

The Effect of Value Added Intellectual Coefficient on Firms' performance: Evidence from Jordanian Industrial Sector

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Abstract

This study aimed to investigate the effect of intellectual capital measured by value added intellectual coefficient (VAIC) and its components on the firms' performance, based on a sample of 20 Jordanian industrial company contribution during the period 2009-2014. The study used two measures of performance; namely, return on assets (ROA) and return on equity (ROE), while independent variables included VAIC and its components; human capital efficiency (HCE), structural capital efficiency (SCE) capital employed efficiency (CEE), in addition to the firm size and leverage ratio.

The results showed that there is a positive and significant effect of VAIC, HCE and CEE on ROA and ROE, while SCE have no effect on the performance of Jordanian industrial companies. The study recommended the need to address the intellectual capital intensively to be one of the most important considerations in the company.

Keywords: intellectual capital, value added intellectual, return on assets, return on equity, , structural capital efficiency,

Preface

Post of the Industrial Revolution, the concept of physical capital had a great popularity as, for several decades, the belief that the wealth of nations are made up of physical resources only prevailed. After the information technology revolution, the rising of the importance of information, and the increasing role of knowledge and the ability of individuals to generate knowledge, the human factor became the real influencing factor in the success of institutions and societies. Thus, new economic concepts emerged based on knowledge, which led to the emergence of the concept of intellectual capital.

The concept of intellectual capital was originated by (Ralph Stayer), the Director of Johnsonville Food Company, as he is the first one who used the term intellectual capital in 1990. He argued that the concept of the wealth of nations and companies has been turned from the focus on natural resources to focus on the physical capital, then giving way to the intellectual capital (Al-Mafraji and Saleh, 2008:14).

In view of the intense competition brought by globalization, there is widespread recognition that intellectual capital is the decisive force that drives the economic growth (Huang and Liu, 2005). There is also a general recognition that intangible assets, such as knowledge and relationship with the customers, which constitute the intellectual capital, is the driving force for business success in the knowledge economy, as well as in the changing and complex global business environment, in addition to the role of intellectual capital in creating sustainable competitive advantages for companies (Kaplan and Norton, 2004: 4). Moreover, measuring the efficiency of these assets is still a challenge at both the macro and micro economy, especially the accounting systems and traditional measures of performance focus intensively on the financial and physical resources and the lack of information on the performance of intellectual capital (Makki and Lodhi, 2009).

The increasing gap between the market value of the companies and their book value resulted to increase the interest of researchers, such as (Lev, 2001) and (Lev and Radhakrishnan, 2003), to make attempts to explore the invisible value which does not appear in the financial statements. (Lev, 2001:9) argued that the book market value of the companies listed on the standard & Poor's stock increased from 1 to 5, which means that 80% of the market value of the companies do not appear in their financial reports. This emphasizes that the source of economic value is not due to the physical capital only, but to the intellectual capital as well.

A number of researchers pointed out that the methods of developing the performance at business organizations have major changes in the light of the growing importance of intellectual capital, to be turned from the focus on the organizational or physical factor, to focus on the human factor and the interest in the intellectual capital (Arif, 2010).

Accordingly, this research aims to investigate the effect of the value added of the intellectual capital on the performance of Jordanian public shareholding companies during 2009-2014.

1. The Research Problem

The problem of the study is represented in the blurred effect of the intellectual capital on the performance of Jordanian public shareholding companies during the period 2009-2014. The global trends over the last two decades turned from the focus on the physical capital to intellectual capital. On the other hand, although the great importance of the financial statements to show the real position of the company, but such financial statements remain unable to explain the gap between market value and book value of the company, reflecting that the source of economic value is not due to the physical resources registered in the financial statements only, but also to the intellectual capital which is invisible value in the financial statements. In more details, it can be said that this study seeks to answer the following questions:

1. What is the impact of the intellectual capital represented in the intellectual value added coefficient on the performance of Jordanian public shareholding companies?
2. What is the impact of the intellectual value added coefficient components represented in the human capital, structural, and coefficient efficiency on the performance of Jordanian public shareholding companies?

2. The Objectives of the Study:

This study aims to:

1. Find out the impact of intellectual capital represented in the intellectual value added coefficient on the performance of Jordanian Public Shareholding Industrial Companies.
2. Find out the impact of the intellectual capital value added components represented in the human capital, structural, and coefficient efficiency on the performance of Jordanian shareholding industrial companies.

3. The Hypotheses of the Study

1. H₀: There is no statistical significant impact of the intellectual value added coefficient (VAIC) on the performance of Jordanian industrial companies.
2. H₀: There is no statistical significant impact of the human capital efficiency (HCE) on the performance of Jordanian industrial companies.
3. H₀: There is no statistical significant impact of the structural capital efficiency (SCE) on the performance of Jordanian industrial companies.
4. H₀: There is no statistical significant impact of the capital employed efficiency (CEE) on the performance of Jordanian industrial companies.

