ISSN: 1839 - 0846

HOW INTELLECTUAL CAPITAL AFFECTS A FIRM'S PERFORMANCE?

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ABSTRACT

The impact of intellectual capital on firm performance is still poorly defined. In this paper, we try to find the relationship between intellectual capital and business performance from the standpoint of financial performance, the marketplace and economics. We conduct a study of the literature on this subject and we announce our research hypotheses. Our empirical study use a sample of 25 companies listed on the stock market in Tunisia. By using a panel's data we perform the necessary tests for obtaining robust results. The main objective of this study is to determine an exact impact of intellectual capital on the performance of these companies.

Keywords: *intellectual capital, performance, panels, Tunisia, relationship.*

INTRODUCTION

Intellectual capital (IC) is gaining importance in today's knowledge economy and plays a key role in innovation, productivity growth as well as the performance and competitiveness of organizations. The IC may include the following areas: human resources, organizational structure and processes, research and development, technology and rights related to intellectual property, consumer networks and software. Management of intellectual capital is a field that uses creativity, intelligence people, new management methods, new information technologies and new ways of conceiving organization in the new post-industrial knowledge economy. Various attempts have been made to the development of a widely accepted definition of intellectual capital. Klein and Prusak (1994) have contributed to the universal definition of IC as intellectual material that can be formalized, captured and exploited to produce a higher value assets. In the same spirit, Edvinsson and Malone (1997) and Sullivan (2000) define IC as knowledge that can be converted into value. Stewart (1997) states that the intellectual resources such as knowledge, information and experience, are the tools of wealth creation and defines intellectual capital as the new wealth of organizations.

In addition, one of the most concise definitions of intellectual capital is given by Stewart (1997) "packaged useful knowledge." He explains that this includes an organization's processes, technologies, patents, employee skills, and information about customers, suppliers, and stakeholders. Brooking (1996), states that "Intellectual capital is the term given to the combined intangible assets which enable the company to operate." According to Edvinsson and Malone (1997), the IC can also be defined as the deviation observed between the book value of a company and the market value.

According to the International Federation of Accountants, intellectual capital includes three main components:

* Human capital: it consists of the talents and skills of all employees and managers of the company.
* Organizational capital: it is composed of processes, systems and organizations offering the possibility to accumulate, store and transmit its knowledge. Synergies developed within the organization contribute significantly to the innovation of the company;
* Relational capital: it is the goodwill and relationships that the company has with its customers;

ISSN: 1839 - 0846

The definition of intellectual capital involves many terms as intangible or immaterial that it was consider synonyms (Pierrat (2009), Montalan and Vincent (2010)). Historically, the distinction between these two terms is not very clear: the intangible was linked to the concept of goodwill as intellectual capital is a part of goodwill. Pierrat (2000) Proposes a definition of intellectual capital "all the intangibles available to a company and can be used as a factor of production in the course of its business: know-how, trademarks, contracts, software, structures, etc .... "

Generally, the distinction between three forms of intangible capital seems to be a consensus among several authors, namely human capital (HC), structural capital (SC) and customer capital (CC) or relational capital. However, the decomposition of each capital differs from one author to another.

Our study is to provide answers to the following questions:

- What is the impact of the added value created by the components of intellectual capital (human capital, structural capital and capital employed) on the performance of listed companies?
- What is the component of intellectual capital associated with better performance measures?

In the first part, we present a theoretical and literal review of the effects of intellectual capital on firm performance. This theoretical research will allow us to present our research hypotheses.

Through an empirical study we attempt to validate our assumptions. To achieve this, we have developed econometric models that link variables which reflect the effects of the components of intellectual capital with variables which reflect the performance of companies especially: economic performance, financial performance and market performance.

Finally, the conclusion summarizes the results of this research.

RELATED LITERATURE AND HYPOTHESIS

Several studies have been conducted to give a precise definition of intellectual capital (IC) and especially to find an exact measurement, but, it was difficult to quantify the IC in economic terms. The majority of studies use the model VAIC (Value Added Intellectual Coefficient) to evaluate the relationship between intellectual capital and corporate performance (financial, economic and market performance ...) (see Table 1). Among these studies, Ahangar (2011) analyzed the effect of intellectual capital on profitability, employee productivity and sales growth. The results show that the efficiency of intellectual capital significantly influenced profitability and productivity in the different sectors, thus human capital is directly associated with business performance.

