THE EFFECTS OF INTELLECTUAL CAPITAL ON FIRM PERFORMANCE OF INDUSTRIAL SECTOR IN JORDAN

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Abstract

Purpose of the study: This paper aims to examine whether intellectual capital (IC), measured through the value-added intellectual coefficient (VAIC[TM]) affects the firm performance of the industrial sector in the Amman Stock Exchange (ASE).

Methodology: The sample comprised 50 industrial companies listed in ASE over the period 2008-2017. The methodology included estimating the impact of IC, measured through VAIC[TM] and its components on the market to book ratio (M/B) and earning per share (EPS). Research hypotheses were tested through the display of descriptive statistics, multicollinearity, normality tests, correlation matrix, and multiple regression models.

Main Findings: The results indicate a positive relationship between VAIC[TM] with the M/B ratio and EPS. As for the M/B ratio, the result is a positive significant relationship for the CEE but not for the SCE, and HCE. However, the results are counterproductive for EPS and found HCE, and SCE has a significant impact on the EPS but CEE not significant.

Applications: The results suggest that industrial companies in Jordan must hold practical and knowledge experiences because it is vital for their competitive advantage, and must reduce unemployment rates by employing new employees with expertise and skills. The present study integrates previous methodologies in order to investigate the relationships between IC and firm performance of industrial companies listed on the ASE.

Novelty/Originality of this study: This study extends previous studies on intellectual capital and firm performance in Jordan by incorporating more samples and the latest period of study. In addition, it also shed some new findings on the effect of intellectual capital on the M/B ratio and EPS.

Keywords: Intellectual Capital, Industrial Sector, Earnings Per Share, Market to Book Ratio, Value Added Intellectual Coefficient.

INTRODUCTION

Traditionally, firms are focusing on the importance of tangible assets to generate wealth (Pulic, 1998). The changing nature of the business environment has been the shift from the industrial age to the information age, which depends on the knowledge, and skills of the firm's employees and their intellectual creativity or human capital (HC), structural capital (SC), and relational capital (RC), along with tangible assets (Stewart & Ruckdeschel, 1998).

Until now, there is no exact definition of IC, given the diversity of its nature. Sullivan, (2000) supported that IC represents the company's ability to convert the knowledge into tangible profit or monetary value. The definition of IC that is used in the current study follows that of Pulic (2008): the people or the employees who have the knowledge and the ability to transform this knowledge to the new products or to create value for the company.

The IC components are HC, SC, and RC (Petrash, 1996), with percentages 36% HC, 29% SC, and 35% RC respectively (Ramanauskaitė & Rudžionienė, 2013). HC depends on a variety of variables that include the number of the company's employees, the employee's education, and years of experience in the company's fieldwork (Lee & Lin, 2018). HC is a firm's ability to get benefits from the employee's knowledge, skills, and experience, innovations (Andreeva & Garanina, 2016). While SC is all "things done by the employee for the advantage of the firms and it stays inside the firms when employees go home" (Momani & Nour, 2019). According to (Lee & Lin, 2018; Martí, 2003) RC is the relationship between the company and its customers, suppliers, shareholders, and banks including all the marketing strategies of the company and its related trademarks and others.

There are more than 60 ways to classify and measure the IC, one of them is the VAIC[TM] model proposed by (Pulic, 1998). It measures the value creation efficiency by using accounting numbers from the companies annual reports (Pulic, 2000). This method combines the CEE, HCE, and SCE to measure the firm's performance (Pulic, 2000, 2004, 2008). Therefore, this method does not measure the value of IC itself but it measures the efficiency of an IC, in terms of financial and physical capital impact on the performance of the firms (Edvinsson, 1997; Ulum et al., 2014). The concept of this method depends on the Skandia Navigator partially (Nazari & Herremans, 2007). The main idea of the Skandia

Navigator is that IC is the difference between market value and capital employed in the company whereas the IC is equal to HC plus SC (Edvinsson, 1997).

