**Evaluating Financial Performance of Companies Listed at Tehran Stock Exchange based on Intellectual Capital (a case study of cement and petrochemical industries)**

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**Abstract**

The present study aims at evaluating different aspects of intellectual capital and its effects on financial performance of companies listed at Tehran stock in cement and petrochemical industries. Bontis theory is used as the basis for studying intellectual capital, while Johnson & Soenen model, along with Q-Tobin model, is used for studying financial performance. In addition to independent and dependent variables, he study sets firm size and leverage as control variables.

Population of the study includes all companies listed at Tehran stock in cement and petrochemical industries in a period of 4 years extending from 2008 to 2012. Analysis is performed using SPSS. Linear regression test is used for examining hypotheses. Results indicate a significant relationship between intellectual capital and financial performance in companies listed at Tehran stock in cement and petrochemical industries.

**Key words**: structural capital, human capital, customer capital, financial performance.

**Introduction**

The second half the 20th century is considered as a milestone for considerable changes in organizational approaches. On the one hand, emergence of new organizational approaches drew the attention of organizations seeking alternatives in their business. On the other hand, new demands in market service provision brought about greater value added for organizations. In fact, in addition to industry and agriculture, a third dimension was introduced into the economy which gained superiority over the other two traditional sectors. Emergence of new theories about the role of information in organizations, and great attention directed towards information technology and development of new forms of entrepreneurship, led to expansion of scope and availability of value creation opportunities for organizations. New forms of service provision, coupled with information, split organizations into two parts with physical and virtual dimensions and, consequently, made conceivable a continuum with absolute physical and virtual extremes. Accordingly, what was considered to be a source of wealth for societies and organizations went through substantial changes, leading to fundamental changes in principles of business and economy. This led to gradual increase of the gap between book value and market value of companies and made prominent the necessity of paying attention to intangible resources influential on value added which goes beyond common calculations (Mirkamali, 2009).

**Statement of the Problem**

Theorists have distinguished between indicators of the market and financial performance while measuring organizational performance. Although the relationship between market share (as an important indicator of market performance) and profitability (as an important indicator of financial performance) is often significant, it is not necessarily so in all cases such as the situations for market penetration. Therefore, unlike many researchers who fail to distinguish between the two phenomena, it is important to discriminate between indicators of financial performance and market performance when evaluating organizational performance. Financial indicators constitute a part of organizational performance indicators which are used for measuring financial performance. Considering the definition of organizational effectiveness and performance, and operational objectives intended in financial performance, financial performance is defies as the degree to which a company succeeds in realizing financial objectives of shareholders in terms of increasing their wealth. Operational objectives of the company are set by the managers to achieve this broader goal and include indicators and measures which are used for evaluating financial performance of commercial companies (Hosseini et al., 2007).

One of the most important restrictions and weaknesses in financial sectors of companies is neglecting intellectual capital in evaluations and financial statements. Intellectual properties represent a set of capacities and capabilities of an organization that are used as sources of stable competitive advantages and financial growth and developments. Though exact measurement of these properties is unattainable, identifying their role in financial performance of an organization leads to understanding the importance of investment in them. Thus, the present study seeks to evaluate effects of intellectual capital on financial performance of companies listed at Tehran stock in cement and petrochemical industries.

**Intellectual Capital**

Many various definitions have been put forward for intellectual capital, upon which no general agreement is attained by far. However, one general definition confirmed by many scientists is that intellectual capital is the set of intangible properties of an organization, including knowledge, structural capital, communicative capital, organizational capital, internal capital and external capital. Intellectual capital is used in the form of intangible assets, knowledge-based assets, knowledge capital, information capital, human capital, and hidden capital of the organization (Bontis, 2001; Kariodimedjo, 2011). The major model used as the basis of the present study is Bontis model which divides intellectual capital into human capital, relational capital and structural capital (Bontis, 1998).

