

The relationship between intellectual capital and value-based performance measurement variables (Case study: automotive industry companies of Iran)

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Abstract. This study aimed to investigate the relationship between intellectual capital and value-based performance measurement variables of automotive companies operating in Iran in the period 2008-2014 and it was found that efficient use of material and intellectual resources is effective on value-based performance measurement indicators. Also, the efficiency of human capital impacts on economic value added, market value added and value-added cash and the efficiency of capital employed impacts only on the economic value added and has a negative impact on cash value and market value added. Finally, the efficiency of the capital structure had a negative impact on all three indicators of financial performance. Given the results of the auto industry's market in Iran, less attention to the use of financial resources in the design and creation of processes, systems and working infrastructure has been paid. The attention of Iran's Automotive Industry Company to the human capital performance than the human capital performance employed and structural capital is greater and it can be said that for more profitability, this industry must consider all three components of intellectual capital.

Keywords: Intellectual capital, value-based performance measurement variables, economic value added, cash value added, market value added

1. INTRODUCTION

The intangible aspects of the economy today is established on intellectual capital and its first and original material is knowledge and information. Organizations, to participate in the market today, in any form and type, needs knowledge and information to improve their performance [13]. In today's knowledge-based societies, intellectual capital efficiency used is much more important than the financial capital efficiency employed. This means that in contrast to the intellectual capital, the role and importance of financial capital in determining sustainable profitability has been significantly reduced. In other words, it can be assumed that there is a direct relationship between the amount of intangible assets and knowledge to companies on the one hand and the real value of intellectual capital (and finally the stock market value of companies) [2]. In a knowledge-based organization, knowledge constitutes of a large part of the value of a product as well as its wealth. Traditional accounting methods based on tangible assets and information related to the operation of the organization are insufficient to value their intellectual capital that is the largest and most valuable asset. Therefore, the intellectual capital approach for organizations that want to be well aware of the value of its performance is more comprehensive [25]. Knowledge-based business requires a new approach that comprises intangible assets such as knowledge and competence organization of human resources, innovation, relationships with customer, organizational culture, systems, organizational structure, etc. The theory of intellectual capital has attracted the attention of academic researchers and organizational practitioners [16]. In this study, it is tried to specify the amount and type of relationship between intellectual capital and value-based performance measurement variables due to the importance of the three measured parameters, including EVA, cash value added and market value added.

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2. RESEARCH LITERATURE

Intellectual Capital

Intellectual capital provides and a new source and base from which organizations can compete. IC is a term for combining intangible assets markets, human assets and property structure that enables the organization to carry out its activities. In other words, intellectual capital is adding knowledge of the organization members and the application of their knowledge [8]. Stewart (1994) considers intellectual capital as packed useful knowledge, including organizational processes, technologies, patents, skills of employees, information related to customers, suppliers and stakeholders. Brookings raises another comprehensive definition of intellectual capital. It is a combination of intangible assets that enable the company to continue performing his functions. This definition provides basic important discussions for understanding the intellectual capital [14]. Intellectual capital can be defined as a resource that is formalized, obtained and relied on that creates assets with higher value. Intellectual capital implies intellectual material such as knowledge, information, intellectual property and experience that can be used to create value [9]. Intellectual capital is divided into two categories of human capital and structural capital. Bilateral relations exists between the two.

Human capital

Human capital represents the knowledge of an organization's members [3]. Roos also argues that employees create intellectual capital through competence, attitude and intellectual agility [21]. Also, Broking believes that human assets of an organization include the skills, expertise, problem-solving ability and leadership styles [5]. Combined knowledge includes skills, innovations, inherent ability of people, tasks, knowledge, wisdom, expertise, direct perception and ability to understand the scientific tasks and goals [15].

Structural Capital

This capital is, in fact, the organization's capacity to transport and store the items intellectual capital that flows in the organization and through the organization [23]. Capital structure has the knowledge that is remained in the firm, but human capital has individual organization members. Unlike human capital, structural capital can be owned and traded. Structural capital is the infrastructure of human capital and in turn human capital helps to develop the structural capital. Structural Capital includes all non-human reservoirs of knowledge that consists of databases, organizational charts, instructions executable processes, strategies, action plans and in general everything its worth for the organization is higher than its material value [22]. Chen and colleagues also believe that the structural capital can support staff to achieve optimal mental performance and mental performance to help business organizations [6].

Economic Value Added

EVA indicator is based on value-based thinking to control the total value created in a business. EVA is generally an assessment of internal performance. Economic value added indicator deals with expressing the challenges that companies face with in measuring the financial performance. EVA states economic profitability by measuring the profit after deducting the expected return on equity [19].

