

Investigating the correlation between the intellectual capital and financial performance in companies listed on Tehran Stock Exchange

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Abstract: Emphasis on the intellectual capital indicates a fundamental difference between the companies' operation in old and new economy; the value was resulted from the physical assets in old economy, while it is created by applying the knowledge and intellectual capital in new economy. The aim of this study is to investigate the correlation between the intellectual capital and its dimensions in financial performance of companies listed on Tehran Stock Exchange. The research method is applied in terms of objective and Ex-Post Facto in terms of data collection. To achieve this aim, sampling was done from the companies listed on Tehran Stock Exchange during 2007-2012. The Value Added Intellectual Coefficient (VAIC) coefficient, developed by Pulic, is applied to measure the intellectual capital, and the Return on Assets (ROA), Return on Equity (ROE) and Tobin's Q ratio applied for operating the financial performance of companies. The hypothesis test results reveal that three dimensions of intellectual capital affect the return on assets and return on equity of companies listed on Tehran Stock Exchange. Furthermore, the communicational capital dimension has greater impact on the ROA and ROE than other dimensions of intellectual capital. However, for Tobin's Q ratio, the findings indicate that the human capital efficiency coefficient is not statistically significant in the model, while the structural capital efficiency has the greatest impact on the Tobin's Q ratio.

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Introduction

The competitive conditions dominating the industries and also the impact of components such as the scarcity, non-imitation and the lack of substitutability of resources have made a particular species of resources valuable among the set of organizational resources. Sirmon et al (2007) argue that developing the strategic resource portfolio is the initial step in creating the organizational capabilities and value for all beneficiaries in the organization. It is worth noting that different structure of strategic resource portfolio will lead to different levels of performance (Zott, 2003) Thus, identifying the most valuable resources and then combining them in the form of an optimal portfolio based on the strategic value should be the managers' one of the fundamental priorities. Ireland & Webb (2006) have considered the effective management of resources as the component which affects the ability and capacity of creating the firm value.

Nowadays, the management in profit units has seriously focused on intra-organizational resources rather than the industry and environment. The non-objective resources, which are called the knowledge,

intangible asset, strategic asset, etc, are the most important intra-organizational resources with the eligibility for creating and increasing the sustainable competitive advantages. Simultaneous with the information technology revolution and quick development of superior technology since the 1990s, the economic growth pattern has been fundamentally changed, and thus the knowledge, as the most important capital, has been replaced by the financial and physical capital in global economy. In other words, the industrial economy has been replaced by the knowledge-based economy. The main factors in the industrial economy are the generation of economic wealth, physical and tangible assets such as the land, labor, money and machinery, etc, and combination of these factors ultimately results in the wealth production. In this type of economy, the knowledge plays the negligible role as the most important factor of value and wealth production. In the knowledge-based economy, a more important position is considered for knowledge and intellectual capital as the primary factor in wealth production compared with other tangible and physical assets. In current competitive markets, wherein the organizational aim is

greater contribution in market through creating the competitive advantages, the success of an organization depends on utilizing and managing the knowledge and intellectual capital in all organizational aspects. (Esmailzadeh, 2010)

The intellectual capital consists of the whole knowledge-based capital or assets of company and the firm is its owner. Therefore, the intellectual capital can also include the knowledge (which is converted into the intellectual property or assets of company) and be the final result of its transition process. (Nikoumaram, 2010) Different methods have been utilized in several studies for measuring the intellectual capital. In this study, Pulic's comprehensive approach, "Value Added Intellectual Coefficient Model (VAIC)", is applied to quantify the intellectual capital. This model is applied due to its benefits and efficiency compared to other models. For instance:

- It provides a standardized and consistent basis of measurement. (Sullivan, 2000)
- It is based on both aspects, the efficiency evaluation and value creation, from the tangible and intangible assets of a company. (Hong Pew Tan, 2007)
- All data in calculating the VAIC is based on the standard accounting and financial information which are normally inserted in the financial reports of company. Thus, the calculations are based on the objective, reliable and approved. (Anne, 2003)
- This model has been utilized in numerous reliable foreign studies. (Nova, 2000)

Therefore, the Importance and objective of this research is to highlight the impact of intellectual capital on the financial performance of companies listed on Tehran Stock Exchange, so that the managers are motivated to enhance and use the intellectual capital optimally in these companies. According to the main question of research: Is there a significant correlation between the dimensions of intellectual capital and financial performance dimensions of companies listed on Tehran Stock Exchange?