Many researchers have studied the relationship between IC and firms' performance, (Girma, 2017) found a significant positive relationship between VAIC^{TM} and return on assets (ROA), as well as return on equity (ROE) for Ethiopian commercial banks during the period 2009-2013, (Nadeem et al., 2018) also found a significant positive relationship between VAIC^{TM} and M/B ratio, ROA, and ROE. Sedeaq Nassar, (2018) found that VAIC^{TM} shows a significant positive impact on ROA, ROE, and EPS before the crisis in Turkish real estate companies over the period 2004-2015. Smriti & Das, (2018) found a positive relationship between VAIC^{TM} and Indian firm performance, HC had a major impact on firm productivity during 2001 and 2016, SCE and CEE were equally important contributors to the firm's sales growth and market value.

Meanwhile, studies about VAIC^{TM} in Jordan are still limited. Al-shubiri, (2011) studied the relationship between VAIC^{TM} and corporate performance of commercial banks in Jordan and the results show a positive significant relationship with M/B. Haan et al., (2016) studied the relationship between VAIC^{TM} and ROA ratio and ROE for 20 industrial companies in Jordan and found a positive and significant effect of VAIC^{TM}, HCE, and CEE on ROA and ROE. On the other hand, (Momani & Nour, 2019) found a negative impact between VAIC^{TM} and ROE of commercial banks in Jordan, but a positive impact between components of VAIC^{TM} with ROE of Jordanian banks through the period 2010–2015.

The main objective of this paper is to examine the relationship between IC, measured through VAIC^{TM} and its components with the performance of industrial companies listed on ASE in Jordan. The next section discusses the methodology, followed by the results/discussion. The final section addresses the conclusion.

METHODOLOGY

The present study outlines the following objectives:

1. To examine the relationship between VAIC^{TM} and firm performance of the industrial sector in ASE.

2. To examine the relationship between VAIC^{TM} components and firm performance of the industrial sector in ASE.

To achieve the above-stated objectives, the following research questions are put forward:

1. What is the relationship between VAIC^{TM} and firm performance of the industrial sector in ASE?

2. What is the relationship between VAIC^{TM} components and firm performance of the industrial sector in ASE?

Figure 1 displays the conceptual framework for this study. The independent variables are IC which measured by VAIC^{TM} that consists of three components: CEE, HCE, and SCE. The dependent variable is firm performance, being measured through Market to Book ratio (M/B) and Earnings per Share (EPS).
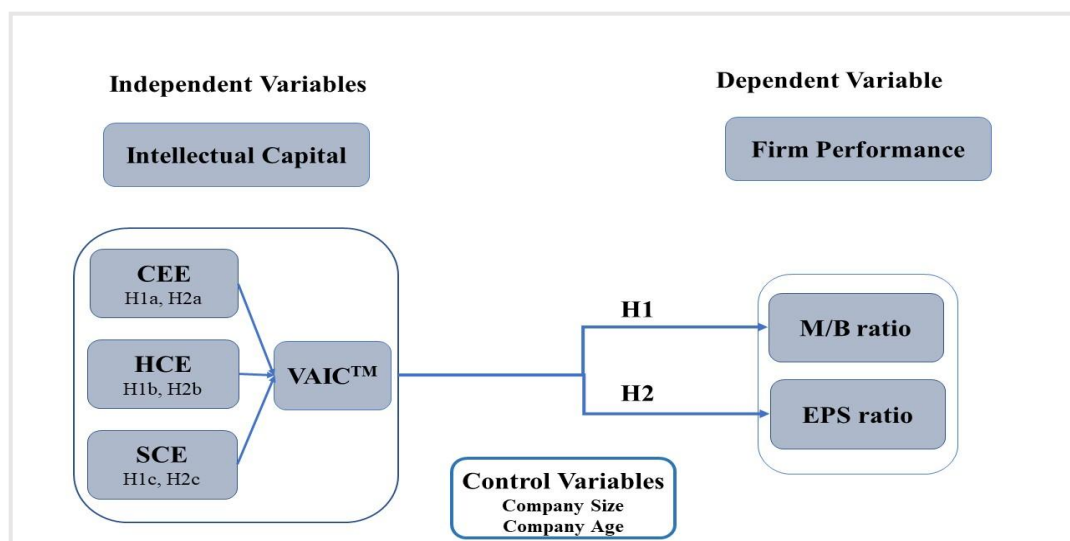

Figure 1: Conceptual Framework

To find answers for the previous questions, the following hypotheses have been developed:

1. H1: VAIC^{TM} has a significant relationship with the M/B ratio in the industrial sector in ASE.

This hypothesis extends to three sub hypotheses as follows:

H1a: CEE has a significant relationship with the M/B ratio in the industrial sector in ASE.

