Full Length Research Paper

Evaluation of relationship between the intellectual capital and earning quality indexes in emerging economics: Case study of Iran's financial market

Majid Zanjirdar and Masomeh Chogha*

Department of Management, Arak Branch, Islamic Azad University, Arak, Iran.

Accepted 3 January 2012

Organizations are increasingly entering knowledge-based economy in which knowledge and intangible assets are among the firms most important sources of competitive advantages. One of the intangible asset components is intellectual capital; nowadays, the role and importance of intellectual capital output used in the firm’s stable and continuous profitability are more than financial capital output. For this reason, the present research aims at evaluating the relationship between the intellectual capitals and earning quality indexes among companies accepted in Tehran Exchange Market. In the research, VAIC (Value Added Intellectual Capital) as a model developed by Pulic is employed for the measurement of intellectual capital. At first, the intellectual capital value of companies accepted in Tehran Exchange Market during a five-year period from 2004 to 2009 has been calculated based on VAIC model and then the relationship between the intellectual capital and firm’s earning quality indexes has been evaluated. The earning quality is measured as a dependent variable according to earning stability, earning predictability, linkage of earning and share value and linkage of operational cash flow and the measured earning. In the present research, the simple regression and correlation coefficients are statistical methods utilized in data analysis. The results of statistical tests show that there is a meaningful relationship between the intellectual capital and earning quality indexes (earning stability and earning predictability). Regarding these results, the increasing importance of intellectual capital in the excellence process of firms is revealed and so it makes it necessary to identify and recognize knowledge, information and framework development for knowledge management in the organizations.

Key words: Intellectual capital, earning quality, simple regression, emerging economics.

INTRODUCTION

In the second half of twenty century, the development of information and quick paced advances of technology have created a remarkable changes in all aspects of human being activities and lives with a consequence of more attention toward knowledge-based economy and transition in the prominent paradigm of industrial economy (Hemmati and Roudposhti, 2010). In such an atmosphere, knowledge and intangible properties are known as the most important sources of firm competitive advantages. In fact, following the agricultural and industrial revolution in which land, capital and work force had formed the basic resources the world is now experiencing information revolution in which the main sources have been created based on knowledge and information. In the knowledge era, the intellectual capital is an important issue which its appropriate management in today’s turbulent and challenging environment is known as the firm success secret (Mojtahed Zadeh, 2002).

Due to the increasing significance of intellectual capital (as the most important part of firm’s total capital) in the strategic excellence process as well as continuous and stable profitability of firms, the present research examines the relationship between the intellectual capital as one of the output creation variables and earning quality indexes in the Iran’s financial market.

*Corresponding author. E-mail: mahta0717@yahoo.com.
The research tries to find an answer for the question that how much the available knowledge and intellectual capital are effective on the organizations transition strategy in order to achieve higher efficiency of earning quality, and finally on financial performance? Followings are discussions about literature and theory basics, methodology, findings, discussion and conclusions.

LITERATURE REVIEW AND RESEARCH BACKGROUND

Intellectual capital

The intellectual capital literature reveals the value and intangible nature of such sources. The primary efforts in relation to the intellectual capital are indebted to Machlup studies in 1962 but historically, the invention of intellectual capital concept dates back to 1969 by Galbraith. He believed that intellectual capital is beyond mental activity and includes an intellectual action. This means that in the intellectual capital literature, the move from knowledge acquisition toward knowledge usage in describing the intellectual capital concept indicates that relations and processes are known as intellectual capital if they change the knowledge to a product or service valuable for organizations, firms etc. The fact also results in a process which leads us from knowledge acquisition toward knowledge usage with consequence of various definitions for the intellectual capital. In the evolution course of intellectual capital concept, theorists have presented different definitions for intellectual capital from various viewpoints some of which are listed in Table 1.