4. Previous Studies

Many previous studies examined the measurement of intellectual capital through the intellectual value added coefficient (VAIC) and its impact on the corporate performance. The studies conducted in Jordan examined the impact of intellectual capital on the performance of Jordanian companies in the various sectors; for example the study conducted by (Bishtawi and Bani Taha, 2014) to examine the impact of intellectual capital on the profitability of drug companies applied to a sample of a Jordanian pharmaceutical company consisting of (11) drug companies. The study used the questionnaire method as an instrument to collect information. The number of questionnaires returned was (80). The results showed that the intellectual capital and its components play a large and effective role in improving the profitability of drug companies.

Another study conducted by (al-Shaykh, 2012) to investigate the effect of intellectual capital on corporate performance by applying to a sample consisting of (23) insurance company listed in Amman Stock Exchange during the period (2007-2012). The results showed a positive relationship between human capital and capital employed with the performance of return on assets (ROA) and return on equity (ROE).

The objective of study conducted by (Baggash, 2012) to find out the companies efficiency in using its intellectual capital and its impact on the company performance based on a sample consisting of (73) Jordanian industrial companies during the period (2006-2010). The study found that there is a positive relationship between the profitability of the industrial companies and human capital and creative capital, in addition to a positive relationship between components of intellectual capital and productivity of Jordanian industrial companies and their market value.

As for Foreign Studies, many studies have examined the impact of intellectual capital on the performance of companies in different countries, where the study conducted by (Brandt et al., 2015) aimed to clarify the relationship between intellectual capital and profitability based on a sample consisting of (14) Brazilian banks during the period (2007-2013). The results showed that the intellectual value added coefficient is positive correlation with the profitability indicators represented in the rate of return on investment, and the rate of return on the equity.

Another study conducted by (Xinyu, 2014) investigated the relationship between intellectual capital and the corporate performance by using a sample consisting of (144) Chinese company and (114) Western companies during the period (2010-2012). The study found out that there is a positive correlation between the capital

employed, human capital and performance of Chinese corporates, while there was a more positive correlation between human capital and the performance of Western companies.

The study of (Rossi and Celenza, 2014) aimed to examine the effect of intellectual capital efficiency on the financial performance of the companies applied to a sample consisting of (23) Italian industrial shareholding companies during the period (2002-2011). The results of the study showed that there is a positive impact of intellectual value added coefficient on all corporate performance measures.

The study conducted by (Fathi et al., 2013) aimed to examine the relationship between intellectual capital and the financial performance based on a sample consisting of (49) Iranian companies in Tehran Stock Exchange (TSE) for the period (2001-2010). The study found out that there is a positive effect of the intellectual and structural capital on the three financial performance measures, as well as there is a positive impact of the capital employed and human capital on the return on the equity and return on assets.

The study conducted by (Gigante, 2013) to examine the impact of the intellectual capital on the performance of banks based on a sample consisting of (64) banks in nine European countries during the period (2004-2007). The study found that there is a positive effect of the intellectual value added coefficient on the return on assets and return on the equity.

The study of (Javornik et al., 2012) aimed to test the relationship between intellectual capital and the financial performance of the corporate by applying on a sample consisting of more than (12000) companies in Slovenia during the period (1995-2008). The study concluded that the intellectual value added coefficient has a positive effect on the return on assets and return on equity as well as on sales ratio of assets. It also concluded that the human capital efficiency, structural capital efficiency and capital employed efficiency have a positive effect on the return on assets and return on equity; and the structural capital efficiency and the capital employed have positive impact on the ratio of assets sales.

The study conducted by (Al-Shubiri, 2011) aimed to investigate the relationship between the efficiency of intellectual value added coefficient components and the performance indicators applied on a sample consisting of (14) Jordanian commercial banks listed on the Stock Exchange of Amman during the period (2002-2007). The regression analysis used by the study, it was found that there is an impact of the structural capital on most Jordanian commercial banks performance indicators.

A study conducted by (Ahangar, 2011) examined the relationship between intellectual capital and the financial performance of the corporates by applying on one Iranian company during the period (1984-2009). The study found that there is an impact of the intellectual capital components (human, structural and capital employed) on the return on the assets and an effect of human capital and capital employed on the return on the employee productivity and income growth.

A study conducted by (Clarke et al., 2010) aimed to examine the effect of intellectual capital on the corporate performance based on a sample consisting of (2161) Australian companies listed in Stock Exchange of Australia during the period (2003-2008). The study concluded to different set of results, most notably, there is an effect of the efficiency of the capital employed and human capital on the rate of return on assets and the growth rate of revenues and employee productivity, while the structural capital has an effect on the rate of return on equity.

