# An investigation of intellectual capital impact on companies' market value and financial performace

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**Abstract**
The main objective of the present study is to measure intellectual capital and investigate its effect on market value and performance measures of 60 Iranian firms listed in Tehran Stock Exchange from three different industries including pharmaceutical products, chemical products and automobile and parts manufacturing industries during the period of 2009-2012. The obtained results indicated that, in pharmaceutical products and automobile and parts manufacturing industry, market value is significantly and positively affected by IC and its components, except for structural capital efficiency and, moreover, in chemical products industry, IC has not any significant relationship with market value, but, some of its components including human capital efficiency and capital employed efficiency have significantly positive relationship with market value indicator. Regarding IC effect on performance measures, it is worth noting that two performance measures of return on asset (ROA) and return on equity (ROE) are significantly associated to IC and some of its components in all three types of industry especially pharmaceutical products and automobile and parts manufacturing industries. Revenue growth (GR), as another performance measure, is significantly affected by IC and its components only in automobile and parts manufacturing industry. Accordingly, it can be concluded that these observed relationships are moderately affected by industry rype.
**Keywords**: intellectual capital, market value, financial performance, Tehran Stock Exchange

## 1. Introduction

Intellectual capital (IC), the knowledge-based equity of companies, as a valuable academic subject worthwhile to investigate and full of applicable concepts, has attracted increasing significant acceptance. Although the importance of IC is continually increasing, many organizations encounter problems regarding its management, mainly resulting from measurement difficulties. The visible growing gap between market- and book value of many companies pulls attention towards searching for missing value in financial statements. According to numerous researchers, IC is assumed a hidden value escaped financial statements and that is the one leads organizations to capture a competitive advantage. Moreover, the belief is that financial statements limitations in exactly describing value of companies, reveals the fact that, nowadays, the source of economic value is intellectual capital creation rather than physical goods production [8].

During the last years, IC management and reporting pulls attention towards itself from not only private companies but also public institutions, research organizations, regions and countries. In fact, IC all over the world has become known as one of the most important resources of profit-seeking and not-for-profit organizations [7]. Regarding its importance, it can be argued that dynamic value-creation is derived from continuous improvement in organizational performance. In fact, a typical enterprise through performance improvement can attain a superior ability to satisfy willingnesses, needs and expectations of its stakeholders. An enterprise, In order to attain continuous improvement, is required to continuously promote effectiveness and efficiency and this in turn requires ability to design, create, manage and develop organizational processes. Achieving these abilities is possible only if the enterprise improves continuously its competitiveness and this is rooted in organization's knowledge assets that form intellectual capital. Accordingly, measuring and managing IC play a critical role in organizational performance improvement and dynamic value creation process [12].

To manage IC, at the first stage it has to be evaluated. subsequently, in order to identify further the performance gap and improve operating performance, benchmarking is used as an important procedure [7]. This research, concentrating on the first stage, evaluates and measures IC and then investigates its efect on market value and performance of enterprise.

## 2. Literature review

Stewart (1997) showed that IC means everything a business enterprise can employ it to increase its sustainable competitive advantage in marketplace and may include knowledge, information, rights to the intellectual properties, and experience. In other words, IC is an intangible asset creating value and could appear in financial statements as a marginal profit, but not as an accounting caption. Therefore, if a business enterprise can evaluate and analyze that intangible asset quantitatively, it will increase its competitiveness in industry [13].

Riahi-Belkaoui (2003) studied IC effect on the performace of U.S. multinational firms using the number of applications for trademark protection as a measure of IC and the ratio of net value added over total assets as a measure of performance and concluded that there is a significant positive relationsheep between IC and performance of the sample firms [11].

Wu and chou (2007) using factor analysis and path analysis deduced that human capital, structure capital and costumer capital associate with IC in a significant positive manner [17].

Tan et al. (2007) using Pulic model investigated the relationship between IC and its components with financial performance of companies listed in Singapore stock exchange. The results indicated that there is a positive relationship between IC and its components with current performance. They also found that IC affects significantly future performance of the firms, growth rate of IC relates positively to financial performance and finally IC performance varies among industries [15].