The first experimental study in relation to intellectual capital measurement was undertaken by Swedish Association in 1980 and afterward many studies have been devoted to determination of the firms’ intellectual capital intra- and inter-countries. Joia's documented researches showed that the inclusion of intellectual capital in the firm balance sheet is a logical concept and other researches undertaken by Joia revealed that the fact has a completely scientific bases (Joia, 2000). Pew et al. (2007) in their research have examined the relationship between the intellectual capital and firm financial output. Their results reveal that there is a positive meaningful relation between the intellectual capital and firm's current and future financial output and also they conclude that the impact of intellectual capital on the firms’ financial output varies in different industries. Rudez and Mihalic (2007) in their research have examined the effect of intellectual capital components on the financial performance of Slovenian hospitality industry.

The research findings show that there is a positive meaningful relation between the intellectual capital components and financial performance in the considered industry and the relational capital has higher effective coefficient on firm financial performance than other intellectual capital components. Garcia and Martinez (2007) in an exponential study examined the relation of the intellectual capital information used in the investment decisions in Spanish firms. Young-Chu et al. (2006) have studied the relationship between the intellectual capital components and value/performance in the advanced specialized industries of Industrial Technology Researches Institute (ITRI) and have concluded that there is a positive meaningful relation between the intellectual capital components and the firm performance and also they have shown that the improvement of intellectual capital is dependent on value creation.

Table 1. Definitions of intellectual capital.

<table>
<thead>
<tr>
<th>Author</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Edvinson and Sullivan (1996)</td>
<td>Intellectual capital is a knowledge which can be converted to value.</td>
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<tr>
<td>Brooking (1996)</td>
<td>Intellectual capital is a combination of four main components: market holdings, human based properties, intellectual assets and infrastructure properties.</td>
</tr>
<tr>
<td>Ross et al. (1997)</td>
<td>Intellectual capital contains an intellectual part (for example, human capital) and a non-intellectual part (for example, structural capital).</td>
</tr>
<tr>
<td>Sveiby (1985)</td>
<td>Intellectual capital includes three intangible asset classifications: internal structure, external structure and employee competence.</td>
</tr>
<tr>
<td>Bontis et al. (2002)</td>
<td>Intellectual capital is a concept which classifies all invisible sources and internal relations.</td>
</tr>
<tr>
<td>Barney (1991)</td>
<td>Intellectual capital has an invisible nature and it persistently has been known as strategic asset in the organizations. The existence of intellectual capital in the organizations will result in the improvement of financial performance and competitive advantages.</td>
</tr>
</tbody>
</table>
process and their strategic supply in the organization. Baum and Silverman (2004) in their research examined and tested the human intellectual capital components and their impact on the firms’ financial risk decisions and performances in the biotechnology industry in Finland and also the components’ effect on the firm future performance. The results indicate that there is a meaningful impact of intellectual capital components on performance and financial risk of firms which are active in the biotechnology industry. Shen-Tai and Tung-Chen (2008) have developed a new model for the evaluation of intellectual capital performance using a combination of 2 Tuple Fuzzy approach and Multi Criteria Decision Making (MCDM) technique and tested it for specialized advanced firms in Taiwan. Tunc and Bozbura (2007) have prioritized the intellectual capital measurement indexes using the Fuzzy AHP method and their findings indicated that the creation and dissemination of strategic values in the organization is the most important index of intellectual capital. Anvari and Saraji (2005) in their research have tested five measurement methods in the intellectual capital calculations. The results of statistical tests reveal that the proposed fourth and fifth methods have high and meaningful correlations with the firms’ share market value and with respect to their higher determination coefficient values than other three methods, they have higher explanation power. Hoda Hemmati has examined the relation between the intellectual capital and new variables of performance measurement based on value creation including economic value added, market value added and shareholder value added comparing six models of intellectual capital measurement. The research results indicate that there is a relation between the intellectual capital scale and market value added (Roudposhti and Hemmati, 2009). Kordestani and Majdi (2007) examined the relation between the earning quality and the response to cash earning changes.