A study conducted by (Nazari, 2010) examined the relationship between the components of the intellectual capital and the financial performance of the corporate based on a sample consisting of (775) American company during (1996-2006). The results showed that there is an effect of the intellectual capital components on the rate of return on assets and the rate of return on the equity, while there was no impact of these components on sales change.

The study of (Zeghal and Maaloul, 2010) aimed to test the effect of intellectual value added coefficient on the market and financial performance of a sample consisting of (300) British company listed on the London Stock Exchange. The study used a set of dependent variables, most notably include the return on sales, rate of return on assets, and the ratio of market value to the book value, and financial leverage, the size of the company. The study found through the regression analysis that there is a positive impact of intellectual capital on all corporate performance measures, but the capital employed, however, was the most influential element on the performance.

The study of (Puntillo, 2009) tested the relationship between the intellectual value added coefficient and the financial performance based on a sample consisting of (21) banks listed in Milan Stock Exchange during the period (2005-2007). The study concluded that there is a positive effect of the capital employed efficiency on the return on the investment and return on assets, while this variable was had a negative impact on the ratio of the market value. The results showed no impact of human capital efficiency and structural capital efficiency on the return on investment and return on assets.

5. The Theoretical Aspect of the Study

1. *The Concept of Intellectual Capital and its Significance*

The intellectual capital is defined as the difference between the market value of the company and the cost of replacing its assets. It is among the things that you cannot be priced or valued; such as experience, knowledge

and the company's ability to learn (Bontis, 1996). According to this definition, it can be said that the market value of certain company is equal to the book value plus the intellectual capital, whereas the book value normally constitutes only a simple fraction of the wealth. The intellectual capital includes many things beyond the forms of intellectual property, such as patents and rights Copyright, as it comprises sum of knowledge, experience, relationships, processes, discoveries and innovations, presence in the market and impact on the society (Miller, 1999).

The intellectual capital also defined the cognitive value of the Organization; its key components are human capital, structural capital, and customer capital. This definition indicates that knowledge management causes the creation of the intellectual capital (Bassi, 1997). A study conducted by (Hansen et al., 1996:106) defined intellectual capital as the competitive assets that working on the creative and strategic development process based on creativity and innovation, which is deemed the key of survival in a changing work environment.

(Shehab 2010:58) defined the intellectual capital as the useful knowledge of the organization that can be employed and converted to a value through the interaction between human capital and structural capital available to the organization. (Al-Sayyed 2013:19) defined the intellectual capital as the ownership of knowledge, practical experience, productive skills, and technology which give the human resources of the organization more competitive superiority to other organizations. (Abdul Rahman 2014:25) defined the intellectual capital as a set of intangible resources, including human resources, organizational and relationships. It is not concentrated in a particular administrative level. If managed effectively it would achieve several benefits to the organization; such as strengthening competitiveness capacity, generate and grow wealth and create value added to the organization.

The International Accounting Standards Committee (IASC) defines the intangible assets in IAS No. (38) as "identifiable assets, non-monetary, have no physical existence which are kept for the use in the production or can be rented to third parties or used in administrative purposes. The US Accounting Standards Board (FASB) defined intangible assets in the Standard No. (141) as the assets that have no physical existence, which is not a financial instrument or financial asset, but are inherently long term assets, which means the assets that can be identified individually out of fame (Ghareeb 2011:13).

The importance of intellectual capital can come from being the most important source of wealth for any organization, it is considered the main source of creating the economic wealth, and it is the motivating factor for future innovations and profit growth (Khattab, 2006). The effective management of the intellectual capital may be the final determiner of the organizational performance because the success of organizations requires investment in the intellectual assets and the intellectual capital is one of the most important sources of competitive advantage of the contemporary organizations because the concept of excellence may be achieved through intellectual production which comes from research, development, innovation and providing new products (Yusuf, 2005:38). Thus, the ability of corporates to compete in global markets relies heavily on achieving greater levels of added value through the investment in intellectual capital (Zeghal and Maaloul, 2010).