Kamath (2008), through examining relationship between IC components and traditional measures of financial performance including profitability, productivity, and market value among Indian pharmaceutical firms, recognized that there is not any significant relationship between IC components and financial performance measures. however, in comparison to other IC components, human capital possesses strongest effect. In addition, he observed that the studied firms, with respect to the use of IC, have experienced a considerable growth in comparison with prior years [5].

Kiong Ting and Lean (2009) using pulic model to measure the intellectual capital, investigated the IC performance and its contribution to the financial performance among malaysian companies and concluded that IC affects profitability in a significantly positive manner. The results also revealed that there is a significant relationsheep between IC components and profitability [6].

Meditions et al. (2011) using empirical data from 96 Greek firms listed in the Athens Stock Exchange examined IC effect on market value and financial performance. The findings indicated that there is a significant relationsheep only between human capital and one of the financial performance measures, i.e. return on equity (ROE), and there is not any significant relationsheep between the other components of IC and also IC itself with the other measures of financial performance, including return on assets (ROA) and growth revenues (GR). The results also failed to show any significant relationsheep between IC and its components with market value [8].

Chu et al. (2011) utilizing pulic model to measure IC, examined IC impact on financial performance indicated in terms of the ratios of market to book value (MB), return on assets (ROA), return on equity (ROE) and asset turnover (AT) of the companies listed on Hong Kong stock exchange. No conclusive evidence was found to support the IC association with ROE and MB. However, IC is able to affect ROA and AT in a positive and negative manner

respectively. The authors also found that there is a significant relationsheep between IC components and a number of financial performance measures and interestingly a negative correlation between human capital and profitability [2].

## 3. Intellectual capital

To date, It have been developed various deffinitions of intellectual capital among which the most commonly acceptable definition seprates IC into three components of human capital (HC), structural capital (SC) and costumer capital (CC) [5]. the definitions of these components are as follw:

**Human capital**: according to Sveiby (1997), human capital refers to a capability of diverse activities to create tangible and intangible assets. Stewart (1997) asserted that the primary objective of human capital is to apply innovation in new products and services and to improve business process. Edvinsson and Malone (1997), combining the definitions proposed by Sveiby (1997) and Stewart (1997), considered human capital as knowledge, skill and creativity and ability of individual employees in an enterprise.

**costumer capital**: it is defined as all the resources linked to external relationsheeps of organization including business relationship with costumers, suppliers and participants in research and development plans. Costumer capital is that part of human capital and structural capital engaging in business relationsheeps with stakeholders (investors, creditors, costumers and suppliers) along with their understanding and feeling aboat business [11]. In fact, costumer capital is a factor necessary to convert IC to value. Costumer capital is also called relationsheep capital (RC) or capital employed (CE) alternatively. we use capital employed hereafter to refer to costumer capital.

**structural capital**: Sveiby (1997) and Edvinsson and Malone (1997) mentioned that structural capital includes internal structure of an organization involving franchises, ideas, patterns and administrative systems. It can be referred to every thing in organization which supports employees in their works. This kind of capital as a supporting infrastructure enables human capital to fullfill its tasks.

Pulic (1998, 2000) developed the "Value Added Intellectual capital Coefficient" (VAIC$^{TM}$) to measure the IC of companies and many researchers such as Williams (2001), Firer and williams (2003), Chen et al. (2005), Tan et al. (2007), Kamath (2008), Kiong Ting and Lean (2009), Maditions et al. (2011) and Chu et al. (2011) used it in their works. He is concerned with two other important aspects of valuation and value creation yet unsolved by other methods:

(1) Market-based IC value cannot be calculated for companies that are not listed on the stock market. Such companies need an alternative way to determine their market-based IC value.

(2) There is no adequate system of monitoring the efficiency of current business activities performed by employees, or whether their potential is directed towards value creation or value destruction.

