THE IMPACT OF THE INTELLECTUAL CAPITAL COMPONENTS ON FIRM'S PERFORMANCE IN EMERGING MARKETS

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Abstract

The objective of this research is to review, analyse, and provide empirical evidence about the impact of the intellectual capital (IC) characteristics on the firm performance on listed 26 companies in Tunisian Stock Exchange for the years 2010–2019. 260 companies were taken as a sample of this research using the purposive sampling method. The efficiency of intellectual capital was measured using the value added intellectual coefficient (VAIC) method developed by Pulic (2000). The research method used was multiple linear regression analysis. Our empirical analysis substantiates the fundamental role of IC components in improving the financial and stock market performance of listed Tunisian companies. The results obtained on the human capital efficiency variable contribute to improving the market of Tunisian listed companies and confirm the role attributed to human capital in the knowledge economy and even the basic hypothesis of the VAIC method. Investors do not place any importance on the following variables: structural capital, human capital and the efficiency of structural capital during market valuation. Future research is suggested to use cross-country companies as the sample.

Keywords: Human Capital, Structural Capital, Efficiency, Financial Performance, Stock Market Performance

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1. INTRODUCTION

The technological acceleration during recent years has revealed the role played by human intelligence in the organization. This intelligence requires support, specific maintenance and encouragement that facilitate its exploitation and capitalization. The introduction of the intellectual asset concept has sped up the reflection about the place of these assets in the company, their management and the advantages that they can offer to the company (Hussein, 2020). In the context of increasingly open globalization on development, intellectual capital (IC) has become a tool of value creation. In fact, it is becoming more and more important as its role has been strengthened. As a result, a company's value lies in the recognition of IC through its organizational potential and the way in which it manages its capital (Hundal & Eskola, 2020).

The aim of this article is to identify the way in which IC has managed to improve the potential for wealth creation and company's performance. However, organizations may not be aware of the magnitude and importance of their IC for current and future performance. Therefore, the question that arises is what impact IC, as

a source of value creation, has on financial and stock market performance in Tunisian companies.

The resource and skills theory considers IC as a strategic resource used by an enterprise to gain competitive advantage, create value and thus improve its overall performance (Marr, Gupta, Pike, & Ross, 2003; Fiandrino, Rizzato, Busso, & Devalle, 2019). Although empirical tests provided mixed results, it is necessary to study the impact of IC on financial performance while the company's stock market value can provide an explanation of the role of IC in the knowledge economy.

The notion of IC is consistent with resource-based approaches whereby a resource becomes a source of sustainable competitive advantage if it provides value to the company. From this point of view, IC is considered by many researchers to be the main resource for creating added value.

More specifically, the research aims at answering the two following basic questions:

- *RQ1: How does the IC represented by human capital and structural capital positively influence financial and stock market performance?*
- *RQ2: Does the added value of IC represented by the human and structural capital have a positive and significant effect on financial and stock market performance?*

The present study is an attempt to analyse the relation between, on the one hand, the components of IC (human and structural capital) and their efficiency and, on the one hand, the financial and stock market performances of 26 Tunisian firms for the year 2018. Our results confirm the role of IC components in the process of improving the financial and stock market performance of listed Tunisian companies, in accordance with Pulic (2004) who shows that human capital can be considered as a reservoir of knowledge that can provide sustainable future benefits.

The paper is divided into six sections. After this introduction, Section 2 provides an overview of the previous related literature and introduces the hypotheses of the study. Section 3 outlines the data and methodology. Sections 4 and 5 present the empirical findings of the study. Finally, Section 6 discusses the conclusion, limitations and future research opportunities.

2. LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

Intellectual capital is considered to be the crucial factor for the company's survival in the market. Therefore, it is necessary to define this capital, to identify its components and the elements that influence its functioning.

2.1. The components of the intellectual capital

There are several definitions for the concept of IC. According to Schiuma, Lerro, and Sanitate (2008), IC includes intangible assets that are not reported in the financial statements of a business entity. Another more global definition according to Subramaniam and Youndt (2005) is that IC refers to the sum of all the knowledge stocks used by companies in order to gain a competitive advantage. Moreover, according to a new interpretation, IC is a group of knowledge assets held and/or controlled by an organization that leads to the creation of value for the organization. In fact, it is considered a key target for the company's stakeholders.

Moreover, Wang (2008) defines IC as the elements held by the company that it can use to increase its competitive advantage in the market, including knowledge, information, intellectual property rights and experience.

Although there is still a consensus in the literature about the dimensions of IC, many authors, such as Edvinsson and Malone (1997), Bontis (2004), Vergauwen, Bollen, and Oirbans (2007), believe that it has three dimensions: human capital, relational capital and structural capital. In this context, Subramaniam and Youndt (2005) adopted a similar classification, suggesting that the IC includes three basic components: human, organizational and social capital. In our study, IC is subdivided into human, relational and structural capital.