In the same field of study, Sharabati et al. (2010) conducted a survey on the pharmaceutical sector and found that pharmaceutical companies in Jordan were managing intellectual capital successfully and therefore the intellectual capital were influencing business performance in a positive way. Zeghal and Maaloul (2010) conducted a similar study on 300 companies in the UK during 2005 to examine the impact of intellectual capital on economic performance, financial and stock market. The results varied and did not give a conclusive result.

Muhammad and Ismail (2009) attempted to investigate the effectiveness of the IC and its performance in the financial sectors of Malaysia. They used a database of 18 companies for the year 2007. They found that the banking sector was the most relaxed on the IC, followed by companies in the insurance industry and brokerage. They have also found that the IC has a positive relationship with firm performance (measured by profitability ROA), but on the other hand, they found that in the financial sectors of Malaysia the market value is determined by several capital (the amount of capital) employed rather than the CI. This final result of Muhammad and Ismail (2009) was consistent with a previous study in the same country during the period 2001 to 2003 (Goh, 2005), where he found that the financial performance of banks Malaysia had low coefficients of IC.

Young et al. (2009) studied a sample of Asian banks for eight countries. They found that physical capital and human capital are the main factors that create value for the banks. A similar study was done by Ting and Lean (2009) on Malaysian firms and for 9 years (1999-2007), they found empirically that the indicator VAIC and some indicators of profitability were positively related to the financial sector of the Malaysia. Chan (2009) conducted a study on a sample of all companies of the Hang Seng stock exchange for the period 2001 to 2005. He examined the relationship between the efficiency of the IC of these companies and its components (human and structural) with measures of firm performance: market valuation, return on assets, and return on equity and productivity measurement. The results of the analysis showed that only structural capital has a significant and positive relationship with profitability measures (ROA and ROE).

ISSN: 1839 - 0846

The most recent research on the relationship between IC and company performance was led by Chu et al. (2011). This study was conducted on a sample of Greek firms from 2008 to 2010. These researchers have confirmed the presence of a significant relationship between HCE (defined in the table below) and the return on equity of these firms. According to our previous theoretical analysis, several authors suggest that investment in intellectual capital allows the company to strengthen its economic performance (Lev and Sougiannis 1996; Lev and Zarowin, 1998; Casta et al, 2005. Bismuth and Tojo, 2008). Our first hypothesis is as follows:

Hypothesis 1: There is a positive association between value added Intellectual coefficient (VAIC™) and economic performance.

Other authors (Riahi-Belkaoui, 2003; Youndt et al, 2004, Chen et al, 2005; Tan et al. 2007) focus on financial performance and are convinced that the IC may have a positive effect on this type of performance. Our second hypothesis is therefore:

Hypothesis 2: There is a positive association between VAIC™ and financial performance.

Some authors (Edvinsson and Malone, 1997; Sougiannis and Lev, 1996; Lev, 2001; Skinner, 2008) considered that the growing gap between the market value of a company and its real value may be due to the fact that the IC is not taken into account in the financial statements. This difference is generally exposed in the ratio of market-to-book value (MB) and it indicates that an investment in IC is a source of value for the company even if it is not present in the balance sheet. The third hypothesis is:

Hypothesis 3: There is a positive association between VAIC™ and stock market performance.

METHODOLOGY

Sample and data

The purpose of this paper is to analyze the impact of intellectual capital on the performance of firms. Our sample consists of a panel of 25 non-financial companies listed on the stock exchange of Tunisia. These companies operate in different sectors summarized in Table 2 (see Appendix). The period of analysis is from 2009 to 2011.

Variables and Empirical models

Our empirical analysis is based on the model VAIC. This model presented an indirect measure of intellectual capital developed by Ante Public (1998, 2000, 2004) and his colleagues at the Austrian IC Research Centre. This model consists essentially of measuring the value added by the resources of the company, based on the relationship between the three major components: a) the capital employed b) human capital c) structural capital (Pike & Roos, 2004; Bhartesh & al, 2005). These components can be analyzed, on the basis of the theory of resources (Resource-Based View RBV) of the firm (Chen & al, 2005).