Theoretical Bases and Research Background

The intellectual capital is the main determinant of value creation in firms and the companies are seeking to create the value through the intellectual capital within the organization. In fact, the managers' previous viewpoints on the value creation of company have been changed by the physical assets. With regard findings, indicating the difference between the market value of firms and what is recorded in the account books (book value), the researchers have been seeking to find the response to this inequality during past two decades. There is a consensus that one of the reasons for the difference between the market value and book value is the intangible assets not included in the balance sheet of company. The intellectual capital is

one of these intangible assets. The intellectual capital is one of the emerging issues in corporate accounting and is still in evolution, thus there is no detailed and comprehensive definition for it. In this regard, the main issue is that there is no particular way for indicating the intellectual capital structures in the form of figures and values in order to investigate the difference between the book and market values of firm and also it is difficult to evaluate the impact of intellectual capital on the firm value. Since the corporate revenues are from the tangible and intangible resources or a combination of both, we need a tool by which the intellectual capital structures are indicated in figures and it is investigated whether the intellectual capital has created the value added in the company and thus the difference between the book and market value in the company.

Intellectual Capital

During recent years, a relative consensus has been created on division of intellectual capital components. According to these studies and definitions, intellectual capital includes 1- relational capital (customer), 2- human capital, and 3- structural (organizational) capital.

Relational Capital (Customer)

The main subject of relational capital is the knowledge existing in the marketing channels and customer relationship which are the determining factor in converting the intellectual capital into the market value and so business performance of the organization.

Human Capital

Human capital of an organization includes skills, expertise, problem solving ability, and leadership styles. Human capital as a basis for intellectual capital results in improving the performance and creating profit for the company.

Structural (Organizational) Capital

It embraces databases, organizational charts, executive procedures of processes, strategies, and plans.

Intellectual Capital Models

In the intellectual capital literature, different models have been offered for measuring intellectual capital. Some of them are specific models that have been designed and implemented in a specific company. Some others are merely theoretical models, most of them have not been accepted as a valid intellectual capital model. In general, intellectual capital models can be classified into two groups: Models that evaluate intellectual capital non-monetarily are namely,

- 1) invisible balance sheet, 2) intangible assets control, 3) balanced scoring card (BSC), 4) intellectual capital index, 5) technology server, 6) Scandia

commercial navigation method, 7) intellectual capital management model, and 8) Joia method.

Models which evaluate intellectual capital monetarily and financially are such as 1) economic value added (EVA), 2) return on assets (ROA), 3) market capital formation method, 4) direct intellectual capital method, 5) methods of intellectual capital financial measurement, and 6) Tobin's Q method.

Value Added Intellectual Coefficient (VAIC) Model

Value added intellectual coefficient (VAIC) presented by Pulic (1998) will be used in this paper as the main model for measuring intellectual capital. Its measurement is based on three dependent variables, 1) relational capital efficiency (CEE), 2) human capital efficiency (HCE), and 3) structural capital efficiency (SCE). Pulic (1998) stated that when VAIC is high, the efficiency of value added by the whole resources of the company is better. Formulation of VAIC indices is as following:

$$VAIC_i = CEE_i + HCE_i + SCE_i$$

1. Value added (VA_i) of company i in year i is calculated as below:

$$VA_i = I_i + DP_i + D_i + T_i + M_i + R_i$$

Where,

I_i : total interest cost of the company for year i ;

DP_i : depreciation costs of the company for year

i ;

D_i : dividend of the company for year i ;

T_i : tax for year i ;

M_i : equity capital for year i ;

R_i : retained earnings of the company for year i

2. CEE_i is calculated by below relation:

$$CEE_i = \frac{VA_i}{CE_i}$$

Where,

CEE_i : coefficient of relational efficiency for company i

VA_i : total value added for company i

CE_i : net book value of assets for company i

3. Salary is one of the indices of human capital efficiency (HCEi). So, HCEi is calculated as below:

$$HCE_i = \frac{VA_i}{HC_i}$$

Where,

HCE_i : human capital efficiency for company i

VA_i : total value added for company i

HC_i : total outlay for salary for company i

4. Structural capital efficiency (SCEi) for company i is calculated as following.

The first step for determining SCEi is to calculate the company structural capital (SCi):