II. *Components and Elements of Intellectual Capital*

Several researchers proposed a set of components that, as a whole, make up the intellectual capital. For example, (Bontis, 1998) divided the intellectual capital into three elements, namely; the human capital, structural capital and capital relationships. While (Lovingsson et al, 2000), divided the intellectual capital into human capital, structural capital which consists of customer capital and organizational capital. (Tovstiga , 2009:73) showed that the best classification of the intellectual capital must include the human capital and structural capital only, because all previous classifications are in the structural capital or take one of its forms. Through the foregoing, the intellectual capital can be divided into three elements or essential components as follows:

1. **Human Capital:** includes all company workers, their skills and knowledge, so that the company receives their contributions to work without being owned directly by the company, thereby increasing the uncertainty about that element, which makes the company's management to reduce turnover rate of the workers through training and development to achieve the greatest possible benefit. The intellectual capital is deemed the most difficult capital that can be measured because it is not consistent with the historical cost principle (Bharesh , 2005: 13).
2. **Structural Capital:** includes the company structure, business strategies and operations, and information systems and databases. The structural capital depends on the human capital because the human capital generates the structural capital. The structural capital can be divided into sub sections, namely (Nazari, 2007:3):
 - a) **Organizational Capital:** includes the philosophy of the organization as well as all systems that lead to show the capabilities of the company.
 - b) **Process Capital:** includes procedures and programs applied by the company in its operation and sales operations.
 - c) **Innovation Capital:** includes intellectual property and intangible assets.

3. **Relational Capital:** It is the ability of the company to interact positively with the community to build value by using human and structural capital. It represents the underlying knowledge that formed as a result of all the relationships that the company formed with external parties; customers, competitors, suppliers and others. Relational Capital serves as a link between human and structural capital, because it consists of an internal part that regulates the relationship between the employees of the company and the management, and an external part which organizes the relationship of the company with the external parties (Ting, 2009: 59).

III. Methods of Measuring the Intellectual Capital

a) *Traditional Measurements of the Intellectual Capital*

The researchers suggested several methods to measure the intellectual capital, including financial metrics and other non-financial metrics. For the financial metrics, a study conducted by (Stewart, 1997:224-229) suggested three financial metrics for the intellectual capital which includes the ratio of market value to the book value, Tobin Q Metric, and intangible value calculated. These will be explained as follows (Stewart, 1997:224-229):

- 1) **Market to Book Ratio:** it assumes that the company value (tangible assets and intangible assets) is the market value of the company, which is the market price per share multiplied by the number of outstanding shares. Therefore, the difference between the book value shown in the balance sheet and the market value of the company gives a rough measure of the intellectual capital. This metric includes several flaws, most notably is that the market shares would be affected by many economic factors not related to tangible or intangible assets of the company, and the company's book value reflects the historical costs which are inconsistent with the real value of the tangible assets (Luthy, 1998).
- 2) **Tobin Q:** The economist James Tobin proposed (Q) metric, which is basically similar to the ratio of market value to book value, but Tobin Q metric uses the replacement cost of the tangible assets rather than the book value of tangible assets. This metric is based on the idea if the value of the company is (1) and more than its competitive companies, then the company will be able to generate higher profits than other similar companies. This is because the company has something unphysical which gives the company such advantage, which is the intellectual capital. Tobin Q value can be calculated through dividing the market value of the company on the replacement cost of assets. The disadvantage of this metric is that it does not provide an accurate measurement to the intellectual capital because it is hard to determine the replacement cost of the assets, in addition the market stock prices are affected by many economic factors (Luthy, 1998).
- 3) **Calculated Intangible Value:** this method of measuring intellectual capital through seven successive steps, which are as follows (Stewart, 1998):
 1. The calculation of the average profit before taxes for three years.
 2. The calculation of the average of tangible assets in the budget for three years.
 3. The calculation of the rate of return on assets by dividing the first step on the second step.
 4. The calculation of the average return on assets for the industry for the same period, compared with the rate of return on assets for the company, if the rate of return on assets of the company is higher than the industry average, it means that the company has a stock of intellectual capital, while if the value is less than the industry average, it means that the company does not have any stock of intellectual capital.
 5. The calculation of the increase in the rate of return on assets of the company compared with the average return on assets for the industry by multiplying the return on assets with the average of tangible assets owned by the company and then subtracts the average of the company profits before tax.
 6. The calculation of the return after tax by multiplying the result from the previous step (1-tax rate).
 7. The calculation of the current value of the output from the previous step by dividing the result on the capital cost to obtain the intangible value which represents the value of the intellectual capital.

Although calculating intangible value has no precise figures which are provided in the balance sheet, but it is useful in many situations; such as the use as a standard index, and its importance to the management in measuring investment in the intellectual capital.

b) *Measuring the Intellectual Capital by using the Intellectual Value Added Coefficient*

Many researchers like (Alipour, 2012), (Dies et al, 2010), (Shiu, 2006) and (Pulic, 2004) argues that the traditional measures of corporate performance, which depends on the accounting income may not suit knowledge economy which considers the intellectual capital as the primary engine of the competitive advantages for companies. This directed towards new measures that meet the requirements and needs of modern companies, resulting to the development of new methods for measuring the intellectual capital.