The VAIC$^{TM}$ method is designed to provide information about the value creation efficiency of tangible and intangible assets within a company. The model starts with a company's ability to create value added (VA). VA is the difference between sales (OUT) and inputs (IN) and is represented by the model 1:

$$VA = OUT - IN \tag{1}$$

OUT includes revenues from sale of merchandises and services and IN encompasses all costs incurring in generating that revenues except for salaries and wages of employees. Notice that in calculating value added, salaries and wages expenses are ignored. In other word, due to active role of employees in value creation process, intellectual capital potential (represented by salary and wage expenses) is not considered as expense. Consequently, a key aspect of

Pulic model is to respect employees as a value creator component in business enterprise. The next phase in calculating Value Added Intellectual Coefficient (VAIC$^{TM}$) is to calculate human capital efficiency with respect to creating value for business enterprise. Model 2 illustrates how to calculate human capital efficiency (HCE):

$$\text{HCE} = \frac{\text{VA}}{\text{HC}} \qquad\qquad (2)$$

In this equation, HCE, VA, and HC are human capital efficiency coefficient, value added, and total salary and wage expenses of employees respectively.

The third stage includes calculation of structural capital efficiency (SCE) in which structural capital (SC) is divided by value added (VA) as demonstrated in model 4. (SC) is also calculated through model 3. SCE is more strictly defined as structural capital efficiency in creating value added.

$$\text{SC=VA-HC} \qquad\qquad (3)$$

$$\text{SCE} = \frac{\text{SC}}{\text{VA}} \qquad\qquad (4)$$

The fourth stage in measuring and evaluating IC, is to calculate capital employed efficiency (CEE). CEE can be calculated using model 5 in which abbreviations CEE and CE are capital employed efficiency and capital employed, including book value of net assets, respectively.

$$\text{CEE} = \frac{\text{VA}}{\text{CE}} \qquad\qquad (5)$$

Finally, the VAIC$^{TM}$ is the total of HCE, SCE, and CEE which illustrated in the following equation as model 6:

$$\text{VACI}^{TM}\text{=HCE+SCE+CEE} \qquad\qquad (6)$$

## 4. research hypotheses

According to traditional accounting, the book value of an organization is exclusively calculated through financial dtatements. However, in this process, the value of one of the most important assets (IC) of every organization can not be calculated from coservative financial statements of accounting system. The outcome of this short seeing appears in divergence between book value and market value of organization. In other words, market, in calculating value of every organization, takes into account intangible assets of organization in addition to assets listed on the left side of the balance sheet. Usualy the market value of a firm is significantly higher than its book value. Then, it is reasonably assumed that the greater the IC, the higher the ratio of market-to-book value [8]. Owing to this argument it is hypothesized:

1. IC affects positively the market value of comoanies. In other words, value added intellectual capital coefficient (VAIC$^{TM}$) has a significantly positive relationsheep with the ratio of market-to-book value (M/B) of the firms.

Considering the IC components, the above hypothesis comes to deal with the three components of IC as follow:

2. Human capital efficiency (HCE) contributes positively to the market value of companies.
3. Structural capital efficiency (SCE) contributes positively to the market value of companies.
4. Capital employed efficiency (CEE) contributes positively to the market value of companies.

The hypotheses 5 to 8, respecting the works done by Riahi-Belkaoui (2003), Tan et. al (2007), maditions et al. (2011) in which they indicated that IC and its components have a positive impact on performance measures, have been developed as follow:

5. VAIC$^{TM}$ contributes positively to the performance measures of companies including return on assets (ROA), return on equity (ROE) and growth revenues (GR).

6. Human capital efficiency (HCE) contributes positively to the performance measures of companies including return on assets (ROA), return on equity (ROE) and growth revenues (GR).
7. Structural capital efficiency (SCE) contributes positively to the performance measures of companies including return on assets (ROA), return on equity (ROE) and growth revenues (GR).
8. Capital employed efficiency (CEE) contributes positively to the performance measures of companies including return on assets (ROA), return on equity (ROE) and growth revenues (GR).

## 5. research variables

The objective of this research is to evaluate IC impact on market value and performance. Moving towards this objective, the research hypotheses have been classified into two groups so that the first group deals with IC effect on market value and the second one is concerned with IC contribution to financial performance. With respect to the research hypotheses, the research variables have also been classified into two categories. In every group, IC and its threefold components are independent variables but in the first group M/B ratio and in the second group ROA, ROE and GR ratios are designated to be dependent variables. Research variables are in accordance with maditions et al. (2011) whose names and how to calculate are summarized in table 1.