For Edvinsson and Malone (1997), human capital includes skills, experience and individual abilities of the firm's employees. Moreover, it is difficult for the organization to take ownership of this capital. Like any other asset belonging to the company, the employees of this entity are considered a competitive and strategic resource. For this reason, it must be invested in them in the same way as in the tangible fixed assets in order to benefit from them in the future. In fact, human capital is the main organ of the IC (Moon & Kym, 2006). According to Schiuma et al. (2008), this capital includes the employee's knowledge, skills, intelligence, attitude, talent, and behaviour.

Relational capital refers to the value linked to an economic entity created by the relations between the organization and its members, as well as with suppliers, shareholders, and other market players. Generally, these are the relationships between the organization and its social environment. Besides, relational capital includes relationships with customers, suppliers and government. It is reflected in the development, maintenance and loyalty of relationships with stakeholders (Chu, Lin, Hsiung, & Liu, 2006).

Structural capital includes all types of non-human knowledge that are part of the organization. In fact, it is related to the process and infrastructure owned by the organization to protect its human capital (Watson & Stanworth, 2006). Therefore, structural capital is defined by Chu et al. (2006) as a system or a set of procedures capable of solving problems and creating innovation as well as a set of mechanisms and structures that can help employees support and optimize intellectual performance. Indeed, the essence of structural capital is the knowledge embedded in the organization's routines. Or their part, Muhammad and Ismail (2009) describe structural capital as the competitive intelligence, the formulas, the information systems, the patents, the policies and the outcome of the company's products or systems created over time.

2.2. Literature review

According to the resource and skills theory, IC remains the main source of wealth and value creation for companies. This was theoretically and empirically proven by some researchers in the field.

In the United States and Europe, for instance, financial reports have been criticized for their inadequacy and dissimilation of the company's real value for the shareholders and financial analysts (Rey, Tuccillo, & Roberto, 2020). In this context, Chen, Cheng, and Hwang (2005) studied the relationship between IC, a company's market value and financial performance. Their regression model helped them reveal a positive relationship between the market value and the value creation rates as well as a positive relationship between IC and the company's current and future financial performance. Subsequently, IC could be a sign of future financial performance.

On the other hand, Abdolmohammadi (2005) analysed the different elements of IC in 58 companies between 1993 and 1997. He proved the effectiveness of disclosing IC-related information on the market value of these companies. The achieved results emphasize the importance of IC for the "new" sectors of the economy that are related to information technology and intellectual property. In this context, Tseng and Goo (2005) classified the IC as human, organizational, innovation and relational capital in order to examine the relationship between the market value and the company's social value. The research sample includes Taiwanese industrial companies the data about which were collected from surveys. These researchers noted the existence of a positive relationship between IC and the company's market value, using Tobin's Q, the value added intellectual coefficient (VAIC) as a measurement tool.

2.3. Hypotheses development

2.3.1. The impact of intellectual capital on firm's performance

Generally, IC contributes to a significant increase of the company's market value and financial performance (Murale, Jayaraj, & Ashrafali, 2010), however, it remains a valuable resource for companies because it creates a competitive advantage that will help improve the company's performance and market value. Moreover, companies with a high IC profile have very high financial returns, Tobin's Q and a very high market value compared to companies with a low overall IC profile. This idea was justified by Subramaniam and Youndt (2005) on a data set collected from executives in 208 Taiwanese companies, while Maditinos, Chatzoudes, Tsairidis, and Theriou (2011) examined the relationship between IC and the financial performance of the listed companies in Greece. Their study revealed that the components of IC are strongly correlated with the companies' financial performance. In the same vein, Chang and Hsieh (2011) showed that IC positively affects the financial performance of Taiwanese companies. Based on the stakeholder theory, Riahi-Belkaoui (2003) states that IC has a positive impact on financial performance.

As human capital is a major component of IC, it is a key factor in value creation. Based on the top 25 companies (based on turnover) in the Indian pharmaceutical industry over the 1996–2006 period, Bharathi Kamath (2008) states that investments in companies' human capital represent a significant part compared to the physical investments in a growth process. Similarly, Wei Kiong Ting and Hooi Lean (2009) conducted a study on IC in Malaysia. Their study revealed that human capital is an important factor in measuring the impact of intellectual property on the company's market value and financial performance.

Moreover, the theoretical and empirical synergy between human capital and structural capital enables the company to guarantee a high current and future profitability and performance. For Tsen and Hu (2010), IC includes human, structural and social capital. It is essential for the organization to develop human capital not easily reproducible by competitors, to transform the knowledge and individual capacities of employees into its core capacities. On the other hand, Chen et al. (2005) studied the relationship between IC, the market value and financial performance of Taiwanese listed companies for 5 years. They showed that the development and disclosure of structural capital information promote the development of a positive relationship between profitability and the market value for the Taiwanese listed companies. On the basis of what has been suggested, the following hypothesis can be formulated:

H1: Intellectual capital, which includes human and structural capital, has a positive and significant impact on firm's performance.

H1a: Intellectual capital, which includes human and structural capital, has a positive and significant impact on firm's economic performance.

H1b: Intellectual capital, which includes human and structural capital, has a positive and significant impact on firm's financial performance.

H1c: Intellectual capital, which includes human and structural capital, has a positive and significant impact on firm's market performance.