They studied 50 firms during 1991-2002 using three definitions for firm quality earning measurement that is, the relationship between the operational cash flow and earning and its components, earning predictability and the stability of reported earnings. Based on the first definition, they showed that the market response to the increase of firm cash earnings is positive which the result is counter expected outcome. With regard to the second definition of earning quality, the market response to the decrease of firms cash earning is positive as expected and based on the third definition, the share unusual (accumulated) return will be increased (decreased) with the increase (decrease) of cash dividend and unexpected profit.

RESEARCH METHODOLOGY

The present research is an applied research with respect to its objective-based classification. The applied research aims at developing a practical knowledge in a specific field (Khaki, 2009). It is also a correlation research regarding its method and nature. In the research, the library method and archival information are used in data collection, hypotheses proposal and research theory bases description. The research tool includes financial statements, complementary notes and financial reports of the studied firms which all of the related information is issued by Tehran Stock Exchange. The sample contains all firms which have been accepted in Tehran Stock Exchange during 2004 to 2009 according to the following requirements:

1. Accepted in Tehran Stock Exchange before the fiscal year of 2004 and not be eliminated from its list until the end of fiscal year of 2009.
2. Ending their fiscal year on 19th March and did not change their fiscal year during the considered period.
3. Having continuous activity during the research period with transacted shares.
4. Not being among investment (holding) and financial intermediate firms.
5. Providing the needed financial information completely during 2004 to 2009 with explicitly mentioned profitability.

With regard to the above mentioned considerations, some firms which did not meet the necessary conditions were eliminated from the study and 70 firms during a fine-year period were selected as the study sample and their related data was obtained.

In the research, data analysis is undertaken using simple linear regression and analysis of variance (ANOVA). In order to confirm the assumed data and remainders normal distribution, the Kolmogorov-Smirnov test (KS) was employed and for evaluation of errors autocorrelation, the Durbin-Watson test (DW) was used. The correlation coefficient is a criterion which determines a relation frequency and its type (direct or reversed). The determination coefficient also reveals that how much percent of the dependent variable changes is explained by the independent variable. The meaningfulness tests of regression equation as well as regression coefficients are undertaken using F-test and T-test, respectively.

The total regression model applied in the research is as follows:

$$Y = \beta_0 + \beta_1 \text{VAIC}_{it} + \epsilon_{it}$$

(1)

Where $Y =$ earning quality indexes, $\text{VAIC} =$ intellectual capital.

Independent variable

The intellectual capital is considered as independent variable in the research which the value added intellectual coefficient (VAIC) model developed by Pulic (2000) is used for its measurement as the firm performance index.

The Pulic’s model is based on the assumption that the development and measurement of firm value added; may have some impact on its market value and so the better the utilization of company resources, the higher its value creation efficiency would be. This model has also been used by some researchers (Ho and Williams, 2003; Shiu, 2006; Nazari and Herremans, 2007; Bannany, 2008; Bharathi, 2007, 2008; Pew Tan et al., 2007, 2008; Saleh et al., 2008; Gan and Saleh, 2008; Zainal et al., 2009). The procedure for calculation of intellectual capital value added coefficient is as follows:

**Determination of value added**

$$\text{VA} = P + I + C + D + \text{DIV} + \text{T}$$

(2)

Where $P =$ retained profit for the considered year, $I =$ interest expense, $C =$ cost of salaries and wages, $D =$ tangible asset depreciation, $\text{DIV} =$ dividend, $\text{T} =$ tax.
**Determination of physical capital employed efficiency (CEE)**

CEE = VA/CE = (value added)/(capital employed) \hspace{1cm} (3)

CE = (total assets book value)-(intangible assets) \hspace{1cm} (4)

**Determination of human capital efficiency (HCE)**

HCE = VA/HC = (value added)/(human capital) \hspace{1cm} (5)

**Determination of structural capital efficiency (SCE)**

SCE = SC/VA = (structural capital)/(value added) \hspace{1cm} (6)

SC = VA-HC = (value added)-(total cost of salaries and wages) \hspace{1cm} (7)