H1b: HCE has a significant relationship with the M/B ratio in the industrial sector in ASE.

H1c: SCE has a significant relationship with the M/B ratio in the industrial sector in ASE.

2. **H2:** VAIC^{TM} has a significant relationship with the EPS ratio in the industrial sector in ASE.

This hypothesis extends to three sub hypotheses as follows:

H2a: CEE has a significant relationship with the EPS ratio in the industrial sector in ASE.

H2b: HCE has a significant relationship with the EPS ratio in the industrial sector in ASE.

H2c: SCE has a significant relationship with the EPS ratio in the industrial sector in ASE.

Pulic, (2000, 2004, 2008) mentions that a suitable tool to measure the value creation in the knowledge economy is the value-added (VA) because it measures the productivity for every type of work at the company's level. VA is measured as the difference between all companies' revenue from sold products/services (OUT), and all the expenses, except employee expenses (IN). In order to find the VAIC^{TM} there are five steps to be followed:

Step (1) find VA:

$$VA_{it} = OUT_{it} - IN_{it} \tag{1}$$

Where, VA it = Value Added of the company i in year t.

OUT it = Output of the company i in year t. IN it = Input of the company i in year t.

So, the formula of VA by the next equation, (Asadollahi & Niazian, 2013; Belkaoui, 2003):

$$VA\ it = OP\ it + EC\ it + D\ it + I\ it + Div\ it + T\ it \tag{2}$$

OP it = operating profit of company i in year t. EC it = Employee cost (employee expenses) of the company i in year t. D it = Depreciation of company i in year t. It = Interest of company i in year t. D it = Dividend of the company i in year t. T it = Tax of company i in year t.

Step (2) find HCE:

$$HCE_{it} = VA_{it} / HC_{it} \tag{3}$$

HCE it = Human Capital Efficiency of the company i in year t. HC it = Human Capital determine by total salaries and wages of the company i in year t.

Step (3) find SCE:

First found

$$SC_{it} = VA_{it} - HC_{it} \tag{4}$$

Where SC it = Structural Capital of the company i in year t.

Second found SCE is measured, (Pew Tan et al., 2007; Pulic, 2008; Sherif & Elsayed, 2016)

$$SCE_{it} = SC_{it} / VA_{it} \tag{5}$$

Where SCE it = Structural capital Efficiency of the company i in year t.

Step (4) find CEE:

$$CEE_{it} = VA_{it} / CE_{it} \tag{6}$$

Where, CEE it = Capital Employed Efficiency of the company i in year t. CE it the book value of company i in year t.

Step (5) find the value of VAICTM is estimated as the following equation:

$$VAIC_{it}^{TM} = CEE_{it} + HCE_{it} + SCE_{it} \tag{7}$$

Whereas, the dependent variables are M/B ratio is used to estimate a company's current market value compared to its book value, M/B is measured by the market value divided by the book value of the common stock (Chatzoudes et al., 2011). While EPS is the profit of shareholders divided by the number of shares with outstanding ordinary shares (Chang & Hsieh, 2011; Gibson, 2011).

Control variables are used to minimize external influences that may affect the relationship between intellectual capital and firm performance (Hill et al. , 1996). This paper contains two control variables; the size Natural Logarithm of Total Assets (LNTA), and the company age.

This study is conducted on the industrial companies listed on ASE, with a total of 50 companies' period over 2008-2017. Data is collected from several sources: (1) the main source is the website for ASE (2) from companies' annual reports of 2008 to 2017, which are available and collected from companies' websites. Companies that have outliers are excluded from the sample so the final observations over the period are 464.

The models tested for this study are:

Model 1: $M/B_{it} = \alpha_0 + \beta_1 \text{VAIC}^{TM}_{it} + \beta_2 \text{LNsize} + \beta_3 \text{Age} + \varepsilon_{it}$ (Fixed effect).

Model 2: $EPS_{it} = \alpha_0 + \beta_1 \text{VAIC}^{TM}_{it} + \beta_2 \text{LNsize} + \beta_3 \text{Age} + (u_i + \varepsilon it)$ (Random effect).