**Intellectual capital models**

In late 1990, different researchers provided frameworks and models that proved effective in better understanding and facilitating the use of intellectual capital. Though slightly different, studies conducted in this regard indicate that no single-dimensional structure is dominant and intellectual capital is projected in different levels. Some of these models are listed as follows: 1. Bontis, 2. Kariodimedjo, 3. Sullivan, 4. Brooking, 5. Roos, 6. Sveiby, 7. Hans & Lavandal.

**Human capital**: human factor constitutes the first and foremost aspect of an organization and counts as a significant and influential factor in organizational success in competitions. Human capital is composed of four components in individual level:

1. Inherited characteristics
2. Education
3. Experience
4. Attitude to life and business

Human factor is considered as a creative and strategic aspect in organizational level and plays a substantial role in helping the organization fulfill its objectives. Human capital also improves performance and promotes profitability of the organization (Chen et al., 2004).

**Structural capital:** represents capability of the organization in dealing with internal and external challenges and includes trends, guidelines, information systems and culture of an organization. It contributes as a framework and a basis for information-based processes in the organization and refers to any assets other than individuals in the organization (McGill, 2006).

**Relational capital:** indicates the knowledge of interactions with stakeholders of an organization. The way of treating and managing the customers is essential for any organization. On the other side, establishing an appropriate relationship with suppliers and interactions with competitors prove essential in corporate survival. The concept of customer capital is extended to relational capital which includes knowledge of relations with competitors, suppliers, institutes and the government (Bontis qtd in Qelichli & Moshabbaki, 2007).

**Significance of the study**

Traditional accounting systems suffer from many difficulties in dealing with new technologies and global competitive markets, since companies fail to incorporate intellectual capital in their financial statements (Seraji, 2006). In modern times, companies might not be able to gain efficiency and productivity by sheer reliance on physical capital and tangible assets; rather it is preferable, even in the most pessimistic situations, to use intellectual capital to reach competitive advantage. Intellectual capital as a real and strategic component of organizational capital is of great importance for research centers and knowledge-based organizations. Therefore, a knowledge-based organization needs conscious recognition and management of intellectual capital to reach sustainable competitive advantage. Traditional accounting models, which are based on tangible assets and information of past operations, are insufficient for evaluating intellectual capital as the most valuable asset of an organization. In other words, intellectual capital approach is more comprehensive and sufficient for those organizations which seek to get a better understanding of the value of their performance (Waterhouse, 1998).

**Literature Review**

Early experiments on measuring intellectual capital were conducted in mid-1980s in a Swedish institute, which were followed by a bulk of studies in different countries, reveling that reporting intellectual capital in company’s balance sheet is both logical and practical.

Santhanam et al. (2003) employed data collected from 1991 to 1996 to examine financial performance using indicators such as returns on sales, return on assets, and the rate of earnings to employees. They also used capability and competency obtained from information technology to examine IT. They revealed paradoxical results on significant and insignificant relationships for different pairs of financial performance indicators. However, the relationships between variables were found to positive in all cases.

Belcoe (2003) evaluated effects of intellectual capital on performance of multinational companies in the U.S between 1992 and 1996. The population of his study included 100 services and manufacturing company in 1991 with 81 samples which have provide the required information in the period under investigation. Here, number of applications of companies for trademark protection in a span of 10 years ending in 1991 was taken as the measure for evaluating intellectual capital, and the rate of value added to total assets was used for evaluating corporate performance. Independent variable of the study was the difference between number of applications for trademark protection and average number of applications for trademark protection in samples of the study. Dependent variable was the difference between average rate of value added to total assets in 1992-1996 and the average rate of value added to total assets in the samples. He found a significant and positive relationship between intellectual capital and performance of multinational companies in the U.S. This is true for companies in other countries, though the intensity of the relationship may be different.

Tan et al. (2005) studied the relationship between intellectual capital and financial returns of 150 companies in Singapore’s stock market from 2000 to 2002. They used returns on equity, earnings per share and annual returns for measuring financial returns, and used three components of Palic coefficient of value added of intellectual capital for measuring intellectual capital. Statistical model of the study was least squares regression. Results of the study showed a positive relationship between intellectual capital with current and future performance of the company. Also, the relationship between growth rate of intellectual capital and future performance of the company was found to be positive.