Market Value Added

How to assess the corporate performance from the market is compared based on the market value of debt and the market value of stocks with the capital invested in the company [19]. The difference between the total market value of the business unit and its economic capital is called market value added [11].

Cash value added

Cash value added, represents the wealth generated in a fiscal period by financial funders (shareholders and lenders), government employees and the company. Total dividends paid to shareholders, paid to lenders, salaries paid to employees, taxes paid to the state and the remaining cash to the Company's operations in a fiscal period represents the cash value added distribution [17].

Literature Review

Anvari Rostami and Seraji (2005) examined the relationship between intellectual capital and market value of stocks of the companies listed on Tehran Stock Exchange. Using five methods to assess intellectual capital in the period 1987-2003, they concluded that among the measurement methods provided, the two methods have higher correlation with the stock market value [2].

Ghelichkhani and Moshabaki (2007) evaluated the role of social capital in the development of their intellectual capital by using a questionnaire. The research findings represents a significant and positive relationship between social capital and intellectual capital. In other words, with the development of social capital, intellectual capital in the human, structure and communication dimensions has been increased [10].

Asadi, Rahmani and Rashid (2009) examined the relationship between intellectual capital and their market value. Using a statistical analysis performed, the relationship between the coefficients of efficiency of intellectual capital and the ratio of market value to book value was achieved positive and significant. Also, the relationship between these three dependent variables of coefficient of efficiency of physical capital, human capital efficiency coefficient and structural capital efficiency coefficient and independent variable ratio of market value to book value is positive and significant [1]. According to the results achieved by Samadi and Motiie (2006), it was found that there is a significant relationship the intellectual capital with earning before interests and taxes, operating cash flow and value added that earning before interests and taxes has a higher correlation coefficients with intellectual capital [24].

Firer and Williams (2003) examined the relationship between efficiency of intellectual capital value added, human capital and structural capital with profitability, productivity and market value of companies listed on the JSE. Using correlation and linear regression analysis, the results suggest that intellectual capital is the most important structure determines the performance of these companies [7].

O.Donnel and et.al (1995) adopted a case study to measure corporate value on intellectual capital. Their studies showed that the chief executive and financial sector believe that 60% of the value of the company is formed by intellectual capital and more than 50% by human capital, while internal and external structural capital are 30 and 20 percent [18], respectively (Jui-Chi Wang (2008). In the study entitled the relationship between intellectual capital and the market value of a company in the electronics industry in the United States with 893 sample companies and their regression model, it was concluded that there is a positive relationship between intellectual capital and market value of a company. The electronics companies in the United States are aware of and enthusiastic in this regard and use intellectual capital to invest in their markets [12].

3. RESEARCH HYPOTHESES

The main hypothesis

Intellectual capital impacts performance measurement variables based on value in the automotive industry companies.

Secondary hypotheses

1. The human capital variables affect value-based performance measures.
2. The structural capital affects value-based performance variables.
3. The capital employed affects value-based performance measurement variables.
4. The coefficients of intellectual value-added affects value-based performance measurement variables.

Statistical population and sampling

In this study, financial statements and notes attached to the companies of Iran's automotive industry companies for a period of six years from 2008 to 2014 were studied.

In this study, among the statistical population without sample-making, the following companies have been selected as the statistical sample:

1. The fiscal year ends in March 29.
2. It should be not the part of investment companies and banks and monetary and credit institutions.
3. It has the information required to carry out research within the period.
4. It should not be changed in the fiscal year during the study period.

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Only 15 companies were remained with the above conditions, which the performance of each company in each year was considered as an observation, and it can be said that the final sample of the study is 105 companies.

Research Method

This study was descriptive and is an applied research in terms of objective since this study was to evaluate the status of variables by means of collecting data from past data, it is classified as post-hoc descriptive studies. The purpose of this study was to measure the performance of financial and intellectual capital in the automotive industry in Iran as well as studying their effect on performance measurement variables based on the value of companies in the industry. In this study, for the following reasons, Palic's value added intellectual coefficient model for measuring intellectual capital is used.

- The basis for measurement in this method is stable and standard so that it makes possible the comparison of large samples in different industries which other methods of intellectual capital are limited as follows.
- They use information that are specific to some companies or nations.
- The use unique financial and non-financial indicators advantage that cannot be easily combined into a single comprehensive measure.
- All data used in this procedure are extracted from the audited financial statements. Therefore, calculations are objective and can be addressed.