Model 3: $M/B_{it} = \alpha_0 + \beta_1 \text{CEE}_{it} + \beta_2 \text{HCE}_{it} + \beta_3 \text{SCE}_{it} + \beta_4 \text{LNsize} + \beta_5 \text{Age} + \varepsilon_{it}$ (Fixed effect).

Model 4: $EPS_{it} = \alpha_0 + \beta_1 \text{CEE}_{it} + \beta_2 \text{HCE}_{it} + \beta_3 \text{SCE}_{it} + \beta_4 \text{LNsize} + \beta_5 \text{Age} + (u_i + \varepsilon it)$ (Random effect).

RESULTS/DISCUSSION

This section presents the results of the empirical analysis with discussion. Firstly, it presents the descriptive statistics and analysis; secondly, it illustrates the regression analysis for the models, with comments.

Table 1: Descriptive Statistics & Multicollinearity

Variable	Obs	Mean	Std. Dev.	Min	Max	VIF	1/VIF
Independent variables							
VAIC^TM	464	1.090851	0.447161	0.47748	1.7917	1.27	0.785
HCE	464	1.02616	0.63374	0.11093	2.50787	2.60	0.384
SCE	464	-0.00002	0.09461	0.638162	0.955129	2.53	0.395
CEE	464	0.306294	0.225237	0.021497	0.873476	1.26	0.794
Control variables							
Size	464	16.50316	1.358569	11.94746	20.63084	1.29	0.776
Age	464	25.19612	14.92567	1	66	1.04	0.958
Dependent variables							
M/B	464	1.178728	0.784646	0.33	3.45		
EPS	464	0.037437	0.147857	-0.27	0.33		

VAIC^TM = Value added intellectual coefficient. HCE = Human capital efficiency. SCE = Structural capital efficiency. CEE = Capital employed efficiency. M/B = Market to book ratio. EPS = Earnings per share. Size = Firm size. Age = Firm age.

Table 1 presents the descriptive statistics for the IC efficiency measures, firms' performance and control variables. The results indicate overall years. The mean for M/B ratio is 1.18; indicating that investors generally value the company that market value in excess of the book value of net assets. Also, 15.163% of the market value is not reflected in financial statements:

Hidden Value = [(1.178728 – 1) / 1.178728] * 100 = 15.163%

Comparison of component VAIC^TM found that CEE (0.31; standard deviation = 0.23), HCE (1.03; standard deviation = 0.63), and SCE (-0.00; standard deviation = 0.09), during 2008-2017, that indicate the industrial companies in Jordan mostly effective in generating value from its HC rather than other components. These results are consistent with previous studies, such as (Al-shubiri, 2011) but the finding contradicts previous studies for example (Sedeaq Nassar, 2018) who found the main component in VAIC^TM is SCE. Previous studies support this finding that emphasized the existence of an increasing gap between the M/B value of companies (Chatzoudes et al., 2011; Pouraghajan et al., 2013; Kamath, 2015; Nuryaman, 2015; Suhendra, 2016; Smriti & Das, 2017).

Multicollinearity: Table 1 shows that VIF value is less than 10 (Hair et al., 2014). This suggests that there is no collinearity within the independent variables of the study.

Before hypotheses testing, the Pearson correlation was executed to test the correlation among the variables problem occurs if the correlation among independent variables is above 0.90 (Tabachnick & Fidell, 2013; Dalila et al., 2019).

Table 2 shows the Pearson Correlation among the independent variables. All the correlation coefficients among the independent variables in the correlation matrix are less than 0.90, except the correlation between VAIC^TM and two

variables, HCE 0.9551, and SCE 0.8104 and this is not a problem because each variable of them is formulated in a separate regression.