Rudez Helena & Mihalic Tanja (2007) investigated effects of components of intellectual capital on financial performance in hotel industry in Slovenia, and found a significant and positive relationship between them. They also found that, compared to the other components of intellectual capital, relational capital was more influential on financial performance.

Tunc Bozbura & Beskese Ahmet (2007) used fuzzy AHP for ranking measuring indicators of intellectual capital. They realized that creating and distributing strategic values in an organization is the most important indicator of intellectual capital.

Combining the fuzzy approach of 2-tuple with multivariate decision-making technique, Shen Tai & Chen-Tung (2008) presented a new model for evaluating intellectual capital and tried it on specialized advanced companies in Taiwan.

Kavida & Sivakoumar (2009) evaluated intellectual property in Indian industries. They examined stock value using intellectual properties such as brand, patents and staff expertise and found a relationship between knowledge and stock market value.

Hung-Chao et al. (2009) used evaluative models of Ohlson (1998) and Deco (1999) to study intellectual capital in IT industry of Taiwan. Results of their study on human resource capital, innovation, process and relations showed that:

1. Tai companies are mostly concerned with process and human capital, rather than relational and innovative capital.
2. There is a positive relationship between IT companies with rate of returns and sustenance of accounting activities, leading to increases in annual sales rate.
3. Intellectual capital is an important commercial value for IT companies and plays a significant role in unexpected earnings.
4. Using fixed discount rate in Ohlson model may turn out inappropriate, since it leads to abnormal earnings and, consequently, unreal rise of the value of intellectual capital in evaluation process.

Zeghal & Maaloul (2010) used value added intellectual coefficient to measure intellectual capital and its effects on financial and economic performance, and market value of 300 companies in England. They realized a significant and positive relationship between efficacy of intellectual capital with economic and financial performance. They also found a negative relationship between physical and financial capital with economic performance, but a positive relationship between financial performance and market value performance.

Wang et al. (2010) examined effects of intellectual capital on performance of retailing companies and conclude that intellectual capital reflects real value of companies and crates competitive advantage in these companies.

Chang & Hsieh (2011) used adjusted value added intellectual coefficient model to evaluate the relationship between components of intellectual capital with operational, financial and market performance in Tai stock market in electronics industry. Results of their study showed a positive relationship between operational performance and adopted capital, while no relationship was observed with structural capital and human capital. Research and development expenditure is positively related to the three performances, but intellectual property has positive relationship only with operational performance.

Maditinos et al. (2011) used value added intellectual coefficient to investigate the relationship between components of intellectual capital with financial and market performance of stock market in Greece and found a significant relationship between them. However, only the relationship between human capital and returns on equity was confirmed.

Malekian & Zare (2010) evaluated effects of financial performance of pharmaceutical companies. The present study aims at explaining effects of intellectual capital on financial performance of companies. Financial statements of companies are used for measuring performance, while a questionnaire with reliability coefficient of 96% is used for measuring intellectual capital. Then, regression model is used for evaluating effects of three components of intellectual capital on financial performance of population of the study. Results indicate that human capital and relational capital have positive effects on financial performance (0.4949 and 0.544, respectively), while structural capital has no significant effect on financial performance.

**Conceptual Framework**

A conceptual framework is essential for conducting a scientific and organized study. Here, intellectual capital based on Bontis theory (human capital, structural capital and relational capital), and financial performance based on Johnson & Soenen theory (ROA-ROE, Q-Tobin), are distinguished. It is noteworthy that Simultaneous study of all variables in similar conditions with a single individual is impractical. Thus, effects of some variables need to be kept fixed or neutral while determining the relationship between dependent and independent variables. These variables are known as control variables. Here, leverage and firm size are set as our control variables.