2.3.2. The relationship between the effectiveness of intellectual capital on firm's performance

Empirical and theoretical results (Pulic, 2000, 2004; Riahi-Belkaoui, 2003; Lee & Guthrie, 2010; Zéghal & Maaloul, 2010) revealed the presence of a relationship between the VAIC, the market value and companies' financial performance. In the same context, Yalam and Coskun (2007) conducted an empirical study on the impact of IC value-added tax on the performance of banks listed on the Istanbul Stock Exchange. The results revealed a strong correlation between the effectiveness of IC and banking profitability. These results corroborate the findings of Chang and Hsieh (2011) on a sample of listed Taiwanese companies, and Wei Kiong Ting and Hooi Lean (2009) on a sample of listed Malaysian companies. The authors found that the efficiency of the IC value-added tax positively affects the firms' financial performance.

Moreover, Salman and Tayib (2012) studied the relationship between IC efficiency and the performance of 20 Nigerian companies using the VAIC methodology. Their results showed that there is a clear positive correlation between the components of IC, financial performance and the companies' market value. However, the empirical results of Firer and Williams (2003) showed that the three components of VAIC, such as the employed capital, the human capital and

the structural capital, have greater descriptive power for the market value volatility. On the other hand, although the VAIC is a cumulative measure of the firm's intellectual capacity, investors place different values on the three elements of the VAIC (Pulic, 2000). This result was empirically observed by some researchers, such as Riahi-Belkaoui (2003), who showed that the efficiency of intellectual, human and structural capital moderates the relationship between the efficiency of the employed capital and firms' performance.

On the other hand, reference could be made to Makki and Lodhi's (2008) study that deals with the search for an explanation of the relationship between IC and companies' profitability using a sample of 25 companies from different sectors of activity listed on the Lahore Stock Exchange over five years to calculate the return on the employed capital and the human and the structural capital efficiency. In fact, these researchers found a statistically significant relationship between the efficiency of the human capital, that of the structural capital and companies' profitability. For their part, Solikhah and Subowo (2016) examined the impact of IC on the performance, the financial growth and the market value of the companies listed on the Indonesian Stock Exchange. The authors attempted to measure the impact of IC efficiency on the market value and financial performance of the listed banking sector companies for the period between 2005 and 2009. The empirical results revealed a strong correlation between the market value and the efficiency of IC. On the basis of what has been suggested, the following hypothesis can be formulated:

H2: The efficiency of intellectual capital (represented by human and structural capital) has a positive and significant impact on firm's performance.

H2a: The efficiency of intellectual capital (represented by human and structural capital) has a positive and significant impact on firm's economic performance.

H2b: The efficiency of intellectual capital (represented by human and structural capital) has a positive and significant impact on firm's financial performance.

H2c: The efficiency of intellectual capital (represented by human and structural capital) has a positive and significant impact on firm's market performance.

3. SAMPLE SELECTION AND DATA COLLECTION

In fact, our sample includes 26 Tunisian companies listed on the Tunis Stock Exchange. For the sake of homogeneity, we attempted to ensure that these companies are industrial but operating in various sectors of activity (agri-food, textile, chemical, agricultural industries, etc.). Companies in the financial sector, such as banks and insurance companies, were excluded from our sample. For these 26 companies, we collected all the financial and accounting information necessary for our study over the 2010–2019 period. 260 companies were taken as a sample of this research using the purposive sampling method. The main source of our information is the financial statements.

Table 1. Sample distribution by sector

Activity sector	*Number of companies*
Telecommunications	1
Services to consumers	5
Health	2
Automotive suppliers	3
Food and beverages	4
Household and personal care products	1
Building and construction materials	4
Industrial goods and services	2
Chemistry	2
Raw materials	1
Oil and gas	1
Total	26

In what follows, we will present our models and the endogenous, exogenous and control variables, which are necessary measures for the achievement of the purpose of our empirical study.

3.1. Dependent variables

As in previous studies, we use three measures of firm performance: economic (*ROA*), financial (*ROE*) and stock market (*MTB*) performance.

- *Return on assets (ROA):* The return on assets is the ratio between the organization's net income and its total assets. It has been used by several studies, such as those of Firer and Williams (2003), Chen et al. (2005), Hang Chan (2009), Maditinos et al. (2011), as a common measure to compare financial performance when IC is considered.
- *Return on equity (ROE):* Return on equity is measured by the ratio of net income for the year to shareholders' equity. This ratio is used as a general indicator of the company's efficiency through the profits that it can generate. In fact, many researchers, such as Chen et al. (2005) and Maditinos et al. (2011), tried to visualize the relationship between the company's performance and IC using the *ROE*.
- The *market-to-book (MTB)* ratio*:* It is the ratio between the market capitalization and equity. In fact, several studies, such as those of Appuhami (2007), Hang Chan (2009), Zéghal and Maaloul (2010), Maditinos et al. (2011), used this ratio to show the relationship between IC and the company's market value.

3.2. Explanatory variables

To present the explanatory variables, which is the topic of our study, it is necessary first to define, specify and clarify two basic concepts, such as value added (*VA*) and the coefficient of value added of IC (*VAIC*) and its different components.