Table 1. variables description

| Variable name | description | abbreviation |
|---|---|---|
| Value added intellectual coefficient | Model (6) | VAIC$^{TM}$ |
| Human capital efficiency | Model (2) | HCE |
| Structural capital efficiency | Models (3) and (4) | SCE |
| Capital employed efficiency | Model (5) | CEE |
| Market to book value | Market value divided by book value of common stock | M/B |
| Return on assets | Net income divided by average total assets | ROA |
| Return on equity | Net income divided by average stockholders equity | ROE |
| Growth revenues | [Current year sale /last year sale] - 1 | GR |

## 6. Researh population and sample

The research population includes companies listed in Tehran stock exchange. No especial sampling method was used, yet, in order to control industry type, 60 companies belonging to three industries of pharmaceutical products (23), chemical products (14) and automobile and parts products (23) whose data availability during the period of 2009 to 2012 were screened, have been selected as research sample. The reason advocating our selection is that, these three types of industries contain the largest number of companies in comparison with other industries.

## 7. findings

identical to Tan et al. (2007), Kamath (2008), Kiong Ting and Lean (2009) and Maditions et al. (2011), the multiple regression has been utilized in order to evaluate the impact of IC and its components on market value and performance measures of sample firms. The research findings have been presented in tables 2, 3 and 4.

The results arising from hypotheses verification using data from pharmaceutical industry demonstrated that hypotheses 1, 2, 4, 5, 7 and 8 are valid and acceptable (presented in table 2). Precisely stated, M/B ratio is significantly and positively affected by IC (VAIC$^{TM}$) and its components except for SCE. Company performance, stated in terms of ROA, is under the

influence of VAIC$^{TM}$ and SCE. In the same vein, ROE is influencey by VAIC$^{TM}$,SCE, and CEE but GR is not correlated to IC and its components at al.

The hypotheses verification among chemical indusrty (presented in table 3) indicated that empirical data analysis supports the hypotheses 2, 4, 5, 6, 7 and 8, suggesting that IC, as an aggregate measure, is not able to affect market value in a significant way. However, some of its components including human capital efficiency and capital employed efficiency contribute to it significantly. Moreover, it can be inferred that VAIC$^{TM}$ can only affect ROA in a significantly positive manner. Regarding IC components, human capital efficiency and structural capital efficiency have the capability of influencing ROA positively. Finaly, capital employed efficiency affects only ROE in the same way as other components of IC. And again, similar to empirical results derived from data analysis in pharmaceutical industry sector, none of the IC and its components indicators can associate with GR.

**Table 2. regression results in pharmaceutical industry**

| Dependent variable | Independent variables | β Coefficient | P-Value |
|---|---|---|---|
| M/B | VAIC$^{TM}$ | 0.252 | 0.007 |
| | HCE | 0.370 | 0.000 |
| | SCE | 1.186 | 0.557 |
| | CEE | 1.753 | 0.000 |
| ROA | VAIC$^{TM}$ | 0.025 | 0.010 |
| | HCE | -0.028 | 0.184 |
| | SCE | 0.378 | 0.000 |
| | CEE | -0.072 | 0.087 |
| ROE | VAIC$^{TM}$ | 0.039 | 0.034 |
| | HCE | 0.001 | 0.977 |
| | SCE | 0.620 | 0.002 |
| | CEE | 0.292 | 0.000 |
| GR | VAIC$^{TM}$ | 0.034 | 0.156 |
| | HCE | -0.001 | 0.983 |
| | SCE | 0.469 | 0.450 |
| | CEE | 0.073 | 0.524 |

