franstorm Start of a team work under the control of international valorization standards committee with the objective of developing a standard for valorization of invisible assets Start of cooperative activities between United States Commission of Financial Auditing Standards and International Commission of Auditing Standards to improve international compatibility of standards in the field of invisible assets	2006
Publication of the book beyond human resources by John Boderio and Peter Ramstad Publication of the book real choices and intellectual capital by Philip Baker Publication of the first manifest related to valorization services by Institute of General Jurant Auditors of America	2007
Publication of the book intellectual capital and business success by Lidsay Moor and Lezly Krige Publication of the book intellectual capital auditing by Indera Abiksera Publication of the book from assets to profit by Bruce Berman Publication of the book intellectual capital: making profit from idea in global innovation era by William Barty, Christopher Price and Thomas Hunt	2008

In common classification, the intellectual capital is divided into three components, namely: human capital, structural capital and customer capital.

1. Human Capital

In simple word, the human capital represents the degree of knowledge for each of the employees of any organization (Bontis, 2000). The human capital is the beginning of development, origin and source of innovation leading to a reachable insight (Stewart, 1997). The human capital is foundation for the intellectual capital and the basic element required for the realization of the intellectual capital (Chen, 2005).

2. Structural Capital

The Structural capital consists of all inhuman knowledge in the organization involving database, organizational charts, strategies, processes manuals and anything else whose value is more than its material worth for the firm (Bontis, 1997). Organizations with a strong structural capital have a supportive culture that allows people to experience new things, learn, fail and re-experience (Bontis, 1999).

3. Customer Capital

The main definition behind the customer capital is the knowledge applied in marketing channels of the organization and the relations with customer while business goes through as well (Bontis, 1997).

Research Background

Foreign Researches

Similar studies have been done about the subject of the present study that a summary of such studies are provided as follows:

- Peytan, Ploman and Hankok (2007) found out that the intellectual capital and firm performance was positively related to each other. In addition, the growth rate of the intellectual capital is also positively is association with the company performance (Pulic, 1998).
- Chen and et al. (2005) concluded that there was a positive relationship between the intellectual capital, current and future financial performance of the firm. Also, they suggested that the intellectual capital can create the economical value in the market (Chen & Cheng, 2005).
- Wang (2008) proved that there was a positive relationship between the intellectual capital and the market value of the firms in the electronics industry with index of 500 S&P in America (Wang, 2008).
- By performing a survey on 500 firms in America, Basi and Bourne (1999) perceived that the investment in the section of intellectual capital was positively in association with the financial performance of the firms (Bassi & Buren, 1999).

Domestic Researches

- Firstly, Anvari Rostami and Rostami presented (2003) some of the definitions on the intellectual capital and its components and then they briefly demonstrated some methods for measuring the intellectual capital.

Finally, they proposed a few simple quantitative models to measure the intellectual capital (Anvari Rostami, 2003).

- Nikoomaram and Yari (2008) showed that there was a meaningful relationship between the intellectual capital and the return on investment and value-added, and the intellectual capital has influenced on these indicators (Nikoomaram & Yari, 2008).

Objectives:

As economy is moving towards knowledge and knowing, so are economic growth parameters; they are moving from efficiency management towards knowledge management. Therefore:

1. To achieve effective management of organizations, there is a need for intellectual capital evaluation models, more than before.
2. Intellectual capital is changing to become an important basis in development of future function of organizations. Hence, planning evaluations and indicators related to evaluation of intellectual capital and its development have great significance.
3. From the financial reporting point of view, to legal and ordering requirements of organizations, and from assurance of intellectual capital management point of view, which is applied in organizations at its best, evaluation of intellectual capital in considered an important task to be carried out.

Research Hypotheses

The increased gap between market value and the book value of the firms has caused various researches to be done for recognizing the factors omitted from the financial statements of the firms. The increased market value to the book value of the firms confirms that the market value of the firms will not be influenced by the financial statements. The existing restrictions on the financial statements for explaining the value of the firm reflect the fact that as in the past, the source of economic value is not on the production of goods and services, but it is resulted from the value of the intellectual capital. As a result, the following hypotheses have been proposed with the regard of the importance of research subject and the previous researches.