- The *value added (VA)* is calculated as the difference between the inputs and outputs of the production process. We consider the inputs as all the operating revenues with the exception of the operating income, while the outputs are the external expenses. This calculation method is chosen because it is more practical.

$$VA = OUTPUT - INPUT \quad (1)$$

• The *coefficient of the intellectual capital value added (VAIC)* was presented by Pulic (2000) on the basis of a stakeholder theory perspective. In fact, the *VAIC* method provides a standardized and consistent basis for measurements. This method breaks down IC into three independent variables: *HCE* (human capital efficiency) ratio, *SCE* (structural capital efficiency) ratio and *CEE* (capital employed efficiency) ratio. The *VAIC* represents the sum of the three variables.

The *human capital efficiency (HCE)* ratio: It is calculated by the ratio between the *VA* and the cost of the human capital (*HC*), with *HC* being the sum of the expenses of the total number of employees in the company, including expenditure on the employees' health and social security, in other words, the staff costs:

$$HCE = VA/HC \quad (2)$$

The *capital employed efficiency (CEE)* ratio: It is determined by the ratio of the *VA* to the employed capital (*EC*):

$$CEE = VA/EC \quad (3)$$

The *structural capital efficiency (SCE)* ratio: It is calculated by the ratio of the structural capital (*SC*) to the *VA*:

$$SCE = SC/VA \quad (4)$$

However, *SC* is determined by the difference between the value added and the staff costs.

VAIC: It represents the fundamental basis of IC measurement. It is calculated by adding the three efficiency components mentioned above:

$$VAIC = CEE + HCE + SCE \quad (5)$$

3.3. Control variables

To be consistent with previous studies conducted by Hang Chan (2009), Chen et al. (2005), Firer and Williams (2003), Shiu (2006) on firms located in Hong Kong, South Africa and Taiwan, it should be noted that the firm's size and indebtedness have been included in the regression as control variables the interactions of which must be minimized by the dependent variables.

3.4. Regression model specifications

The empirical study, as undertaken in our work, is based on regression models for the purpose of testing the research hypotheses. The relationship between the variables is analysed using panel data. To develop our statistical tests, we use three statistical models for all explanatory variables (with each variable IC and efficiency of IC includes *HC* (*H(i)*) and *SC* (*H(ii)*), the first devoted to the measurement of economic performance (Model 1 proves to validate the sub-hypotheses *H1a(i)* "*HC/ROE*", *H1a(ii)* "*SC/ROE*", *H2a(i)* "*HCE/ROE*" and *H2a(ii)* "*SCE/ROE*"); the second measures the financial performance (Model 2 proves to validate the sub-hypotheses *H1b(i)* "*HC/ROA*", *H1b(ii)* "*SC/ROA*", *H2b(i)* "*HCE/ROA*" and *H2b(ii)* "*SCE/ROA*"), and the third apprehends the stock market performance (Model 3 proves to validate the sub-hypotheses *H1c(i)* "*HC/MTB*", *H1c(ii)* "*SC/MTB*", *H2c(i)* "*HCE/MTB*" and *H2c(ii)* "*SCE/MTB*"):

Model 1

$$ROA_{i,t} = \beta_0 + \beta_1 HC_{i,t} + \beta_2 SC_{i,t} + \beta_3 HCE_{i,t} + \beta_4 SCE_{i,t} + \beta_5 DEBT_{i,t} + \beta_6 SIZE_{i,t} + \varepsilon_{i,t} \quad (6)$$

Model 2

$$ROE_{i,t} = \beta_0 + \beta_1 HC_{i,t} + \beta_2 SC_{i,t} + \beta_3 HCE_{i,t} + \beta_4 SCE_{i,t} + \beta_5 DEBT_{i,t} + \beta_6 SIZE_{i,t} + \varepsilon_{i,t} \quad (7)$$

Model 3

$$MTB_{i,t} = \beta_0 + \beta_1 HC_{i,t} + \beta_2 SC_{i,t} + \beta_3 HCE_{i,t} + \beta_4 SCE_{i,t} + \beta_5 DEBT_{i,t} + \beta_6 SIZE_{i,t} + \varepsilon_{i,t} \quad (8)$$

where:

- *i* indicates the firm: 1,..., 26;
- *t* denotes the time dimension: 2010, ... 2019;
- $ROA_{i,t}$ designates the economic performance of firm *i* in the period *t*;
- $ROE_{i,t}$ is the financial performance of firm *i* in the period *t*;
- $MTB_{i,t}$ is the stock market performance of firm *i* in the period *t*;
- $HC_{i,t}$ is the human capital of firm *i* in the period *t*;
- $SC_{i,t}$ is the structural capital of firm *i* in the period *t*;
- $HCE_{i,t}$ is the human capital efficiency of firm *i* in the period *t*;
- $SCE_{i,t}$ is the structural capital efficiency of firm *i* in the period *t*;
- $DEBT_{i,t}$ is the indebtedness of firm *i* in the period *t*;
- $SIZE_{i,t}$ is size of firm *i, t*;
- β_1, β_2, β_3, β_4, β_5, β_6 are the parameters to estimate;
- $\varepsilon_{i,t}$ is random error.

4. RESULTS ANALYSIS

In order to test the hypothetical relations, our research has followed the commonly established two-stage procedure.