Based on the foregoing, (Pulic, 1998, 2004) suggested the method of Value Added Intellectual Coefficient which aims to develop a measure of efficiency of the intellectual capital. The value added model is an appropriate tool to measure and manage the process of creating value, and it is a part of the knowledge management in the knowledge economy management system (Pulic, 2000a, 2000b).

Value added Coefficient of the intellectual capital concentrates on measuring the efficiency of achieving the value added from all tangible and intangible resources of the company where the company resources are divided into physical capital, human capital, structural capital, then computing the efficiency of achieving the value added for each of one separately, and then collect the three previous indicators to obtain the value added coefficient for the company as a whole, as follows (Pulic, 2000a, 2000b):

- 1) **Calculating the Value Added of the Company:** it is done through the following equation: $VA = OUT - IN$

Where to VA is the value added of the company, and OUT are the outputs of the company, represented in total sales. Where IN are the inputs of the company represented in all costs of purchasing raw materials, components and services. In the light of the information available in the financial statements of the company, the above equation, for computing the value added, must be modified to be as follows (Sabolovic, 2009:80): $VA = OP + EC + D + A \dots (1)$

Where OP is the operational profit, EC is the staff costs, D is the consumption, and A is the amortizations. According to the study of (Pulic, 2004), the value added of the intellectual capital (VAICTM) consists of the total of two components: the Intellectual Capital Efficiency (ICE), and the Capital Employed Efficiency (CEE). The intellectual capital consists of two elements, namely the Human Capital Efficiency (HCE) and the Structural Capital Efficiency (SCE). We shall explain herein below the calculation mechanisms of these elements (Pulic, 2004):

- 2) **Intellectual Capital Efficiency (ICE)** can be calculated by collecting (HCE) and (SCE) as follows:

$$ICE = HCE + SCE \dots (2)$$

Where to HCE is the Human Capital Efficiency and SCE is the structural capital efficiency. We will explain herein below how to calculate these two elements (Sabolovic, 2009:80):

- A. **Human Capital Efficiency (HCE):** (Pulic, 2000a), explained that HCE can be computed through the value added of the expenditure on personnel as follows: $HCE = VA / HC \dots (3)$

Where HCE is the human capital efficiency and HC are the total salaries and wages.

- B. **Structural Capital Efficiency (SCE):** structural capital (SC) can be calculated by the difference between the gross value added (VA) and human capital (HC) as follows (Sabolovic, 2009:80):

$$SC = VA - HC \dots (4)$$

Structural capital efficiency is measured by the following equation: $CE = SC / VA \dots (5)2$

- Capital Employed Efficiency (CEE):** CEE express the unexplained part of the value added by human and structural capital. The CEE can be measured as follows: $CEE = VA / CE \dots (6)$

Where CEE is the capital employed efficiency and CE is the capital employed represented in the book value of the net assets of the company. Through the foregoing, the (Value added of the intellectual capital coefficient (VAICTM)) can be calculated by collecting the previous items as follows (Sabolovic, 2009:81): $AIC^{TM} = ICE + CEE \dots (7)$

6. Data and Methodology

1. Community and Sample

The community of study consists of all industrial public shareholding companies listed in the stock exchange in Amman, which are (71) company at the end of 2014. The sample of the study included (20) Jordanian industrial public shareholding company which were randomly selected during the period 2009- 2014. The annual financial data of such companies was obtained by relying on the corporates directory issued by Stock Exchange in Amman.

2. Study Model

Through acquaintance to the methodologies used in the previous studies which aimed to know the impact of intellectual capital on corporate performance, in particular study of (Brandt et al., 2015), the study of (Gigante, 2013) and the study of (Javornik et al., 2012), and relying on intellectual value added coefficient model and its components that has been developed by the researchers (Pulic, 2004), as a measure of the intellectual capital, the standard model of this study could be developed as follows :

$$Perf_{i,t} = \beta_1 + \beta_2 VAIC_{i,t} + \beta_3 SIZE_{i,t} + \beta_4 LEV_{i,t} + \epsilon_t \dots (8)$$

Where $Perf_{i,t}$ is the performance metrics of the company (i) during the period (t), which includes two measures; namely, rate of return on assets (ROA) and the rate of return on equity (ROE). $VAIC_{i,t}$ is the intellectual value added coefficient of the company (i) during the period (t), and the remaining independent variables are control variables where $SIZE_{i,t}$ is the company size measured by the natural logarithm of the size of the company (i) assets in the period (t), and $LEV_{i,t}$ is the liabilities of the company (i) in the period (t). Another model can be developed through the previous model, including the components of the intellectual value added coefficients, which are HCE, SCE, and CEE as follows (Javornik et al., 2012):

$$Perf_{i,t} = \beta_1 + \beta_2 HCE_{i,t} + \beta_3 SCE_{i,t} + \beta_4 CEE_{i,t} + \beta_5 SIZE_{i,t} + \beta_6 LEV_{i,t} + \epsilon_t \dots (8)$$

3. Procedural Definitions of the Study Variables

3.1 The Dependent Variables:

- 1) **Average Return on Assets (ROA):** it is the annual net income of a company divided by the total assets (Brandt et al., 2015:455).
- 2) **Average Return on Equity (ROE):** it is the annual net income of a company divided by the total equity (Brandt et al., 2015:455).