The Main Hypothesis

Those firms with a higher efficiency coefficient of the intellectual capital have a higher ratio of the market value to book value.

Sub-hypotheses:

Sub-hypothesis 1: those firms with a higher efficiency coefficient of the physical capital have a higher ratio of the market value to book value.

Sub-hypothesis 2: those firms with a higher efficiency coefficient of the human capital have a higher ratio of the market value to book value.

Sub-hypothesis 3: those firms with a higher efficiency coefficient of the structural capital have a higher ratio of the market value to book value.

Research Period for the Statistical Population

Given to limited available data, the study period is from 2003 to 2009, and the statistical population includes all companies listed in Tehran Stock Exchange.

The followings are considered in selecting samples:

1. The end of fiscal year is the 29th day of Esfand.
2. Full information and notes with the financial statements of the firms and stock market prices at the end of the fiscal year are available on the board of Tehran Stock Exchange.
3. Studied firms should not have a transaction delay more than 3 months.
4. Studied firms should not be included in the financial intermediation firms.

RESEARCH METHODOLOGY

In terms of classifying the achievements based on the purpose, the present research is considered as an applied study whose results are directly applicable by real and potential investors, managers of organizations, university students and professors in the field of accounting and management. With respect to the data collection method, this study is an empirical one of survey type describing the relationship between the intellectual capital and the market value of the firms through use of correlation coefficient and regression tests. Also, the research methodology is of post-event type by the use of the previous information.

Operational Definition of Variables

1. Dependent Variable

According to the research subject, the dependent variable is the ratio of market value to the book value of equity (M/B) and it is obtained by the ordinary shares market value divided by its book value.

Ordinary shares market value= the total shares available for the shareholders× share price in stock exchange at the end of the fiscal year

Ordinary shares book value= the book value of the equity after deducting any funds owned by shareholders.

2. Independent Variable

Given that the independent variables have been selected on the basis of the research conducted by Pulic (2008), the present study is featured to have an acceptable content validity because according to the research background, the market value of the firm is resulted from the capital applied along with the intellectual capital which consists of the human capital and the structural capital.

In the study, the value-added intellectual coefficient model of Pulic (2008) is used to measure the intellectual capital based on the following reasons:

1. In this approach, measurement basis is unchangeable and standard such that it allows great samples in the different industries to be compared.
2. All data used in the method is derived from the audited financial statements. Thus, the computations are observable and investigable.
3. The method of the value-added intellectual coefficient is a simple and transparent technique. The computational simplicity allows non-institutional beneficiaries to use the method and other methods of the intellectual measurement are limited for the reason that they are only calculated by intra-organizational groups or by complex models, analysis and principles. Pulic model (2008) has 5 steps as follows:

1. Determining Value-Added (VA)

Palik describes calculation of value-added as following:

R=S-B-DP-W-I-DD-T
R (changes in retained earning)
S (net sales revenues)
B (bought – in materials services or cost of good sold)
DP (depreciation)
W (wages or employee salaries)
I (interest expenses)
DD (dividends)
T(taxes)

By arranging the above equation the following is derived:

$$\left.\begin{aligned} &S-B=DP+W+I+DD+T=R \\ &S-B-DP=W+I+DD+T+R \\ &D+R=WI \end{aligned}\right\} \Rightarrow VA=S-B-DP=W+I+T+NI$$

2. Determining Capital Employed Efficiency (CEE)

In this model, to give a whole picture of efficiency of value sources, efficiency of physical capital and financial capital should be taken into account. This efficiency is derived from the below equation:

$$CEE=\frac{VA}{CE}$$

Capital Employed Efficiency : CEE

Capital Employed which is equal to total value of net assets : CE

3. Determining Human Capital Efficiency (HU)

Based on this model, all salaries of the employees are considered as human capital.

$$HUE=\frac{VA}{HU}$$

Human Capital Efficiency : HUE

4. Determining Structural Capital Efficiency (SC):

SC=VA-HU
firm's structural capital :SC

$$SCE = \frac{SC}{VA}$$

Structural Capital Efficiency : SCE

Now we can calculate intellectual capital efficiency based on the following equation:
ICE=HUE+SCE
Intellectual Capital Efficiency :ICE

5. Determining the coefficient of Value-Added Intellectual Capital:

VAIC=ICE+CEE=HUE+SCE+CEE
this coefficient shows intellectual capability or the efficiency of value making of the firm. The more this :VAIC coefficient is, the more the management has used the potential capabilities of the firm.