The first stage is the descriptive statistics and correlation results. Indeed, the normality of the variables is supposed to be checked because the number of observations is greater than 30.

According to the Pearson correlation, as shown in Table 2, there are no correlations exceeding 0.5 between our explanatory variables, which means the absence of multicollinearity problems between the independent variables. In fact, all the variables are negatively correlated with the *HC* while the *SC* is positively correlated with the other variables. The same result is observed for the efficiency ratio of the *SC*.

By looking at the table below, it can be noticed that the most important correlation coefficient refers to both the *SC* value and the *HCE* coefficient, which indicates the presence of a positive relationship between these two variables. The second variable can be explained by the importance of organizational investment strategies in developing and improving the *HC* as a key factor for the success of each company.

Table 2. Correlation between explanatory variables

	HC	*SC*	*HCE*	*SCE*	*DEBT*	*SIZE*
HC	1.0000					
SC	-0.2882	1.0000				
HCE	-0.2430	0.4731	1.0000			
SCE	-0.1163	0.2226	0.0960	1.0000		
DEBT	-0.1283	0.1191	-0.0656	0.0575	1.0000	
SIZE	-0.4015	0.0432	0.1863	0.0034	-0.4661	1.0000

Notes: All correlations between variables are significantly smaller than 0.6 (threshold at which we begin to experience serious problems of multicollinearity). In the Pearson test and the index of conditioning, we have found that these variables are distinct from each other and are not significant (correlation thresholds are above 10% and the packaging is less than 1000).

In the second stage and to start with panel data, the test of homogeneity is conducted to validate the existence of individual effects in models. The results show that the p-values associated with the F-statistic calculated for each model are more than 10% that do not require specific effects. The three statistical models will be estimated with the multiple regression method.

5. STATISTICAL TEST RESULTS

This section leads us to the analysis of the results collected after the statistical tests and to the explanations of some of them.

5.1. Test of hypotheses (Model 1 and Model 2)

To identify the impact of IC and its effectiveness on financial performance, two models are used, in which the variables to be explained are two measures of financial profitability: *ROA* and *ROE*, however, the denominator of the *ROA* is the amount of liability and equity while that of the *ROE* includes only equity.

Table 3 presents the statistical results of the model on the financial performance measured by the *ROA*. The examination of the statistical tests (beta coefficient, t-student and the significance rate) revealed the existence or absence of some expected relationships. It should be noted that the adjusted R^2 is acceptable for 0.6634.

Table 3. Summarization of the results of Model 1 (*ROA*)

$$ROA_{i,t} = \beta_0 + \beta_1 HC_{i,t} + \beta_2 SC_{i,t} + \beta_3 HCE_{i,t} + \beta_4 SCE_{i,t} + \beta_5 DEBT_{i,t} + \beta_6 SIZE_{i,t} + \varepsilon_{i,t}$$

	Coefficient	***t-student***	***Significance***
HC	0.0941**	2.04450	0.04090
SC	0.0528	1.23162	0.21809
HCE	0.0154***	3.60960	0.00030
SCE	-0.00003	-0.44108	0.65915
DEBT	0.0352	0.26855	0.78827
SIZE	0.0410***	10.93215	0.0000
Constant	-0.0244	-0.08270	0.93408
Adjusted R^2	0.6634		

*Notes: *** coefficient significant at 1%, ** coefficient significant at 5%, * coefficient significant at 10%. HC: human capital, SC: structural capital, HCE: human capital efficiency, SCE: structural capital efficiency, DEBT: indebtedness, SIZE: size.*

The statistical results showed that there is a positive relationship between human capital and financial performance as measured by the *ROA*. This is represented by a positive and significant value of the coefficient of the *HC* variable compared to the *ROA* (beta = 0.09410; t-student = 2.04450; p < 5%). As a result, human capital has a positive and significant impact on financial performance. In fact, this result is consistent with theoretical and practical findings. Moreover, human capital in the knowledge economy has a fundamental role in the development of the company. By referring to the literature, we can see that successful companies attach great importance to investments in human capital to develop their overall capacities (Makki & Lodhi, 2008).

On the other hand, this empirical finding was justified by Murale et al. (2010) in their empirical study of IC in the Indian context. These authors concluded that human capital is a major asset for the most competitive and efficient companies because this capital, and especially its efficiency, could generate sustainable economic and financial benefits for companies. On the basis of what has been announced, *H1a(i)* can be confirmed.

According to Table 3 above, structural capital is positively correlated with financial performance (beta = 0.05285; t-student = 1.23162), but the significance threshold is greater than 10%. However, the relationship between financial performance and structural capital is not significant. Therefore, this result does not confirm our theoretical proposals, which leads us to rejection of *H1a(ii)*.