**Table 3. regression results in chemical industry**

| Dependent variable | Independent variables | β Coefficient | P-Value |
|---|---|---|---|
| M/B | VAIC$^{TM}$ | 0.046 | 0.232 |
| | HCE | 0.072 | 0.049 |
| | SCE | -0.798 | 0.192 |
| | CEE | 2.926 | 0.000 |
| ROA | VAIC$^{TM}$ | 0.013 | 0.000 |
| | HCE | 0.008 | 0.000 |
| | SCE | 0.191 | 0.000 |
| | CEE | 0.004 | 0.852 |
| ROE | VAIC$^{TM}$ | 0.203 | 0.484 |
| | HCE | 0.283 | 0.384 |
| | SCE | -2.364 | 0.664 |
| | CEE | 11.484 | 0.003 |
| GR | VAIC$^{TM}$ | -0.001 | 0.977 |
| | HCE | -0.030 | 0.425 |
| | SCE | 0.960 | 0.134 |
| | CEE | -0.545 | 0.221 |

Table 4 presents the empirical results arising from testing hypotheses related to automobile and parts manufacturing incustry. Briefly, the results prove the significant

relationship between IC and its components (excluding structural capital efficiency) with market value and ROA, between IC and its components with ROE and finally between IC and human capital efficiency with GR. It is worth noting that except for the negative effects of human capital efficiency on ROA and ROE, the other mentioned relationships are positive. These negative correlations are contrary to the results related to other two industries and also to the results regarding the relationships between the other variables. The reason can be found in the fact that investors cosider salaries payable to employees as an expense rather than an asset [2,5].

**Table 4. regression results in automobile and parts manufacturing incustry**

| Dependent variable | Independent variables | $\beta$ Coefficient | P-Value |
|---|---|---|---|
| M/B | VAIC$^{TM}$ | 0.316 | 0.000 |
| | HCE | 0.361 | 0.008 |
| | SCE | 0.602 | 0.563 |
| | CEE | 0.350 | 0.005 |
| ROA | VAIC$^{TM}$ | 0.024 | 0.000 |
| | HCE | -0.027 | 0.034 |
| | SCE | 0.293 | 0.000 |
| | CEE | 0.000 | 0.987 |
| ROE | VAIC$^{TM}$ | 0.566 | 0.000 |
| | HCE | -0.741 | 0.000 |
| | SCE | 5.121 | 0.000 |
| | CEE | 0.589 | 0.000 |
| GR | VAIC$^{TM}$ | 0.055 | 0.004 |
| | HCE | 0.096 | 0.002 |
| | SCE | 0.062 | 0.788 |
| | CEE | 0.024 | 0.402 |

## 8. Discussion and Conclusion

The present study attemped to measure IC and investigate its effects on market value and performance evaluation measures including return on assets, return on equity and revenue growth among three different industries involving pharmaceutical produts, chemical products and automobile and parts manufacturing industries. In order to measure IC, the pulic model was utilizad and susequently, using multiple regression, the effects of IC and its components on market value and performance measures were invesstigated. The results obtained are briefly as follow:

In contrast to the results illustrated by maditions et al. (2011) and chu et al. (2011), in pharmaceutical products and automobile and parts manufacturing industry, market value is significantly and positively affected by IC and its components, except for structural capital efficiency and, moreover, consistent with their results, in chemical products industry, IC has not any significant relationship with market value, but, some of its components including human capital efficiency and capital employed efficiency have significantly positive relationship with market value indicator. Accordingly, it can be concluded these relationships are slightly affected by industry rype.

Regarding IC effects on performance, the following significant relationships have been observed:

In pharmaceutical products industry, relationsheeps between IC (aggregate measure or VAIC$^{TM}$) with ROA and ROE, between SCE with ROA and ROE and finally between CEE and ROE.

In chemical products industry, between IC, HCE and SCE with ROA and between CEE and ROE.

In automobile and parts manufacturing industry, between IC and all of its componensts except CEE with ROA, between IC and all of its componenets with ROE and between IC and

HCE with GR. All of the above-mentioed correlations are significantly positve ones excluding the significanty negative correlations between HCE with ROA and ROE in automobile and parts manufacturing industry. The reason justifying the latter results rests with the fact that investors cosider salaries payable to employees as an expense rather than an asset.

Generally, according to the results regarding the efects of IC and its components on performance measures, it can be argued that predetermined association of IC and its components to performance measures are not affected by industry type. The results are substantially consistent with the results obtained by Riahi-Belkaoui (2003), Tan et al. (2007) and Kiong Ting and Lean (2009) and also inconsistent with Kamath (2008) and Maditions et al. (2011).

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