The sum of the last three measures is the ratio of the total value VAIC. A higher value VAIC suggests a better use of strategic resource management companies. This method is very relevant because it allows measuring the contribution of all the human, structural, material and financial resources to create value added by the company.

Several benefits are derived from this model, thus Firer and Williams (2003) suggested "VAIC provides an easy interface to calculate a standardized and consistent basis of measurement, also allowing a comparative analysis and effective communication between companies and countries, and finally, the data used in the calculation of VAIC are based on the financial statements, which are generally certified by an auditor."

We will conduct a multivariate analysis. This analysis serves to highlight the effect of different variables introduced to the basic model on the dependent variables. The tests are based on an estimate panel data with metric variables. The data will be processed by the software STATA 10. The estimation of these regressions has required the verification of several diagnostic tests which are presented in the appendices.

We present a descriptive analysis of the variables used in our models. Subsequently, we will check Multi co-linearity between the explanatory variables referring to the Pearson test. In the absence of the problem of correlation between the variables, we will test the homogeneity constants. This test allows us to choose between the estimation by the method of least squares (OLS) or estimation using panel data.

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To achieve our research objective, we propose to test empirically three equations to economic performance (Model 1), financial (model 2) and the performance of market capitalization (model 3):

$$\mathbf{ROS_{it}} = \alpha_0+\beta_1\ VAHU_{it}+\beta_2\ STVA_{it}+\beta_3\ VACA_{it}+\beta_4\ TAI_{it}+\beta_5\ END_{it}+\mu_{it} \quad \text{(model 1)}$$
$$\mathbf{ROA_{it}} = \beta_0+\beta_1\ VAHU_{it}+\beta_2\ STVA_{it}+\beta_3\ VACA_{it}+\beta_4\ TAI_{it}+\beta_5\ END_{it}+£_{it} \quad \text{(model 2)}$$
$$\mathbf{MB_{it}} = \varphi_0+\beta_1\ VAHU_{it}+\beta_2\ STVA_{it}+\beta_3\ VACA_{it}+\beta_4\ TAI_{it}+\beta_5\ END_{it}+ę_{it} \quad \text{(model 3)}$$

with:
$\alpha_0; \beta_0; \varphi_0 =$ Constants,
$\mu_{it}; £_{it}; ę_{it} =$ Standards errors ; with, i: individual t: year
ROS: economic performance measured by the ratio: operating income / sales.
ROA: financial performance measured by the ratio: operating income / total assets.
MB: market performance measured by the ratio: Market capitalization / equity.
VAHU: coefficient of the added value created by the human capital measured by the ratio value / human capital.
STVA: coefficient of the added value created by the structural capital measured by the ratio: structural capital / value added.
VACA: coefficient of the added value created by capital employed.
TAI: firm size measured by the natural logarithm of total assets.
END: debt level measured by the ratio: total assets / equity.

Descriptive statistics
The results presented in Table 3 show that the average value added by human capital (VAHU) is 10.904 and this value varies between -1.786 and 153.568 with a standard deviation of 27.909. These results also show that the average value added by structural capital (STVA) is 0.660 and it varies between -0.493 and 1.560 with a standard deviation of 0.335. In addition, this descriptive analysis shows that the average value added created by the physical and financial capital employed (VACA) is 1.070. Added value varies between -0.193 and 4.581 with a standard deviation of 0.914.

The examination of the total added value created by the intellectual capital of listed Tunisian firms reveals that the average VAIC is 12.634 and that it varies between -0.420 and 157.984 with a standard deviation of 28.435. According to this result, it seems that the Tunisian listed firms create on average, 12.634 dinars for each dinar invested.

On the basis of these results, it appears that Tunisian firms create, on average, more effective added value through human capital and other variables related to human capital.

Regressions results
To test the quality of the linear fit of the model, we calculated the coefficient of multiple correlations or the explanatory power of the model "R^2" adjusted. However, this statistic increases systematically with the number of explanatory variables in the model. In this sense, we calculate the derivative of R^2 called correlation coefficient adjusted. The table 6 shows that model 1 has a satisfactory explanatory power and indicates that 54.96% of the variation in economic performance is explained by the components of intellectual capital, the size and the level of indebtedness of the company.