On the other hand, the *HCE* ratio has a positive and significant relationship with the explanatory variable (beta = 0.01548; t-student = 3.60960; p < 1%). This result supports what was announced in *H2a(i)* and corroborates the results of the previous studies conducted by Zéghal and Maaloul (2010) which showed the existence of a positive significant relationship between human capital efficiency and financial performance of British companies. According to *H2a(ii)*, which predicts a positive relationship between *SCE* and financial performance, the coefficient has a negative value (beta = -0.00003; t-student = -0.44108) with an insignificant threshold value (p > 10%). This makes us reject *H2a(ii)* and conclude that the *SCE* variable has no effect on the financial performance measured by the *ROA*. When examining the control variables (*DEBT*, *SIZE*), it becomes clear that the statistical results show a positive relationship between these two variables and financial performance (beta = 0.03524; beta = 0.04105).

Model 2 has an adjusted R^2 of 0.4987 which implies that this model is actually quite strong. Regarding the independent and control variables, it was noted that approximately 50 percent of the variance in return on equity is explained by these explanatory and control variables. Moreover, for the coefficients presented in Table 4, which is related to Model 2 (*ROE*), there are various statistical results.

Table 4. Results of the linear regression of Model 2 (*ROE*)

$$ROE_{i,t} = \beta_0 + \beta_1 HC_{i,t} + \beta_2 SC_{i,t} + \beta_3 HCE_{i,t} + \beta_4 SCE_{i,t} + \beta_5 DEBT_{i,t} + \beta_6 SIZE_{i,t} + \varepsilon_{i,t}$$

	Coefficient	***t-student***	***Significance***
HC	0.1461	1.2959	0.1950
SC	0.1313***	8.4385	0.0000
HCE	0.0186*	1.6758	0.0937
SCE	-0.00003	-0.1705	0.8645
DEBT	-0.1311***	-3.8691	0.0000
SIZE	0.0351	0.4074	0.6837
Constant	-0.2179	-0.3199	0.7490
Adjusted R^2	0.4987		

*Notes: *** significant coefficient at 1%, ** significant coefficient at 5%, * significant coefficient at 10%. HC: human capital, SC: structural capital, HCE: human capital efficiency, SCE: structural capital efficiency, DEBT: indebtedness, SIZE: size.*

Regarding the *SC* variable, the following results can be drawn. Indeed, the *SC* coefficient has a positive and significant value (beta = 0.1313; t-student = 8.43850) and p-value = 0.0000, respectively, which means that there is a positive and significant relationship between structural capital and financial performance measured by the *ROE*. On the other hand, a significant structural capital generates a favourable environment for its employees, which increases their productivity, profitability and the company's profit. For their part, listed Tunisian companies rely on structural capital (the second key component of IC) as a means to improve their shareholder returns, which leads us to accept *H1b(ii)*. The regression results also revealed a positive but insignificant relationship between *HC* and *ROE*, which contradicts *H1b(i)* and, therefore, it will be rejected.

Regarding the *HCE* ratio, it was found to have a positive (*HCE* = 0.01868; t-student = 1.67587) and significant value at 10% threshold. This indicates that this variable has a positive and significant effect on the variation of the variable to be explained, namely the *ROE*. On the other hand, using the *ROE* indicator, Maditinos et al. (2011) inferred the existence of a significant relationship between *HCE* and financial performance. Similarly, our results are consistent with those of the studies conducted by Chen et al. (2005) and Hang Chan (2009). In fact, when the *HCE* ratio has a positive relationship with the return on equity, this indicates its importance as the main success factor for the Tunisian listed companies. This orientation confirms *H2b(i)* of our study.

In what follows, we will focus on the *SCE* ratio because the results found are not consistent with what was expected. Indeed, the results of the statistical tests revealed a negative *SCE* coefficient, very low and close to 0 (beta = -0.00003; t-student = -0.17055), but not significant (p-value=0.8645). For our sample, the efficiency of structural capital is not affected by the financial performance measured by the *ROE*. This result corroborates those of Appuhami's (2007) study and rejects *H2b(ii)*.

With regard to the last two variables, the following results can be noted: indebtedness as a control variable shows a result in line with our expectations. In fact, the *DEBT* coefficient takes a negative sign (beta = -0.13113; t-student = 3.86913) with a favourable significance level (p-value = 0.0000). However, companies use credits in their structural capital to maintain a high level of investment, which was assessed by the return on equity ratio for our sample. However, these investments are not efficiently used to generate satisfactory returns for Tunisian investors. This is reflected in the low efficiency ratio of structural capital, which showed a significant relationship with financial performance. However, the "*company's size*" variable coefficient shows a positive value (beta = 0.03515; t-student = 0.40742) but not significant (p-value = 0.68370), which means that the company's size has no effect.

The differences that were revealed in the regression models of the IC indicators *ROA* (Model 1) and *ROE* (Model 2) are worth mentioning. First, the explanatory power of the *ROA* regressions is higher than that of the *ROE* models. In fact, an examination of Table 5 shows that Model 1 (*ROA*) has a fairly strong explanatory power (adjusted R^2 = 0.6634) while Model 2 (*ROE*) has a moderately acceptable explanatory power (adjusted R^2 = 0.4987) compared to Model 1.

The analysis of the results of the statistical tests shows different practical outcomes. First, the "*human capital*" (*HC*) variable reflects a positive (beta = 0.09410; t-student = 2.04450) and significant (p-value = 0.04090) relationship with *ROA* while in *ROE* model, it shows a positive (beta = 0.14619; t-student = 1.29593) but not significant (p-value = 0.1950) relationship. This indicates that the value of IC to investors is valued as capital expenditure (the basic hypothesis of the VAIC method) when financial performance is measured by the *ROA*.