It can be noted that Pulic model only takes into consideration the capital employed, the human capital and the structural capital and doesn't formally consider the customer capital (Williams, 2000, Bozzolan, 2003, Tan, 2007).

Research Hypotheses Test and Results

Every of the hypotheses are tested by using the real data gathered on the actual basis of the studied firms. The degree of relationship between two variables is expressed as a correlation coefficient, if the correlation is significant at a defined confidence level, the regression equation will be used to predict and describe the relationships between the variables; otherwise, the regression equation will not be a useful predictive and descriptive factor for the dependent variable. Also, in the method of correlation test, instead of the critical value the significance level of the test will be used to test the research hypotheses. The analysis method is that if the amount of significance level is less than 5 percent, then the hypothesis zero will be rejected. The significance means a statistical criterion with a maximum error of 0.05 and a confidence level of 95% (Azar & Momeni, 2006).

The Main Hypothesis:

The main hypothesis of the research is that those firms with a higher efficiency coefficient of the intellectual capital have a higher ratio of the market value to book value.

Table 2- The results of Pearson correlation coefficient of the main hypothesis

Variable	Name of Indicator	Intellectual Capital Efficiency
Ratio of the Market Value to The book value	Correlation Coefficient	0.314
	Significance Level	0.000
	Number	104

Table 3- The results of Spearman correlation coefficient of the main hypothesis

Variable	Name of Indicator	Intellectual Capital Efficiency
Ratio of the Market Value to the Book Value	Correlation Coefficient	0.314
	Significance Level	0.000
	Number	104

Pearson correlation coefficient between two variables is 0.314 such that the number with an error of 1% shows a significant correlation between two variables.

Table4- Regression analysis for the main hypothesis

Model		Non-standard Coefficient		Standard Coefficients	Statistic t	P
		Coefficient	Standard Error	Coefficient		
The main assumption	Constant	4.553	0.309		0.342	0.733
	Efficiency Coefficient	1.63	0.248	0.314	6.354	0.000

The regression analysis test has been used to study the effect of the independent variable of the intellectual capital on the dependent variable of the market value to the book value ratio of the firms. F statistic with a value

of 27/548 is larger than the critical value. In other words, its error level is smaller than 0.01 indicating a significant and linear relationship between the independent variables and the dependent variable. T statistic for the independent variable with a value of 6.354 is larger than 1.96 showing that the effect of small coefficient of the intellectual capital independent variable on the dependent variable of the market value to the book value of the firms with a value of 0.314 is positive and meaningful.

The First Sub-Hypothesis

Table 5. The results of Pearson correlation coefficient for the first sub-hypothesis

Variable	Index Name	Efficiency Coefficient of the Physical Capital
Ratio of the Market Value to the Book Value	The Value of Correlation Coefficient	0.254
	Significant Level	0.000
	Number	104

Table 6. The results of Spearman correlation coefficient for the first sub-hypothesis

Variable	Index Name	Efficiency Coefficient of the Physical Capital
Ratio of the Market the Value to Book Value	The Value of Correlation Coefficient	0.362
	Significant Level	0.000
	Number	104

Pearson correlation coefficient is 0.254 which the number with an error level of 1% shows a significant correlation between two variables of the efficiency coefficient of the physical capital and the ratio of the market value to the book value.

The Second Sub-Hypothesis

Table 7- The results of Pearson correlation coefficient for the second sub-hypothesis

Variable	Index Name	Efficiency Coefficient of the Physical Capital
Ratio of the Market Value to the Book Value	The Value of Correlation Coefficient	0.324
	Significant Level	0.000
	Number	104

Table 8- The results of Spearman correlation coefficient for the second sub-hypothesis

Variable	Index Name	Efficiency Coefficient of the Physical Capital
Ratio of the Market Value to the Book Value	The Value of Correlation Coefficient	0.316
	Significant Level	0.000
	Number	104

Pearson correlation coefficient is 0.324 which the number with an error level of 1% shows a significant correlation between two variables of the efficiency coefficient of the human capital and the ratio of the market value to the book value.