**Determination of intellectual capital efficiency (ICE)**

ICE = HCE + SCE \hspace{1cm} (8)

**Determination of intellectual capital value added coefficient**

VAIC = ICE + CEE = HCE + SCE + CEE \hspace{1cm} (9)

**Dependent variable**

The earning quality indexes including earning stability, earning predictability, earning relationship with share value and linkage between operational cash flow and earnings are considered as the dependent variables in the present research. Their individual calculations procedures are as follows:

**Earning stability**

Slon’s model (Richardson et al., 2005) is used in the evaluation of earning stability:

\[ E_{j,t} = B_{1,j} + B_{2,j}E_{j,t-1} + E_{j,t} \] \hspace{1cm} (10)

\[ E_{j,t-1} = \text{earnings before unusual items of firm } j \text{ in year } t-1 \]

Earning stability means the repeatability (continuity) of current earning; higher earnings stability indicates that a firm has a higher ability to keep the current earning and so, it is assumed that the firm earning quality would be higher. In the measurement of earning stability, \( E_{j,t-1} \), the explanatory variable coefficient, that is, \( B_{1,j} \) indicates the earning stability.

If the value obtained for the descriptive variable coefficient, \( B_{1,j} \) is close to 1, the earning stability will be high and otherwise, if it is close to 0, temporality of earning will be high.

**Earning predictability**

Model for the evaluation of earning predictability;

\[ \text{predictability} = \sqrt{\delta^2(V)} \] \hspace{1cm} (11)

After the estimation of model 1, the error square root is calculated and the obtained higher (lower) values will indicate lower (higher) earning predictability.

**Earning relationship with share value**

In order to evaluate this feature of earning quality, the following model has been estimated;

\[ RET_{j,t} = B_{1,j} + B_{2,j}E_{j,t} + B_{2,j}\Delta E_{j,t} + E_{j,t} \] \hspace{1cm} (12)

Where \( E_{j,t} = \text{earnings before unusual items of firm } j \text{ in year } t \),

\[ \Delta E_{j,t} = \text{earnings changes before unusual items compared to previous year}, \]

\( RET_{j,t} = \text{firm output in year } t \).

Determination coefficient resulted from the above model estimation indicates earning relationship with the considered share value.

**Earning quality based on relationship between operational cash flow and earning or earning components**

In another word, the determination coefficient resulted from the operational cash flow and earning regression is considered as a criterion for earning quality, so model A is estimated as follows:

**Model A:**

\[ CFO_{j,t} = B_{1,j} + B_{2,j}\text{PROF}_{j,t-1} + E_{j,t} \] \hspace{1cm} (13)

Previous researches have revealed that the earning components prediction power for the firm future performance is higher than earning, so two parts of earning, that is, non-operational profit (loss) and operational profit (loss) are separated in model B.

**Model B:**

\[ CFO_{j,t} = B_{1,j} + B_{2,j}\text{OP}_{j,t-1} + B_{3,j}\text{NOP}_{j,t-1} + E_{j,t} \] \hspace{1cm} (14)

The aforementioned models variables are as follows:

\( CFO_{j,t} = \text{cash flow resulted from operations of firm } j \text{ in year } t \) which has been calculated as follows:

Cash flow = operational earning after deduction of interest and tax + depreciation cost+ changes of current assets and debts (Dechow, 1994).

\[ \text{PROF}_{j,t-1} = \text{annual profit before unusual items of firm } j \text{ in year } t-1, \]

\[ \text{OP}_{j,t-1} = \text{operational profit obtained after deduction of operational costs and other net incomes from gross profit for year } t-1, \]

\[ \text{NOP}_{j,t-1} = \text{other net incomes and non-operational costs for year } t-1 \]

**RESEARCH HYPOTHESES**

\( H_1: \) There is a relationship between the intellectual capital and
### Table 2. Dependent variables normality test.