**Control variable**

**Control variable**

**Customer capital**

**Human capital**

**Structural capital**

**Firm size**

**Leverage**

**Q-Tobin**

**ROE**

**ROA**

**Hypotheses**

The study proposes a main hypothesis and three subsidiary hypotheses:

Main hypothesis: Intellectual capital is influential on financial performance of companies listed at Tehran stock.

Subsidiary hypotheses:

1. Human capital is influential on financial performance of companies listed at Tehran stock.
2. Structural/organizational capital is influential on financial performance of companies listed at Tehran stock.
3. Relational/customer capital is influential on financial performance of companies listed at Tehran stock.

**Measurement of Variables**

Palic value added intellectual coefficient (VAIC) is used here for measuring intellectual capital.

**Step 1**: Value added (VA)

Value added is calculated using information presented in annual reports:

VA=OP+EC+D+A

Where OP is operational earnings, EC is employee costs, D is depreciation and A is assets expiration (depreciation of intangible assets).

**Step 2**: value added physical capital coefficient (VACA)

Represents value added derived from applying tangible physical assets and is calculated as:

CA= total assets – intangible assets= tangible assets

VACA= VACA

**Step 3**: value added human capital coefficient (VAHU)

Represents value added created by employees, which is derived from dividing value added by employee wages and salary costs. It is calculated as follows:

VAHU= VAHU

VAHU= value added employee wages

**Step 4:** structural capitalvalue added coefficient (STVA)

Represents value added obtained from processes and structures of the organization and is calculated as:

SC= VA – HC

SC= value added - employee wages

or

STVA= SC VA

STVA = SC VA

**Step 5:** value added intellectual capital (VAIC)

Represents company’s efficacy in creating value or intellectual productivity. Higher levels of this coefficient indicate better use of potentials on the side of manager. It is calculated as follows:

VAIC= VACA+VAHU+STVA

**Dependent variable (financial performance)**

1. Returns on assets

The study measures the degree to which a company succeeds in effective exploitation of financial performance. In particular, it seeks to measure profitability of total assets in terms of returns on assets. Some analysts use the sum of net income before tax with costs of loan in the numerator, while using total assets in the denominator (Akbari, 1996). This fraction is used for measuring managerial performance and reflects efficacy of management in using corporate assets for producing greater earnings.

ROA=

ROA=

1. Returns on equity (ROE)

ROE reflects rate of profitability in a company in relation to book capital of shareholders.

ROA=

ROA=

1. Q-Tobin

It is an important indicator for measuring value and a valid indicator for measuring corporate performance. Q-Tobin is obtained from the rate of market value of corporate securities to replacement costs of assets.

ROA=

**Control variable**

Firm size: natural logarithm of sales is used as representing firm size.

Fs= ln sales

Leverage: is obtained through dividing liabilities by book value of total assets.

Leverage= liability / assets

**Methodology**

The present study is an applied, post-event and descriptive research. Population of the study includes all 56 companies listed at Tehran Stock Exchange from 2008 to 2012, from among which, using elimination method of screening, 46 companies are taken as samples. Sampling is performed based on the following requirements on companies:

1. Companies with their fiscal year set for end of Esfand.
2. Companies which have been active continuously in the Stock.
3. Companies with information needed for testing hypotheses.
4. Companies with shares untraded not more than five months during the study.

**Data analysis**

After collecting data for sample companies, Kolmogorov-Smirnov model was used for testing data normality. Then, Perason distribution is used for testing the hypotheses. Pearson-Spearman correlation model is used for evaluating the relationship between variables. Finally, linear regression is used for testing explanatory capability of variables.

**Testing Hypotheses**

Main hypothesis: Intellectual capital is influential on financial performance of companies listed at Tehran stock (cement and petrochemical industries).