Moreover, the *SC* variable has a positive and significant association (beta = 0.1313; t-student = 8.43850; p-value = 0.000) with the variable to be explained (*ROE*), which is confirmed by Model 2. Actually, this variable shows a positive (beta = 0.0528; t-student = 1.23162) but insignificant (p-value = 0.2180) relationship in Model 1. Therefore, it seems that the change in the measurement method affects the investors' perceptions of the value of structural capital. Therefore, *H1a* and *H1b*, which indicate the existence of a positive and significant relationship between economic and financial performance and IC, which includes human and structural capital, are accepted.

Second, the empirical results of Model 1 show a positive and significant association at 10% threshold between *HCE* and the financial performance measured by the *ROA*. Moreover, the same result was obtained for Model 2, but with a negligible difference in the beta coefficient (beta Model 1 = 0.01548, or beta 2 = 0.01868). This result corroborates the theoretical findings of Tseng and Goo (2005), Firer and Williams (2003), Ahangar (2011) and Zéghal and Maaloul (2010), according to which the efficiency of human capital represents a crucial factor for the improvement of financial performance regardless of the used measurement tool (*ROE* or *ROA*).

On the other hand, following an examination of the explanatory variable, the *SCE* in Model 2, we notice a negative and insignificant association (beta = -0.00003; t-student = -0.1705; p-value = 0.8645) with the variable to explain (*ROE*). Similarly, a negative and insignificant relationship (beta = -0.00003; t-student = -0.4410; p-value = 0.6591) between *SCE* and asset profitability (*ROA*) is presented in Model 1. Therefore, *H2a* and *H2b*, which indicate the existence of a positive and significant relationship between financial performance and efficiency of IC (represented only by human capital), are accepted.

In conclusion, it can be said that human capital efficiency is an important factor in the prediction of *ROA* and *ROE*. This is because the *ROA* ratio reflects the company's efficiency using all the sources of financing (debt and equity). Generally, a company borrows loans to develop innovative projects that require high human capital requirements for the planning, financial and accounting control of the technologies of these projects. This may explain the reason that *HCE* is a significant predictor of the *ROA* dependent variable. Similarly, this theoretical observation was justified by the results of the linear regression of Model 2.

5.2. Statistical test results of Model 3

To identify the nature of the relationship between the market performance, IC components and efficiency, we have applied Model 3. By examining the reliability and the overall quality of our stock market performance model, we notice that the explanatory power of our model is very high, with an adjusted R^2 of 0.9762, which gives credibility to the used variables and promotes the association between the explanatory variables and the stock market performance of the Tunisian listed companies.

Table 5. Results of the Model 3 (*MTB*)

$MTB_{i,t} = \beta_0 + \beta_1 HC_{i,t} + \beta_2 SC_{i,t} + \beta_3 HCE_{i,t} + \beta_4 SCE_{i,t} + \beta_5 DEBT_{i,t} + \beta_6 SIZE_{i,t} + \varepsilon_{i,t}$			
	Coefficient	***t-student***	***Significance***
HC	-11.677	-0.64594	0.5183
SC	-18.059	-1.08020	0.2800
HCE	0.6503***	2.85647	0.0041
SCE	-0.0069	-0.25396	0.7995
DEBT	-70.764*	-1.60493	0.1085
SIZE	-57.941 ***	-2.65081	0.0080
Constant	477.678***	2.78516	0.0053
Adjusted R^2	0.9762		

*Notes: *** significant coefficient at 1%, ** significant coefficient at 5%, * significant coefficient at 10%. HC: human capital, SC: structural capital, HCE: human capital efficiency, SCE: structural capital efficiency, DEBT: indebtedness, SIZE: size.*

Table 5 shows a negative coefficient (*HC* = -11,677; t-student = -0.64594) but insignificant for p-value = 0.5183, which is inconsistent with the basic hypothesis of the VAIC method, where the human capital expenditures are considered as investments rather than expenses. On the other hand, the *HC* coefficient does not prove any significant relationship with the market valuation (*MTB*). Therefore, *H1c(i)* is rejected. Similarly, the variable "*structural capital*" has a negative and insignificant coefficient (*SC* = -18,059; t-student = -1,0802; p-value = 0.2800), which indicates that there is no relationship between structural capital and the company's market performance. As a result, it can be deduced that *H1c(ii)* is not validated in the Tunisian context. This leads us to reject *H1c* and conclude that the IC has no effect on the firm's market performance.

The empirical results presented show that there is a strong correlation between *HCE* and corporate market valuation, with a positive (beta = 0.6503; t-student = 2.85647) and significant coefficient at 1% threshold. This is in line with the expectations of Pulic (2000), the inventor of the VAIC method, who confirmed the existence of a positive relationship between the companies' human resource efficiency and the market value (through the study of a sample of companies listed on the London and Vienna Stock Exchanges). For their part, Chen et al. (2005) also justified this relationship for companies listed in Taiwan. Consequently, the empirical results lead us to confirm *H2c(i)*, which indicates the presence of a positive impact of human capital efficiency on the firms' stock market performance.