3.2 The Dependent Variables:

Independent Variables:

- 1) **Value Added Intellectual Capital Coefficient (VAIC):** it is a measure of intellectual capital based on the company added value which is realized from two sources; namely the intellectual capital and capital employed. The more value of this coefficient indicates the more optimal use of the company resources (Kujansivu and Lonnqvist, 2007:6). This coefficient has been calculated by the following steps (Sabolovic, 2009: 80):

1. Value added calculation (Added Value-VA) by addition of the operational profit (OP), employees costs (EC), depreciation (D), and amortizations (A) according to equation No. (1) as follows:

$$VA = OP + EC + D + A$$

2. Human capital efficiency calculation (HCE) through dividing the value added (VA) on the total salaries and wage (HC) as follows: $HCE = VA / HC$

3. Structural capital efficiency (SCE) is calculated by subtracting the human capital (HC) from the value added (VA) and dividing the output on the added value as follows:

$$SCE = VA - HC / VA$$

4. Capital employed efficiency (CEE) is calculated by dividing the value added (VA) on the capital employed (CE) represented in the book value of the net assets of the company as follows:

$$CEE = VA / CE$$

5. The intellectual value added coefficient (VAICTM) is calculated by adding the previous elements as follows (Sabolovic, 2009:81): $VAIC^{TM} = HCE + SCE + CEE$

2)

he Company Size(SIZE): it is the natural logarithm of total company assets (Shahveisi et al., 2015:814).

- 3) **Liability Enterprise value (LEV):** it is the total debt ratio to total assets (Yu et al. 2010:4).

7. Statistical Analysis Outputs

This section points out the descriptive statistics of the study variables, regression analysis outputs to know the extent of added value impact on the Jordanian industrial companies.

- **Descriptive Statistics:** Table (1) shows the descriptive statistics of the study variables.

Table (1) Descriptive statistics of the study variables during the period 2009-2014

	ROA?	ROE?	HCE?	SCE?	CEE?	VAIC?	SIZE?	LEV?
<i>Mean</i>	0.05864	0.06614	6.18178	0.76744	0.29386	7.24308	7.41273	0.30768
<i>Median</i>	0.04384	0.05158	4.93848	0.79844	0.26725	5.88899	7.22898	0.26420
<i>Maximum</i>	0.2843	0.3836	23.2971	2.1032	0.6378	24.7846	9.0875	0.7697
<i>Minimum</i>	-0.20495	-0.25023	-2.23246	0.05198	-0.06745	-0.85197	6.26100	0.03180
<i>Std. Dev.</i>	0.07153	0.09377	5.07057	0.24040	0.15086	5.22969	0.64704	0.19883
<i>Skewness</i>	0.3722	0.2942	0.7575	0.1176	0.15154	0.0613	0.1489	-0.2824
<i>Kurtosis</i>	2.498	3.122	2.304	1.225	2.474	1.441	1.239	1.983
<i>Jarque-Bera</i>	0.938	0.529	3.238	3.755	1.841	2.859	3.698	1.576
<i>Probability</i>	0.628	0.766	0.198	0.153	0.398	0.221	0.158	0.456
<i>Observations</i>	120	120	120	120	120	120	120	120
<i>Cross sections</i>	20.	20.	20.	20.	20.	20.	20.	20.