For this purpose, according to Palik method, the intellectual capital of each of the companies in the sample for the period was first calculated and at the next stage, primary and secondary research hypotheses were tested.

Data collection method

The data required in this study has been collected using "Rahavard Nowin" software, including official financial reports (balance sheet, profit and loss) and annual financial statements and explanatory notes with companies through the Tehran Stock Exchange site and Kadal site. Due to an increase in managers' understanding on the role of intangible assets in creating competitive advantages, several ways to measure intellectual capital have so far been created.

4. RESEARCH FINDINGS

Descriptive statistics

The results obtained from descriptive analysis of the data is presented in Table 1. The number of observations in the present study is 105 years. These observations are resulted from combining the data of 15 companies listed in the stock as cross-sectional data during the 7 years (2008 to 2014) as the test period. For example, according to Table 1, the average economic value added of the sample companies was 0/193. The mean to this variable is equal to 0/170. Standard deviation that is a measure to determine the distribution of data is equal to 0/133. Given the elongation factor (2/510), the curve is more pronounced of the normal distribution with respect to the coefficient of skewness (17/23), skew curve is directed to the right. According to the results of jarque-bera statistics in Table 1, all model variables are normally distributed.

Table 1. Descriptive statistics of independent, dependent and control variables.

Variables	EVA	CVA	MVA	VACA	STVA	VAHU	VAIC	DR	FS
average	0/193	0/014	25/535	0/144	0/014	20/507	0/153	0/114	5/147
Median	0/170	0/012	0/3186	0/123	0/011	0/2586	0/017	0/102	0/3186
sd	0/133	0/009	0/075	0/024	0/145	0/004	0/178	0/108	0/058
Stretching	2/510	7/249	2/609	5/512	4/417	7/223	6/203	4/115	6/256
Skewness	17/23	88/429	12/414	15/220	18/851	22/762	21/430	56/120	21/401
jarque-bera	3/5319	5/141	9/2716	4/119	3/270	8/272	5/834	3/169	7/226
prob	0/016	0/008	0/026	0/017	0/009	0/014	0/011	0/008	0/012

EVA: economic value added, CVA: cash value added, MVA: market value added, VACA: The efficiency of capital employed, STVA: Structural capital efficiency, VAHU: Human capital performance, VAIC: Value added intellectual coefficient, DR: debt ratio, FS: firm size

Inferential statistics

Test the hypothesis

First, the relationship between intellectual capital and economic value added and its constituents using the following model is examined.

$$EVA = a_0 + a_1VACA + a_2VAHU + a_3STVA + a_4 k_1 + a_5k_2 \tag{1}$$

Multiple regression was used to examine the hypotheses. As can be seen in Table-2, only the efficiency of human capital has a significant positive correlation with economic value added and the relationship between capital efficiency employed and effectiveness of structural capital is negative and among the control variables, only the variable k2 (firm size) has a significant positive correlation with economic value added.

Table 2. The results of regression.

MC	T test		CD	F test		variable
	sig	TS		sig	TS	
28/122	0/0576	1/256	0/781	0/008	12/015	C
-2/521	0/529	-0/449				VACA
0/874	0/007	2/951				VAHU
-26/144	0/012	-2/862				STVA
-34/125	0/009	-1/479				K1
0/177	0/002	1/648				K2

CD: Coefficient of determination, Sig: Significance level, MC: Model coefficients, TS: Test statistic, K1: debt ratio, K2: firm size.

Then, the relationship between the cash value added and intellectual capital and its constituents using the following model are discussed and the efficiency of the capital structure is negatively related to cash value added.

$$CVA = b_0 + b_1VACA + b_2VAHU + b_3STVA + b_4 k_1 + b_5k_2 \tag{2}$$

As can be seen in Table-3, the efficiency of capital employed as well as the efficiency of human capital has a significant positive correlation with cash value added. Also, two control variables of k1 (debt ratio) and k2 (firm size) have significant positive correlation with cash value, and according to their beta coefficients, k1 has the greatest explanatory power than k2, physical and human capital to cash value added.

Table 3. The results of regression.

MC	T test		CD	F test		variable
	sig	TS		sig	TS	
41/741	0/283	1/785	0/629	0/064	4/562	C
2/088	0/822	0/326				VACA
1/415	0/014	2/113				VAHU
-80/785	0/127	-1/652				STVA
10/543	0/556	0/481				K1
0/899	0/114	1/236				K2

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Then the relationship between the market value added and intellectual capital and its constituents using the following model is discussed.

$$MVA = c_0 + c_1 VACA + c_2 VAHU + c_3 STVA + c_4 k_1 + c_5 k_2 \quad (3)$$

As can be seen in Table 4, among the components of intellectual capital, only human capital efficiency has a positive and significant impact on the market value and among the control variables, k2 shows a significant positive correlation with regard to the beta coefficient k2, it shows the greater the explanatory power than human capital.