$$SC_i = VA_i - HC_i$$

Where,

SC_i : structural capital for company i

VA_i : total value added for company i

HC_i : total outlay for salary for company i

Pulic stated that there is an inverse relation between SC_i and HC_i , so SCE_i is calculated as below:

$$SCE_i = \frac{SC_i}{VA_i}$$

Where,

SCE_i : structural capital efficiency for company i

SC_i : structural capital for company i

VA_i : total value added for company i

Review of empirical studies regarding the research subject shows that the first empirical research for measuring the intellectual capital was carried out in the mid 1980s by a Swedish association and then many studies were carried out for determining the status of companies' intellectual capital inside the countries and among countries. Documentary research of Joia showed that try to incorporate intellectual capital into the company balance sheet is a logical concept and Joia research proved that it is quite scientific. Oliver P. Pfeil (2003) has sought the most appropriate method for identifying intellectual capital and has compared different models. He has studied 300 European large companies during 1990 – 2001 and evaluated Olsson 1995 and Feltam 1995 and investigated the return on intellectual capital. Hong Pew Tan (2007) has studied the relation between intellectual capital and financial return of the companies. The results indicate that first, there is a positive significant relation between intellectual capital and current and future financial return of the companies and second, the effect of intellectual capital on the financial return of the companies varies in different industries. Rudez (2007) studied the effect of intellectual capital components on the financial performance in hotel industry in Slovenia. The results of this research revealed that first there is a positive significant relation between intellectual capital components and financial performance in this industry and second, the effect of relational capital on the company financial performance is more than other intellectual capital components. Garcia (2007) studied in an empirical research the relation of intellectual capital information used in the investment decisions in the Spanish companies.

Importance of the Subject

During the second half of the twentieth century, the concept, role and importance of knowledge in economy and business have changed highly. Importance of this issue is to the extent that the European Union introduces conversion into the greatest knowledge-based economic pole in the world as its major goal in its meeting 2000 in Lisbon, Portugal. During recent decade, more than 7000 scientific papers have been published in the scientific

journal and conferences on intellectual capital and any of them has studied a specific perspective. The role and importance of knowledge has always been increasing not only at a macro- economic level and business but also in the company management processes. One of the main problems of traditional accounting systems is their disability to measure intellectual capitals of the companies. That's why, inclination to measure and consider real value of intangible assets and knowledge in the financial statements of the companies has been increased more than ever.

Methodology

This paper is regarded as a descriptive research and also an applied research in terms of objective. This paper is aimed at providing a proper method for measuring intellectual capitals of the companies and testing these methods in Tehran Stock Exchange. In so

doing, first intellectual capital value of each company was calculated based on Pulic method for a six-year period from 2007 to 2012. Then the relation between intellectual capital dimensions and financial performance dimensions of the company was studied by using generalized least squares method. In this paper, Data required for testing the hypotheses has been gathered by Rahavard Novin software. The gathered data was classified by using excel program and then variables were calculated for testing the research hypotheses based on the mentioned models. Independent and dependent variables are as below. Independent variables include value added coefficient of relational capital (CEE), value added coefficient of structural capital (SCE), and value added coefficient of human capital (HCE). Dependent variables include return on assets (ROA), return on equity (ROE), and annual service return (ASR).

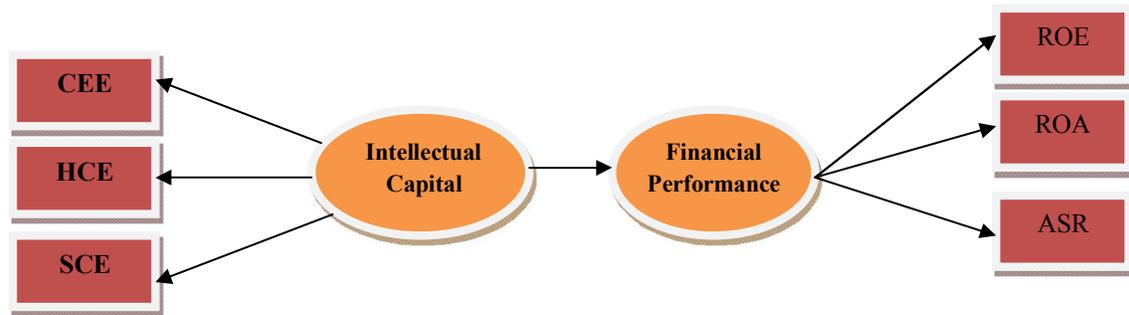


Figure 1: Research Model

According to the research model, the research hypotheses are as follows:

- There is a significant correlation between dimensions of intellectual capital and return on assets.
- There is a significant correlation between dimensions of intellectual capital and return on equity.
- There is a significant correlation between dimensions of intellectual capital and Tobin's Q ratio.