- **The Rate of return on assets (ROA):** The average rate of return on assets of the companies involved in the study sample during the period (2009-2014) is about 5.9%, which is ranged from -20.5% to 28.4%, with standard deviation 7.1%. This reflects a significant variation in profitability of Jordanian industrial companies which is clearly shown by the wide range between the highest and lowest value, and the highest value of the standard deviation.
- **The Rate of Return on Equity (ROE):** The average rate of return on the equity of the sample companies during the study period was 6.6%, which ranged from -25% to 38.4% with standard deviation 9.4%. This reflects a significant variation in profitability of Jordanian industrial companies.
- **Human Capital Efficiency (HCE):** The average efficiency of human capital of the sample companies during the study period was about 6.18, which means that each dinar invested in human resources realizes added value to company amounting to 6.18 dinars, which indicates high efficiency of human capital in Jordanian industrial companies. The human capital efficiency ranged from -2.2 to 23.3 with a standard deviation 5.1, reflecting the level of difference of efficiency from one company to another and from one year to another.
- **Structural Capital Efficiency (SCE):** The average efficiency of the structural capital of the sample companies was 0.77, which means that each dinar invested in systems, policies and procedures used is capable to generate added value equivalent to 0.77 dinars. This indicates low efficiency of structural capital in Jordanian industrial companies compared with human capital efficiency. The structural efficiency level ranged from 0.05 to 2.1, with standard deviation 0.24, reflecting the different levels of efficiency from one company to another and from one year to another.
- **Capital Employed Efficiency (CEE):** Average capital employed efficiency of the sample firms was about 0.29, which means that each dinar invested in physical assets of Jordanian industrial companies is capable to generate added value equivalent to 0.29 dinars. It indicates low efficiency of physical capital in general compared to the human capital efficiency and structural capital efficiency. The capital employed efficiency ranged from -0.07 to 0.64 with standard deviation 0.15. This reflects the different levels of efficiency from one company to another and from one year to another.
- **Value Added Intellectual Coefficient (VAIC):** Average VAIC of the sample companies was around 7.24, which means that each dinar invested in physical and non-physical assets of Jordanian industrial companies is capable to generate added value equivalent to 7.24 JD. The coefficient value ranged from -0.85 to 24.8 with a standard deviation 5.2. This reflects different value added intellectual coefficient from one company to another and from one year to another.
- **The Company Size (SIZE):** The average size of the Jordanian industrial companies is about 7.41 logarithm (about 25.9 million dinars), and the size ranged from 6.26 logarithm (1.82 million JD) to 9.08 logarithm (1223 million JD) which reflects a significant variation in the sizes of the Jordanian industrial companies.
- **Liability Enterprise Value (LEV):** The average of the debt ratio of the sample companies during the study period was about 30.1%, and ranged from 3.2% to 77% with standard deviation 19.9%, which reflects the different ratio of debt from one company to another and from one year to another.
- **Other Statistics:** (Skewness and Kurtosis) and (Jarque-Bera) statistics show that the distribution of the dependent and independent variables is normal. The number of views was 120 which reflect the data of 20 companies for 6 years (2009-2014).

Regression Analysis Outputs

This section is designed to test the effect of intellectual value added and its components on the performance of Jordanian industrial companies. Pooled Data Regression analysis method will be used because it is suitable to the nature of the data used in the study, so this method is used whenever the data contained a time series and a cross-sectional.

First: The Outputs of the Regression Analysis of the Testing the Impact of the Value added Intellectual Coefficient on the Corporate Performance

Table (2) shows the results of testing the impact of the regression analysis of the value added coefficient on the performance of Jordanian industrial companies.

Table (2) The Results of Regression Analysis (*) of testing the impact of intellectual coefficient on corporate performance $Perf_{i,t} = \beta_1 + \beta_2 VAIC_{i,t} + \beta_3 SIZE_{i,t} + \beta_4 LEV_{i,t} + \varepsilon_t$

<i>Variable</i>	<i>ROA</i>	<i>ROE</i>
	<i>Coefficient</i>	<i>Coefficient</i>
<i>Constant</i>	-0.0267 (-0.8328)	0.0390 (1.0689)
<i>VAIC</i>	0.0097 (17.9438)***	0.0135 (18.5461)***
<i>SIZE</i>	0.0037 (0.8114)	-0.0077 (-1.4546)
<i>LEV</i>	-0.0427 (-5.0356)***	-0.0409 (-6.2921)***
<i>R-squared</i>	0.8753	0.8378
<i>Adjusted R-squared</i>	0.8721	0.8336
<i>Durbin-Watson stat</i>	1.9034	1.8940
<i>F-statistic</i>	271.4113	199.7514
<i>Prob(F-statistic)</i>	0.0000	0.0000

(*) Method: Pooled EGLS (Cross-section weights)

- Values in parenthesis denote t-statistic.

- ***, **, and * denotes significance at the 1%, 5% and 10% respectively.

- White diagonal standard errors & covariance (d.f. corrected).

It may be noted through the above table that the value added intellectual coefficient has a positive impact and statistically significant at the significance level 5%, which means that increasing the efficiency of intellectual capital improves the company performance by increasing the rate of return on assets (ROA) and return on the equity (ROE). The results did not show any impact of company size (SIZE) on performance indicators. The results showed that the debt ratio has a negative impact with statistical significance on the return on assets (ROE) and return on equity (ROE). The adjusted explanatory power (Adj. R2) of the independent variables was 87% for the variable rate of return on assets, and was 83% for the rate of return on the equity, which is relatively high and reflect the explanatory power of the independent variables in explaining the change in the dependent variable. The statistical value (Durbin-Watson) for serial correlation in the dependent variable values about 1.9, which is close to (2), which means the series correlation has no problem in the values of the dependent variables, thus it confirms the validity and suitability of the data of the study for regression method. Finally (F) value and its importance (Prop. F-statistic) indicates the fitness of the study model.