Pi= α0+ α1VAICi+e

H0: there is no linear relationship between the two variables

H1: there is a linear relationship between the two variables

**Table 1.** Results of regression

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **variable** | **F-test** | | **Coefficient of correlation** | **t-test** | | **D-W** |
| **Test statistics** | **Level of significance** | **Test statistics** | **Level of significance** |
| **VAIC** | **338/5** | **020/0** | **342/0** | **415/2** | **020/0** | **988/1** |

The adjusted coefficient of correlation indicates that independent variable (intellectual capital) explains 34.2% changes in dependent variable (financial performance). Regarding level of significance of F-statistics (0.02) and comparing it with error level (0.05), significance of the relationship between changes in intellectual capital and financial performance with 99% confidence level is confirmed. D-W statistics lies between 1.5 and 2.5 and suggests no correlation in error components of regression models. Therefore, H0 is rejected and H1 is confirmed. As can be seen in Table 1, intellectual capital has significant effects on financial performance.

Now we test the main hypothesis in presence of control variables (leverage and firm size).



H0: there is no linear relationship between the two variables

H1: there is a linear relationship between the two variables

**Table 2.** Results of regression

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Variable** | **F-test** | | **Coefficient of correlation** | **t-test** | | **D-W** |
| **Test statistics** | **Level of significance** | **Test statistics** | **Level of significance** |
| **VAIC** | **345/8** | **000/0** | **373/0** | **370/3** | **02/0** | **610/1** |
| **LEV** | **507/3** | **01/0** |
| **SIZE** | **354/1-** | **183/0** |

Coefficient of determination for the two variables is 0.373 and indicates a direct relationship between dependent variables and the independent variable. Regarding level of significance of F-statistics (0.000) and comparing it with error level (0.05), significance of the relationships between changes in intellectual capital with firm size and leverage with 99% confidence level is confirmed. Also, considering significance level of t-statistics, it is concluded that level of significance for intellectual capital (0.02) and leverage (0.01) s smaller than 0.05; therefore, these coefficients are non-zero and shouldn’t be excluded from the regression equation. However, level of significance for firm size (0.183) is greater than 0.05 and it is excluded from the regression equation. D-W statistics lies between 1.5 and 2.5 and suggests no correlation in error components of regression models. Therefore, H0 is rejected and H1 is confirmed.

Subsidiary hypothesis 1:

Human capital is influential on financial performance of companies listed at Tehran stock (cement and petrochemical industries).



H0: there is no linear relationship between the two variables

H1: there is a linear relationship between the two variables

**Table 3.** Results of regression

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Variable** | **F-test** | | **Coefficient of correlation** | **t-test** | | **D-W** |
| **Test statistics** | **Level of significance** | **Test statistics** | **Level of significance** |
| **Fixed value** | **142/0** | **009/0** | **023/0** | **305/4** | **000/0** | **561/1** |
| **VAHU** | **004/0** | **009/0** |

Table 3 demonstrates that human capital has significant effects on financial performance. Coefficient of determination for the two variables is 0.023 and indicates a direct and significant relationship between human capital and financial performance. Regarding level of significance of F-statistics (0.009) and comparing it with error level (0.05), significance of the relationships between changes in human capital and financial performance with 99% confidence level is confirmed. Also, considering the fact that level of t-statistics is smaller than 5, the equality of coefficients with zero is rejected and they shouldn’t be excluded from the regression equation. D-W statistics lies between 1.5 and 2.5 and suggests no correlation in error components of regression models. Therefore, H0 is rejected and H1 is confirmed.

Subsidiary hypothesis 2:

Structural/organizational capital is influential on financial performance of companies listed at Tehran stock (cement and petrochemical industries).