The Third Sub-Hypothesis:

Table 9- The results of Pearson correlation coefficient for the third sub-hypothesis

Variable	Index Name	Efficiency Coefficient of the Physical Capital
Ratio of the Market Value to the Book Value	The Value of Correlation Coefficient	0.270
	Significant Level	0.000
	Number	104

Table 10- The results of Spearman correlation coefficient for the third sub-hypothesis

Variable	Index Name	Efficiency Coefficient of the Physical Capital
Ratio of the Market Value to the Book Value	The Value of Correlation Coefficient	0.271
	Significant Level	0.000
	Number	104

Pearson correlation coefficient is 0.270 which the number with an error level of 1% shows a significant correlation between two variables of the efficiency coefficient of the structural capital and the ratio of the market value to the book value.

Given that there is a certain relationship between all three independent variables and the dependent variable, therefore, all three independent variables have been used as indicators influencing on the dependent variable in order to analyze the multiple regression. F statistic with a value of 11.78 is larger than the critical value indicating that at least one of the independent variables is significantly and linearly associated with the dependent variable. T statistic for all three independent variables is larger than 1.96 showing that the effect of small coefficient of the independent variables on the dependent variable is meaningful. The statistics for small positive coefficients show that the effect of the independent variables on the dependent variable is direct. The multiple correlation coefficient is 0.619, and the determination coefficient with a value of 0.361 indicates that a variable unit in the independent variables of the physical capital, the human capital and the structural capital

efficiency coefficients has an effect on the degree of changes in the market value to the book value ratio of the firms equal to 0.361.

Table 11. Regression analysis for three sub-hypotheses

Research Variables		Non-Standard Coefficients		Standard Coefficients	Statistic t	P
		Coefficient	Standard Error	Coefficient		
The main assumption	Fixed	1.671	0.294		8.47	0.000
	Physical and Financial Capital	3.089	0.957	0.297	0.657	0.002
	Human Capital	0.257	0.098	0.214	2.58	0.034
	Structural Capital	0.397	0.83	0.201	2.351	0.0068

Conclusion

In the contemporary's economy, some factors such as income, profitability and assets reflect only a small part of the organization's success. Real wealth of the organizations is to employ and use the expert manpower and their superior knowledge and skills in intra-organizational processes and their wealth and admirable reputation as well. The knowledge is the most important strategic source for trade in the organizations. Thus, the knowledge has been known as the most valuable assets in an organization, and therefore, the knowledge management has been increasingly paid attention with the intention of creation and maintenance of the competitive advantages in business. The research hypotheses are tested by Spearman correlation coefficient nonparametric test, Pearson correlation coefficient parametric tests and univariate and multivariate regression analysis. The results show that the efficiency coefficient of the physical capital, the human capital and the structural capital is significantly and directly associated with the ratio of the market value to the book value indicating that there is a positive and meaningful relationship between the efficiency coefficient of the intellectual capital and the ratio of the market value to the book value implying that those firms with a higher efficiency coefficient of the intellectual capital have a higher ratio of the market value to the book value. Therefore, it can be declared that market understands the attempts in intellectual capital of the firms and takes these attempts into consideration when pricing the stock of the firms; so, in order to improve their function, firms should improve their intellectual capital. Considering other researches, we found much compatibility of the current results with those of earlier researches, in that, this research is compatible with those of Anvari Rostami, Seraji (1382), Bathaii (1385), Bontis et al (2000), Chen (2005), Hang (2007), and Joei Chen Van (2008). Achieving these results, with regards to today's knowledge-based economy sailing towards globalization, is not out of reach. Taking the results into account, we can understand the importance of intellectual capital in financial functioning and value of firm markets. Therefore, it is suggested to investors that for making investment decisions and in order to use the basic financial forms, they should consider intellectual capital and its evaluation in organizations and firms more precisely.

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