Research findings

Descriptive statistics:

In descriptive statistics sector, data analysis is done by central indexes such as the mean, median, and dispersion indexes including the standard deviation, skewness and kurtosis.

Table 1. Description of research variables

| Variables | No. | Mean | Standard deviation | Skewness | Kurtosis |
|----------------------|-----|---------|--------------------|----------|----------|
| Intellectual Capital | 252 | 35638.5 | 86152.4 | 4.156 | 17.52 |
| Return on assets | 252 | 0.176 | 0.124 | 0.638 | -0.063 |
| Return on equity | 252 | 0.575 | 0.452 | 0.426 | 3.542 |
| Tobin's Q ratio | 252 | 5.4 | 3.45 | 4.35 | 1.25 |

Inferential statistics:

The applied regression model in this study can be expressed as follows:

$$Y_{it} = B_0 + B_1 CEE_{it} + B_2 HCE_{it} + B_3 SCE_{it} + M_{it}$$

Where, Y_i is the dependent variable with the variable of Tobin's Q, ROA and ROE. Furthermore,

CEE_{it} , HCE_{it} and SCE_{it} are the independent variables of model.

First hypothesis: There is a significant correlation between the dimensions of intellectual capital and return on assets.

$$ROA = b_0 + b_1 CEE + b_2 HCE + b_3 SCE + e$$

Table 2. The correlation between dimensions of intellectual capital and return on assets

| Variable | Coefficients of model | t test | | F test | | Coefficient of determination |
|----------------|-----------------------|----------------|--------------------|----------------|--------------------|------------------------------|
| | | Test statistic | Significance level | Test statistic | Significance level | |
| Constant value | -0.153 | -5.321 | 0.000 | 80.27 | 0.000 | 0.392 |
| CEE | 0.456 | 11.52 | 0.035 | | | |
| HCE | 0.153 | 2.12 | 0.051 | | | |
| SCE | 0.232 | 5.62 | 0.000 | | | |

The results of data analysis indicate that the significance level of F statistics (0.000), which is less than 0.05, indicates the correlation between changes in ROA and independent variables at the confidence level of 99 percent, thus the result of model validation is positive.

Given the significance level of t statistics, it can be concluded that the significance level of applied communicational capital efficiency coefficient as the independent variable is 0.035, human capital efficiency as the independent variable is 0.051, and the structural capital efficiency as the independent variable is 0.00 which are less than 0.05, thus the non-zero hypothesis of these coefficients is accepted and they are equal to

0.456, 0.153 and 0.232, respectively. Since the applied communicational capital efficiency has the highest coefficient (0.456) in the regression equation, it is concluded that the applied communicational capital is more effective than other components of intellectual capital in terms of return on assets. Thus, the fitted model is as follows.

$$ROA = -0.153 + 0.456 CEE + 0.153 HCE + 0.232 SCE$$

Second hypothesis: There is a significant correlation between the dimensions of intellectual capital and return on equity.

$$ROE = b_0 + b_1 CEE + b_2 HCE + b_3 SCE + e$$

Table 3. The correlation between dimensions of intellectual capital and return on equity

| Variable | Coefficients of model | t test | | F Test | | Coefficient of determination |
|----------------|-----------------------|----------------|--------------------|----------------|--------------------|------------------------------|
| | | Test statistic | Significance level | Test statistic | Significance level | |
| Constant value | 0.895 | 2.356 | 0.002 | 53.5 | 0.000 | 0.482 |
| CEE | 0.321 | 3.652 | 0.005 | | | |
| HCE | 0.112 | 3.265 | 0.001 | | | |
| SCE | 0.223 | 2.652 | 0.006 | | | |