Second: The Results of Regression Analysis of Testing the Impact of Intellectual Value Coefficient Components on the Performance of the Corporate

Table 3 shows the results of the regression analysis of testing the effect of the three components of intellectual value added coefficient on the performance of Jordanian industrial companies.

Table (3): The results of regression analysis (*) of testing the effect of the intellectual value coefficient components on the performance of the companies

$$Perf_{i,t} = \beta_1 + \beta_2 VAIC_{i,t} + \beta_3 SIZE_{i,t} + \beta_4 LEV_{i,t} + \sigma_t$$

<i>Variable</i>	<i>ROA</i>	<i>ROE</i>
	<i>Coefficient</i>	<i>Coefficient</i>
<i>Constant</i>	-0.1979 (-3.9004)***	-0.1342 (-2.0638)**
<i>HCE</i>	0.0061 (6.4944)***	0.0099 (7.6079)***
<i>SCE</i>	0.0262 (0.9366)	0.0276 (0.6472)
<i>CEE</i>	0.1053 (6.9403)***	0.1028 (4.1635)***
<i>SIZE</i>	0.0255 (3.9182)***	0.0144 (1.7726)*
<i>LEV</i>	-0.0726 (-14.8581) ***	-0.0500 (-8.1494)***
<i>R-squared</i>	0.8811	0.8603
<i>Adjusted R-squared</i>	0.8759	0.8542
<i>Durbin-Watson stat</i>	1.8869	1.8517
<i>F-statistic</i>	168.9175	140.4566
<i>Prob(F-statistic)</i>		0.0000

(*) Method: Pooled EGLS (Cross-section weights)

- Values in parenthesis denote t-statistic.
- ***, **, and * denotes significance at the 1%, 5% and 10% respectively.
- White diagonal standard errors & covariance (d.f. corrected).

It may be noted through the above that there is a positive impact with statistical significance for the human capital efficiency and capital employed efficiency on the rate of return on assets (ROA) and return on the equity (ROE), while the structural capital did not have any impact on metrics of the performance of the Jordanian industrial companies. The results did not show any impact of company size (SIZE) on performance indicators, while the results showed that the debt ratio had a negative impact with statistical significance on the rate of return on assets and rate of return on equity. The adjusted explanatory power (adj.R2) of the independent variables was about 87.6% for the variable of the rate of the return on assets, and reached 85.4% for the rate of return on equity, which is deemed relatively high and reflects the explanatory power of the independent variables in explaining the change in the dependent variable. The statistical value (Durbin-Watson) was close to (2), which means that there is no problem in the serial correlation in the dependent variables, thus it confirms the validity and suitability of the data of the study for the regression method. Finally, (F) value and its importance indicate (Prop. F-statistic) the suitability of the study model (Goodness of fit).

8. Conclusions and Recommendations

The purpose of this study was to test the effect of value added coefficient of intellectual capital and its three components on the performance of the Jordanian industrial companies during the period (2009-2014). The results showed that there was considerable and clear variability in the measures of Jordanian industrial companies' performance during the study period, and it is different from one company to another. The results showed that the human capital efficiency (HCE) was high in the Jordanian industrial companies; while the structural capital efficiency (SCE) and capital employed efficiency (CEE) is relatively low compared to as the human capital efficiency. The value added intellectual efficiency (VAIC) indicated a high added value of human capital in Jordanian industrial companies. The results of the regression analysis showed that the intellectual value added coefficient has a positive impact with statistical significance on the rate of return on assets (ROA) and return on equity (ROE), which means the increase of intellectual capital efficiency improves the performance of the companies. This result is consistent with many previous studies, such as the study of (Brandt et al., 2015) and the study of (Gigante, 2013).

Regression analysis results also showed that the human capital efficiency and capital employed efficiency have a positive impact on the rate of return on assets and rate of return on equity, while the structural capital has no effect on the measures of the performance of the Jordanian industrial companies. This reflects that the human capital efficiency and capital employed efficiency are deemed the most influential elements on the performance, while the structural capital has no impact on the performance of the Jordanian industrial companies, which is consistent with the results of the study of (Xinyu, 2014) and the study of (Shaykh, 2012). Based on the findings achieved, and considering the positive impact of the intellectual capital on the performance of Jordanian industrial companies, this study recommends the need for more focus on the intellectual capital and should be highlighted more, to be one of the most important things taken into consideration by the companies in their different decision makings, developing their strategic, executive plans and work programs.

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