<table>
<thead>
<tr>
<th>Variable index</th>
<th>No.</th>
<th>Normal parameter</th>
<th>Maximum SD</th>
<th>Kolmogorov-Smirnov test (KS)</th>
<th>Sig. level</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Mean</td>
<td>Sd</td>
<td>Absolute value</td>
<td>Max positive deviation</td>
</tr>
<tr>
<td>Sqrt (earning stability)</td>
<td>250</td>
<td>0.6835</td>
<td>0.27277</td>
<td>0.081</td>
<td>0.081</td>
</tr>
<tr>
<td>Ln (earning predictability)</td>
<td>291</td>
<td>4.9701</td>
<td>0.64378</td>
<td>0.039</td>
<td>0.031</td>
</tr>
<tr>
<td>Linkage of earning and share value</td>
<td>354</td>
<td>0.55499</td>
<td>0.299513</td>
<td>0.117</td>
<td>0.107</td>
</tr>
<tr>
<td>Ln (linkage of operational cash flow and earning)</td>
<td>219</td>
<td>11.6950</td>
<td>1.39677</td>
<td>0.075</td>
<td>0.050</td>
</tr>
</tbody>
</table>

Max, Maximum; Std, standard deviation.

### Table 3. Summary of findings obtained from the first hypothesis evaluation.

<table>
<thead>
<tr>
<th>Tests</th>
<th>Correlation coefficient</th>
<th>Determination coefficient</th>
<th>Modified determination coefficient</th>
<th>Durbin-Watson test (DW)</th>
<th>T-test</th>
<th>Error level</th>
<th>Sig. level</th>
<th>Test result</th>
</tr>
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<tr>
<td>Relation between intellectual capital and earning stability</td>
<td>0.200</td>
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<td>H1</td>
</tr>
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</table>

### HYPOTHESES TESTING AND ANALYSIS

Since the normality of dependent variables resulted in normality as follows:

**H0:** Dependent variable has a normal distribution.

**H1:** Dependent variable has not a normal distribution.

For the research dependent variables, the linkage of earnings to share value has a normal distribution while for other variables, if they are non-normal, the regression and panel models will be invalid. It is necessary that data the normality is obtained through appropriate methods such as conversions and used them as Ln (earning predictability), Sqrt (earning stability) and Ln (Linkage of operational cash flow and earning or earning components) in the model.

Based on values provided in Table 2, the meaningfulness (Significance) level values for all four variables in the model are higher than 5% (sig>5%), so the null hypothesis for the variable normality is accepted.

**First hypothesis testing and analysis**

**First main hypothesis**

**H1:** There is a relationship between the intellectual capital and earning stability in the capital market of Iran. The hypothesis in statistical term is as follows:

**H0:** There is not any meaningful correlation between the intellectual capital and earning stability.

**H1:** There is a meaningful correlation between the intellectual capital and earning stability.

Table 3 shows that the modified $R^2$ for the relationship between the intellectual capital and earning stability in the capital market of Iran is 0.036. It is worth mentioning that 0.040 change in the earning stability would be explained assuming other factors are constant. The value of Durbin-Watson test was 1.684.
Table 4. Summary of findings obtained from the second hypothesis evaluation.

<table>
<thead>
<tr>
<th>Tests</th>
<th>Correlation coefficient</th>
<th>Determination coefficient</th>
<th>Modified determination coefficient</th>
<th>Durbin-Watson test (DW)</th>
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<th>Error level</th>
<th>Sig. level</th>
<th>Test result</th>
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<tbody>
<tr>
<td>Relation between intellectual capital and earning predictability</td>
<td>0.297</td>
<td>0.088</td>
<td>0.085</td>
<td>2.140</td>
<td>27.622</td>
<td>0.61601</td>
<td>0.000</td>
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</tr>
</tbody>
</table>

which indicates independency of model errors. The linearity of regression model with respect to the significant level of ≤5% and regarding the confirmation of F and T tests which are placed in the rejection area of H0, so the meaningfulness of relationship between the intellectual capitals and earning predictability is accepted.