Table 2: Correlation Matrix

variables	VAIC^{TM}	HCE	SCE	CEE	SIZE	AGE
VAIC^{TM}	1					
HCE	0.9551*	1				
SCE	0.8104*	0.7617*	1			
CEE	0.4306*	0.3888*	0.4269*	1		
SIZE	0.4387*	0.4538*	0.3925*	0.2087*	1	
AGE	-0.1204*	-0.0956*	-0.0942*	0.0722	0.0669	1

The present study adopts the econometric analysis using panel data that combines time-series and cross-sectional data to examine the numbers and regression model of variables study. There are three models in panel data. To examine the effect in study regression models, the research depended on the model related to panel data as following:

1. Pooled Regression Model (PRM)

2. Fixed Effect Model (FEM)

3. Random Effect Model (REM)

Lagrange Multiplier was applied to select the effective model from PRM and REM, While the Hausman test was applied to decide the appropriate model from FEM and REM, (Nwakuya & Ijomah, 2017). Table 3 represents the results of these tests.

Table 3: Lagrange and Hausman Test

Model	Lagrange Multiplier		Hausman		Appropriate Model
	Chi^2	Sig.	Chi^2	Sig.	
1	825.84	0.0000	8.85	0.0314	Fixed effect
2	231.66	0.0000	2.94	0.4012	Random effect
3	625.16	0.0000	24.18	0.0002	Fixed effect
4	237.27	0.0000	5.54	0.3539	Random effect

Lagrange Multiplier test, to select an appropriate model (PRM) and (REM)
H0: PRM is more consistent than REM
Hausman test, to select an appropriate model (FEM) and (REM)
H0: REM is more consistent than FEM

Table 4 presents the results considering H1, H2, (Models 1 and 2), the result of the analysis supports these hypotheses because there is a positive linkage between VAIC^{TM} and firm performance ($p < 0.05$). As seen in table 5, the explanatory power of models 1, and 2 are minimal. Moreover, the results reveal that VAIC^{TM} is significant and positively associated with M/B and EPS. This indicates that an increase in IC is a positive effect on firm performance.

In model 1, VAIC^{TM} and control variables interpret 3.98% of the variance in M/B, a positive sign as shown in the F value of 15.76. The values of VAIC^{TM} 14.57% indicate that VAIC™ contributes to profitability prediction but the value is very low. The results in the present paper are lower than previously studied according to (Murale et al., 2010) but (Chu et al., 2011) found the relationship between VAIC^{TM} and M/B ratio not significant, besides the coefficient for VAIC^{TM} negative.

Therefore, the low level of the IC of the company will decrease the level of investors' confidence in the company's management, and future prospects of the company. While, (Sedeaq Nassar, 2018), studied the impact of VAIC^{TM} on the firms' market performance M/B ratio. The results show that there is no impact between VAIC^{TM} and M/B ratio. Another study by (Firer & Stainbank, 2003) found the impact of VAIC^{TM} on the MB for 65 South African industrial companies listed on the Johannesburg Securities Exchange in 2001. However, they found that VAIC^{TM} does not significant with M/B ratio. It indicates the VAIC^{TM} cannot contribute to the forecast of the M/B ratio.

In model 2, VAIC^{TM} control variables interpret 38.9 % of the variance in EPS, a positive sign as shown in the Chi^2 value of 80.32. An examination of values coefficient 20.19% indicates that VAIC^{TM} contributes to profitability prediction also has a very low.

Moreover, the relationship between EPS and VAIC^{TM} in previous studies such as (Ahmad & Ahmed, 2016; Pew Tan et al., 2007), found the" a" positive significant impact of VAIC^{TM} on the EPS. There are no previous studies examined the relationship between VAIC^{TM} and EPS ratio on the industrial companies in Jordan.

Table 4: Multiple Regression between VAIC^{TM} and Firm Performance

	Model 1 M/B		Model 2 EPS	
Variables	Coefficients	t-statistic	Coefficients	Z-stat
Constant	-2.445998	-3.45*	-.1342969	-1.08
VAIC^{TM}	0.1457339	2.52*	0.2019524	7.92*
SIZE	0.1524928	3.95*	-0.0060343	-0.74
AGE	-0.0095251	-1.32	0.0019952	2.48*
F (chi^2) value	15.76		80.32©	
Sig. F (chi^2)	0.0006		0.0000©	
R^2	3.98%		38.9%	
N of Obs	464		464	
No of groups	49		49	

*, ** Correlation is significant at 5%, and 10% levels respectively. © chi2

VAIC^{TM} is Value added intellectual coefficient, log size is firm size, age is firm age.