H0: there is no linear relationship between the two variables

H1: there is a linear relationship between the two variables

**Table 4.** Results of regression

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Variable** | **F-test** | | **Coefficient of correlation** | **t-test** | | **D-W** |
| **Test statistics** | **Level of significance** | **Test statistics** | **Level of significance** |
| **Fixed value** | **656/2** | **110/0** | **057/0** | **858/7** | **000/0** | **252/1** |
| **STVA** | **630/1-** | **110/0** |

According to Table 4, structural capital has significant effects on financial performance. Adjusted coefficient of determination shows that structural capital explains 5% of changes in financial performance. Since level of significance of F-statistics (0.110) is greater than error level (0.05), significance of the relationships between changes in structural capital and financial performance is not confirmed. Also, considering the fact that level of t-statistics is greater than 5, the equality of coefficients with zero is rejected and they should be excluded from the regression equation. D-W statistics lies between 1.5 and 2.5 and indicates a correlation in error components of regression model. Therefore, H0 is confirmed and H1 is rejected.

Subsidiary hypothesis 3:

Relational/customer capital is influential on financial performance of companies listed at Tehran stock (cement and petrochemical industries).



H0: there is no linear relationship between the two variables

H1: there is a linear relationship between the two variables

**Table 5.** Results of regression

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Variable** | **F-test** | | **Coefficient of correlation** | **t-test** | | **D-W** |
| **Test statistics** | **Level of significance** | **Test statistics** | **Level of significance** |
| **Fixed value** | **977/8** | **004/0** | **169/0** | **830/2** | **007/0** | **170/2** |
| **VACA** | **996/2** | **004/0** |

Results of Table 5 represent significant effects of customer capital on financial performance. Adjusted coefficient of determination for customer capital and financial performance is 0.169, reflecting a direct and significant relationship between the two variables. Regarding level of significance of F-statistics (0.004) and comparing it with error level (0.05), significance of the relationships between changes in customer capital and financial performance with 99% confidence level is confirmed. Also, considering the fact that level of t-statistics is smaller than 5, the equality of coefficients with zero is rejected and they shouldn’t be excluded from the regression equation. D-W statistics lies between 1.5 and 2.5 and suggests no correlation in error components of regression models. Therefore, H0 is rejected and H1 is confirmed.

**Conclusion**

Results of testing hypotheses reveal a significant relationship between intellectual capital and financial performance of companies listed at Tehran Stock Exchange. The first subsidiary hypothesis explores effects of human resources on financial performance of companies. Human value added determines how greater value added is created by the staff of a business unit. Employee expenditure should be taken into account as an indicator of human resources. Moreover, appropriate investment on human resources, discovering and flourishing potentials and skills, and exploiting experiences should be seriously pursued in organizations.

The second subsidiary hypothesis examines effects of structural/organizational capital on financial performance in companies and found a significant relationship between the two. Finally, the third subsidiary hypothesis evaluated effects of relational/customer capital on financial performance in companies, indicating a significant relationship between the two variables. Our results are in agreement with findings of Santhanam (2003), Belcoe (2003), Tan (2005) and Malekian (2010). Accordingly, based on rejecting of the second subsidiary hypothesis, the following suggestions are projected for further studies in this regard:

1. Human value added determines how greater value added is created by the staff of a business unit. Employee expenditure should be taken into account as an indicator of human resources. Moreover, appropriate investment on human resources, discovering and flourishing potentials and skills, and exploiting experiences should be seriously pursued in organizations.
2. It is suggested that managers pay more attention to structural capital. It should also be borne in mind that structural reforms, improving processes, implementing operational plans, observing regulations, enhancing strategies, improving business methods and advantages derived from brands, innovations may help strengthen structural capital and, consequently, contribute in the betterment of financial performance indicators in the future.
3. Lack of structural capital value added signifies the presence of inappropriate trends, guidelines, information systems, and organizational culture. Organizational structure is ostensibly influential on skills and the degree of motivation of employees in the organization. Hence, appropriate adoption of integrating procedures, creation of cooperative culture and development of knowledge, establishment of relations and integration among resources, organizational communications, which lead to customer satisfaction and shareholders and bring about competitive advantage for the organization, are of greatest importance of creative organizations.
4. It is suggested that organizations and companies calculate their intangible assets related to intellectual capital and report them to capital market and the Stock Exchange. this helps analysts and experts make better decisions in evaluating the real share of companies and organizations.

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