On the other hand, Model 3 shows that the independent variable of the *SCE* is negatively correlated with the firm's market value (*SCE* = -0.0069; t-student = -0.2539). This relationship is statistically insignificant (p-value = 0.7995). Consequently, *H2c(ii)*, which indicates the existence of a positive and significant relationship between structural capital efficiency and stock market performance is rejected. This result corroborates previous studies by Firer and Williams (2003) and Hang Chan (2009) on different samples in which they showed the absence of a relationship between the efficiency ratio of structural capital and the market valuation. Therefore, *H2c* is verified and concludes that the efficiency of IC (represented only by human capital) has an effect on the firm's market performance.

Since the sub-hypotheses (*H1a*, *H1b*, *H2a*, *H2b* and *H2c*) are partially validated, we can then consider that the hypotheses *H1* and *H2* are partially accepted.

In fact, the information provided on the structural capital of the listed companies measured by the *SC* and its efficiency measured by the *SCE* may be limited and have no value for investors. As a consequence, information related to structural capital is considered as strategic information that can be used by competitors.

Regarding the control variables, indebtedness and the firm's size, which are two negative and significant coefficients, are presented in Table 5. Consequently, our reasoning regarding the positive and significant impact of indebtedness and the company's size will be called into question.

5.3. Discussion and contribution

The results show that intellectual capital characteristics affect the performance of companies listed on Tunisian Stock Exchange. First, *HCE* has a positive effect on firm value of companies listed on Tunisian Stock Exchange. Second, *HC* does affect only the economic performance of Tunisian firms. These results show that players in the Tunisian stock market perceive *HC* as a source of value in companies. This is contradictory to the studies of Chen et al. (2005) and Firer and Williams (2003) in South Africa because investors there react negatively to market value if the company increases human resources, due to poor economic conditions. Third, *SC* does affect financial performance and not the stock market performance of companies listed on Tunisian Stock Exchange. *SC* is being little developed in Tunisian companies. Fourth, *SCE* does not affect firm value because investors assume that the investment in the intellectual capital has a low degree of certainty; investors lack awareness in capturing good signals about the intellectual capital within a company. Therefore, the company's intellectual capital must be disclosed.

Our paper has shown and corroborated that the IC components affect the process of improving the firm performance of listed Tunisian companies showing that *HC* can be considered as a reservoir of knowledge that can provide sustainable future benefits. Although Tunisian companies are making efforts in terms of developing their human resources and adopting new information and communication technologies, they have not yet developed the capacity for innovation and creation.

Such a contribution should be appreciated by the concerned investors, engaged in setting up convenient formulas, whereby the Tunisian firm practice could be efficiently managed and supervised.

6. CONCLUSION

This study seems to be a good reference for drawing a conclusion on the fundamental role of IC in the process of improving the financial and stock market performance of listed companies. For this reason, business leaders can benefit from a fundamental understanding of the importance of allocating IC as a set of valuable resources since investment in IC provides a higher financial return than investment in physical assets.

The first relationship between *HC*, the company's financial and stock market performance is verified. This result considers that human capital is an indispensable factor in the value creation process. According to Pulic (2004), *HC* can be considered as a reservoir of knowledge that can provide sustainable future benefits. Therefore, it is the key hypothesis of the VAIC method while the staff costs are treated as investments and not expenses.

For this reason, even if the results are modest, we have succeeded in enriching the scope of the IC issue and its impact on financial and stock market performance. Based on the empirical results, it is time for Tunisia to give more importance to IC as a means of value creation, which increases its potential competitive advantage. In fact, the absence of an important role of *SC* could be a sign to which it is time to pay more attention given the superiority and inferiority of the IC values, which can have a great impact on an organization's competitive advantage and on the investors' perceptions of its long-term viability.

However, our study has some limitations. Indeed, the first limitation is that the identification of the IC components is very fragile. Besides, the context that determines the value attributed to tangible assets may affect the valuation of intangible assets. On the other hand, the context that shapes the value attributed to tangible assets may impact the assessment of the intangible ones. Therefore, the verification of the hypothesis about the companies' stock market performance can be questioned because the market value is heavily affected by the feelings of the market investors, which makes them ignore the financial reality of the company. Moreover, the measurement of the company's financial performance by the *ROE* may have risks for managers whose main concern is to generate dividends for shareholders, which would result in under-investment in human resources and adversely affects competitiveness. In fact, our study deals with a limited number of listed companies, which may lead to a risk of non-validation of the research hypotheses for the rest of the listed and unlisted Tunisian companies.

Then, a future study could identify the association between intellectual asset development strategies and stock market performance. Besides, the relationship between *HC* and relational capital can be examined later in order to have a better understanding of the customer's retention practices and their impact on financial performance. It is, therefore, appropriate to use other IC efficiency measures (e.g., EVA) with the VAIC model in order to generate more valuable conclusions.

Furthermore, researchers suggest the next researcher adding other independent variables or other factors that can affect firm value and expanding the sample research (study cross-country companies); therefore, the influence of intellectual capital disclosure on firm value in various countries can be explained better.

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