Table 5 presents the last two models, which show the relationship between VAIC^{TM} components and M/B and EPS ratios. The analysis revealed that CEE has a significant positive impact which represents 45.9 percent of the M/B variance, however, HCE and SCE do not have any significant effect on it. But the results are completely counterproductive for EPS and found HCE, and SCE has a significant impact on the EPS, which represents 4.33, 2.64 percent respectively of the EPS variance and CEE not significant. Overall models are significance, nevertheless, its ability to explain the overall variability in the M/B ratio is low; about 5.64%, and EPS 39.13%.

Table 5: Multiple Regression between VAIC^{TM} components and Firm Performance

	Model 3 M/B		Model 4 EPS	
Variables	Coefficients	t-statistic	Coefficients	Z-stat
Constant	-1.986128	-3.15*	.0328786	0.26
HCE	-.0217244	-0.35	.0930712	4.33*
SCE	.342821	1.71	.3091392	2.64*
CEE	.4591194	2.53*	.1038898	1.36
SIZE	.1336144	3.99*	-.0100677	-1.29
AGE	-.0137986	-1.97**	.0016922	1.81**
F (chi^2) value	16.56		92.70©	
Sig. F (chi^2)	0.0003		0.0000©	
R^2	5.64%		39.13%	
N of Obs	464		464	
No of groups	49		49	

*, ** Correlation is significant at 5%, and 10% levels respectively.
© chi^2. HCE= Human capital efficiency. SCE= Structural capital efficiency. CEE= Capital employed efficiency. M/B= Market to book ratio. EPS= Earnings per share.

Previous studies also found insignificant between M/B and HCE and SCE (Yilmaz & Acar, 2018). The findings contradict previous studies, (Smriti & Das, 2017; Ghosh & Maji, 2015; Firer et al., 2003) indicate a positive relationship between HCE and M/B ratio. Overall, all models are positive signs, but the ability to explain the overall variance in the EPS ratio is small at about 39.13%.

CONCLUSION

This study examined the effects of IC on value and performance in Jordanian industrial companies listed in ASE over the period 2008-2017. The study selected two dependent variables; first one, for market value M/B ratio, and the other EPS for financial performance. Firstly, two models of dependent variables are applied with VAIC^{TM}. Then another two models also applied with VAIC^{TM} components that include HCE, SCE, and CEE.

The M/B ratio is used to compare between market and book value for the companies. Despite their significance, the model with VAIC^{TM} has a low capacity to justify the M/B ratio changes with R² 3.98%. The main reason for this problem comes from the complexity of the decision-making processes of traders in ASE. Since they depend on companies' financial information, and other information such as industrial issues, interest rate, and the political situation, etc. Besides, the CE has an effect on the investors' decisions, and therefore it impacts the M/B ratio positively and substantially.

EPS is considered as one of the main firm performance indicators that are positively influenced by VAIC^{TM}, HCE, SCE, and CEE. Generally, the model EPS is a powerful R^2 with VAIC^{TM} and its components 38.9% and 39.13% respectively. This is because the EPS is powerfully related to the balance sheet and income statement like independent variables. In addition, HCE, CSE, and CEE considered as measures for HC, SC, and CE and EPS is efficient. It is an expected result as they are significantly related to the balance sheet and income statement.

According to the results, amongst the components of multiple factors model, the most influential explanatory variable was CEE, then SCE and finally HCE. HCE has the lowest effect in explaining both elements of the company's value and performance because of the deteriorating economic situation in Jordan and high unemployment rates which reached 18% in the last quarter of 2018 according to Jordanian Central Bank 2019.

The study recommends the following:

1. There is increasing interest in IC which is required for measurement method and needs to disclose it in the financial statements.
2. The industrial companies in Jordan must hold practical and knowledge experiences because they are the basis of competitive advantage.
3. Unemployment rates can be reduced by employing new employees with expertise and skills.
4. It suggests providing physical capital and maintains it from theft and embezzlement in addition to providing SC of equipment and programs that support the productivity of employees.

STUDY LIMITATION

The main limitation of this study is that the time period of study comes between crisis and Arab Spring. Further studies can be conducted by applying VAIC^{TM} for all companies in all sectors in ASE, which is financial, services, and industrial sectors.

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