Second hypothesis testing and analysis

Second main hypothesis

H2: There is a relationship between the intellectual capital and earning predictability in the capital market of Iran.

Results of the second hypothesis analysis are provided and analyzed in Table 4. Table 4 shows that the modified R² for the relationship between the intellectual capital and earning predictability is 0.085. It is worth mentioning that 0.088 change in the earning predictability would be explained assuming other factors are constant. The value of Durbin-Watson test was 2.140 which indicate independency of model errors. The linearity of regression model with respect to the significant level of ≤5% and regarding the confirmation of F and T tests which are placed in the rejection area of H0, so the meaningfulness of relationship between the intellectual capitals and earning predictability is accepted.

Third hypothesis testing and analysis

Third main hypothesis

H3: There is a relationship between the intellectual capital and linkage of earning with share value in the capital market of Iran.

Results obtained from the third hypothesis testing are provided and analyzed in Table 5. Table 5 shows that the modified R² for the relationship between the intellectual capital and linkage of earning and share value was -0.002. It is necessary to mention that 0.001 change in linkage of earning and share value would be explained assuming other factors are constant. The value of Durbin-Watson test was 2.141 which indicate independency of model errors. The linearity of regression model with respect to the significant level of ≥5% and regarding the rejection of F and T tests which are placed in the confirmation area of H0, so the meaningfulness of relationship between the intellectual capitals and linkage of earning and share value is rejected.

Fourth hypothesis testing and analysis

Fourth main hypothesis

H4: There is a relationship between the intellectual capital and linkage of operational cash flow and earnings in the capital market of Iran.

Results obtained from the fourth hypothesis testing are
provided and analyzed in Table 6. Table 6 shows that the modified $R^2$ for the relationship between the intellectual capital and linkage of operational cash flow and earning is 0.001. It is necessary to mention that 0.006 change in linkage of operational cash flow and earnings would be explained assuming other factors are constant. The value of Durbin-Watson test was 1.866 which indicates independency of model errors. The linearity of regression model with respect to the significant level of ≥5% and regarding the rejection of F and T tests which are placed in the confirmation area of $H_0$, so the meaningfulness of relationship between the intellectual capitals and linkage of operational cash flow and earning is rejected.

### DISCUSSION AND CONCLUSION

The results of first hypothesis indicated that there was a positive meaningful relationship between the intellectual capital and earning predictability because the employees' competence, vision and mental agility had important effects on the estimation and predictability of current year earnings. The results obtained from the analysis of the third and fourth main hypotheses indicated that there was no meaningful relation between the intellectual capital and other earning quality indexes (linkage of earning and share value as well as linkage of operational cash flow and earnings). With regard to the future status of the studied industry, increasing growth of technology, higher focus on customers and internal structure of firms as well as the present research findings, it is concluded that the research time interval in 2004 to 2009 is concurrent with a period during which Tehran Stock Exchange has been faced with depression. In another word, Iranian accounting professional and scientific associations and agents as well as capital market professional entities have been not in companion with other countries, they did not designed appropriate tools for intellectual capital information reporting and evaluation; and also they did not include measurement and reporting considerations of intellectual capital dimensions into the accounting standards to obtain the firm real value by the accounting system. Similar to current research, Madhoushi and Asgharnejad (2009) used Pulic model for the measurement of intellectual capital and found that appropriate reporting and disclosure of firm intellectual capital will improve its current and future financial position (Alam and Rajabifard, 2009) as well as its financial output and performance.

### PROPOSALS FOR FUTURE RESEARCHES

i) The use of other intellectual capital measurement models (a combination of financial and non-financial models).

ii) Testing the relationship between the intellectual capital and other earning quality indexes including accrual items, etc.

iii) Adding firm and industry sizes as control variables to the current research.

iv) Examining the relationship between the intellectual capital and non-financial performance such as customer and employee satisfaction, industry ranking, market share, etc.

v) Ranking the accepted firms in Tehran Exchange Stock based on intellectual capital index in order for investors to achieve improved resource assignment through decision making model.

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