The value of F statistic and its significance level indicate the correlation between the dimensions of intellectual capital and return on equity at the confidence level of 99%. Therefore, the research model is confirmed. Furthermore, the coefficients of model indicate that the communicational capital variable with coefficient of 0.321, the human capital efficiency (0.112), and the structural capital efficiency (0.223) are effective in explaining the equity. Furthermore, the significance of t test indicates the significance of coefficients in the model. Thus, the communicational

capital efficiency dimension has the greatest impact on the equity of stock exchange companies firms and the fitted model is as follows:

$$ROE = 0.895 + 0.321 CEE + 0.112 HCE + 0.223 SCE$$

Third hypothesis: There is a significant correlation between the dimensions of intellectual capital and Tobin's Q ratio.

$$Tobin's Q = b_0 + b_1 CEE + b_2 HCE + b_3 SCE + e$$

Table 4. The Correlation between dimensions of intellectual capital and Tobin's Q ratio

| Variable | Coefficients of model | t test | | F Test | | Coefficient of determination |
|----------------|-----------------------|----------------|--------------------|----------------|--------------------|------------------------------|
| | | Test statistic | Significance level | Test statistic | Significance level | |
| Constant value | 1.10 | 3.18 | 0.000 | 12.5 | 0.000 | 0.054 |
| CEE | 0.154 | 3.16 | 0.003 | | | |
| HCE | 0.058 | 0.85 | 0.281 | | | |
| SCE | 0.166 | 2.88 | 0.003 | | | |

Given the level of significance level associated with F statistics (0.000), which is less than 0.05, the correlation between the changes of Tobin's Q ratio and the independent variables is significant at a confidence

level of 99 percent. Therefore, the research model is confirmed.

Given the significance level of t statistics, it can be concluded that the significance level of human

capital efficiency coefficient as the independent variable is 0.058 and higher than 0.05, thus this coefficient is excluded from the regression equation. Furthermore, the significance level of communicational capital efficiency as the independent variable is 0.003, and the structural capital efficiency as the independent variable is 0.05 which are less than 0.05, thus the non-zero hypothesis of these coefficients is accepted and they are equal to 0.154, 0.166, respectively. Since the applied structural capital efficiency has the highest coefficient (0.166) in the regression equation, it is concluded that the structural capital is more effective than other components of intellectual capital in terms of determining the Tobin's Q ratio.

$$\text{Tobin's Q} = 1.10 + 0.154 \text{ CEE} + 0.166 \text{ SCE}$$

Discussion and conclusion

Nowadays, the importance and role of intellectual capital efficiency are more in profitability and continued sustainability of companies than the return on financial capital. In other words, the importance and role of financial capital have been dramatically decreased in determining the sustainable profitability compared to the intellectual capital in current knowledge-based communities. Therefore, due to the increasing importance of intellectual capital in the process of corporate strategy superiority, most of the companies are seeking to find the ways for measuring the intellectual capital and investigating its correlation with financial performance of company.

This study initially introduces the components of intellectual capital and models for measuring the intellectual capital of companies, and then an appropriate model for measuring the intellectual capital of companies to observe the actual value of organizations and the inclusion of this capital in the financial balance sheets of companies. The significant correlation between the intellectual capital and financial performance of companies is investigated after measuring the value of intellectual capital in investment companies listed on Tehran Stock Exchange through Pulic's model in a 6-year period; the following findings are obtained after analyzing the results:

There is a positive and significant correlation between the intellectual capital and rate of return on assets. The mentioned result is consistent with the studies by Zeghal and Malul (2010), Bontis et al (2010), Mahran Muhammad (2009), Sang Chan (2007), Kamat (2008), and Namazi and Ebrahimi (2010), but inconsistent with the results of research by Madontis et al (2011) on Greek market. This finding emphasizes that the intellectual capital plays the important role in enhancing the performance and profitability of firm. Despite the fact that the accepted accounting standards of accounting prevent more identification of intellectual

capital in financial statements, the investors have understood the value of intellectual capital in their decisions and considered it essential for better performance of companies; furthermore, the accounting systems are now not able to calculate the firm performance proportional to the intellectual capital in spite of increased importance of intangible assets and especially the intellectual capital of firms.

Compared to other dimensions of intellectual capital, the communicational capital has greater impact on the return on assets and return on equity. Furthermore, the structural capital efficiency has higher effect on Tobin's Q ratio of Stock Exchange companies than other dimensions of intellectual capital. According to these results, it is suggested utilizing this model for preparation, presentation and analysis of complete and actual financial statements in accounting systems of companies. It is also recommended that the correlation between the intellectual capital and non-financial performance as well as the customers and employees' satisfaction should be investigated in future studies.

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