Table 4. The results of regression.

MC	T test		CD	F test		variable
	sig	TS		sig	TS	
32/994	0/355	2/056	0/754	0/009	5/897	C
-10/245	0/324	-1/421				VACA
1/015	0/011	2/569				VAHU
-21/285	0/511	-0/485				STVA
-70/216	0/004	-3/695				K1
1/771	0/023	3/226				K2

Finally, the relationship between the three criteria for assessment of performance based on the value of intellectual value added based on the following model is examined.

$$\text{Dependent variable (EVA, CVA, MVA)} = d_0 + d_1 VAIC + d_2 k_1 + d_3 k_2 \quad (4)$$

In reviewing the impact of intellectual value added coefficients on market value added, it is found with respect to the Tables-5, that intellectual value added coefficients has a significant positive correlation with economic value added and market value added, but its relationship with cash value added was negative and not significant.

Table 3. The results of regression (dependent variable EVA).

MC	T test		CD	F test		variable
	sig	TS		sig	TS	
6/845	0/061	1/546	0/822	0/00	16/165	C
0/400	0/007	2/632				VAIC
-30/546	0/006	-3/458				K1
0/658	0/012	2/225				K2
The results of regression (Dependent variable CVA)						
MC	T test		CD	F test		variable
	sig	TS		sig	TS	
-10/556	0/388	-0/645	0/589	0/018	5/156	C
0/955	0/051	2/365				VAIC
24/665	0/385	1/143				K1
0/798	0/186	1/669				K2
The results of regression (Dependent variable MVA)						
MC	T test		CD	F test		variable
	sig	TS		sig	TS	
15/875	0/211	1/461	0/297	0/114	1/052	C
-0/845	0/146	-1/649				VAIC
-62/365	0/089	-1/746				K1
1/285	0/065	2/354				K2

CD: Coefficient of determination, Sig: Significance level, MC: Model coefficients, TS: Test statistic, K1: debt ratio, K2: firm size

5. DISCUSSION AND CONCLUSION

The study aimed to investigate the relationship between intellectual capital and value-based performance measurement variables in automotive industry companies in Iran. The results of multiple regression analysis indicated that only structural capital efficiency has a negative relationship with economic value added, market value added and cash value added. In explaining this negative correlation, it should be said that attention to the efficiency of the capital structure will reduce performance indicators wasting the costs in the automotive industry companies, i.e. the companies that are looking to maximize the economic value added, market value added and cash value added are usually show more efforts to efficient use of structural capital. On the other hand, companies that care about structural capital may show less attention on the use of human resource knowledge and capabilities. The findings prove that structural capital performance with indicators of value-based performance measurement in automotive industry is negative and in fact, this is the performance of human capital which has a greater impact on indicators of performance measurement. These findings are consistent with theories of, Bonetis et.al [4] and Riahi [20] indicating that there is a positive relationship between company’s intellectual capital and performance. Also, given the more effective control variables on economic value added, it can be said that the automotive industry market was not so sensitive to the ability of companies in profitability through intellectual property. In general, according to the results, the attention of automotive industry companies to the performance of human capital is more than the performance of the capital employed and structural capital. It can be said that this industry should have all three components of intellectual capital for more profitability. The results also showed there is a significant difference between intellectual capital coefficients in different automotive industry companies.

6. RECOMMENDATIONS

This study has significant implications for managers of the auto industry and researchers interested in the subject of intellectual capital as well. First, the performance of automobile industry companies in using the ability and knowledge of employees was more than the capital efficiency employed and structural capital. It can be said that the auto industry companies have not an effective and desirable use of physical capitals, infrastructures and business processes. Second, it is necessary that intellectual capital indicators are included in the company's financial report and made available to those who need these information to decide on investors. Third, it seems that companies in the automobile industry forget other fields when considering a field. For example, when the skills and knowledge of staff are concerned, efficient use of material resources and facilities and reduce and control of costs are forgotten, while considering all three

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fields can be led to growth and flourishing of these companies in the competitive environment. Fourth, this study helps automotive industry companies to calculate their intellectual capital performance using the methodology of intellectual value added coefficient and compare it with material efficiency performance and incorporate them to clarify and inform shareholders and investors in their financial statements. For future research, it is recommended that the analysis be conducted in various industries and compared with other industries.

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