The results of multiple linear regression with regard to economic performance (Table 7) confirm previous studies by Sougiannis (1994), Riahi-Belkaoui (2003), Chen et al. (2005) and Tan et al. (2007) which have all found a positive and significant association between the components of intellectual capital and economic performance. The results of the second regression (Table 8) confirm previous studies by Riahi-Belkaoui (2003), Chen et al. (2005) and Tan et al. (2007) which have all found a significant positive association between financial performance and components of intellectual capital.

The results of the third model (Table 9) show that our expectations regarding the positive and significant impact on the size of the company and its stock performance are not confirmed. In addition, the results presented appears to be a positive and significant association ($\beta5 = 0.3414229$) and ($p = 0.009$) between the level of indebtedness of the company and its stock market performance. To conclude, table 10 summarizes the results of our empirical analysis. Indeed, most of the hypotheses were confirmed. This explains the merits of our goal and corroborates the results of the majority of work on the effects different components of intellectual capital on firm performance.

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Appendices-

Table 2- Sample & Sector of activity

Sector	Number of firms
Agricultural	2
Commercial	3
industrial	12
health	2
Real estate	2
telecommunication	1
transport	3
total	25

ISSN: 1839 - 0846

Table 3- Variables of models

	Variable	ratios	entitled
Dependentes Variables	ROS	Operating profit / sales	economic performance
	ROA	Operating profit / total assets	financial performance
	MB	capitalization / equity	market performance
Independentes Variables	VAHU	Added value / human capital	coefficient of the added value created by human capital
	STVA	Structural capital / value added	coefficient of the added value created by the structural capital
	VACA	Added value / capital employed (capital employed= total assets - intangible assets)	coefficient of the added value created by the employed capital
Control Variables	TAI	the natural logarithm of total assets	Size of firm
	END	Total assets / equity	Level of debts

Table 4- Descriptive Statistics

Variable	Mean	Standard Deviation	Min	Max
VAHU	10.90458	27.90982	-1.786402	153.5679
STVA	0.6604518	0.3356692	-0.49354	1.559784
VACA	1.069323	0.9144147	-0.1936374	4.5812
VAIC	12.63435	28.43525	-0.4202555	157.9841
END	2.698732	4.611397	1.007063	37.0758
TAI	18.02096	0.7800116	15.459	19.464
ROS	0.4358713	1.603462	-0.2725909	11.77944
ROA	0.0725564	0.0769798	-0.1887859	0.2711722
MB	0.5377534	0.3969326	0.1426901	3.034561

Table 5- Diagnostic tests

✓ Multicollinearity Test of Pearson

	VAHU	STVA	VACA	TAI	END
VAHU	1.0000				
STVA	0.2924	1.0000			
VACA	0.4507	0.2817	1.0000		
TAI	-0.0964	-0.1708	-0.1683	1.0000	
END	-0.0115	-0.0406	-0.1554	0.1645	1.0000

✓ Homogeneity test

	Statistics of Fisher	P-Value	conclusion	Choice of test
Model 1	6.08	0.0000	Reject H0	Individual specific effect
Model 2	4.32	0.0000	Reject H0	Individual specific effect
Model 3	51.15	0.0000	Reject H0	Individual specific effect

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✓ Study of individuals effects

	Model 1	Model 2	Model 3
Hausman Test	7.88	2.06	-6.02
P-Value	0.1631	0.8413	-
Specification of model	Random effects model		
Estimator	MCG		

✓ Heteroscedasticity Test

	Model 1	*Model 2*	*Model 3*
Breusch-Pagan Test	23.93	19.46	39.80
P-Value	0.0000	0.0000	0.0000
Conclusion	Reject H0		

✓ Autocorrelation Test

	Model 1	Model 2	Model 3
Wald Test	2.511	20.226	7.282
P-Value	0.1261	0.0001	0.0126
Conclusion	Reject H0	Accept H0	

Table 6- Correlation coefficients models

	Model 1	Model 2	Model 3
Adjusted R^2	54,96%	47,97%	23,04%

Table 7- The regression results of Model 1

$ROS_{it}= \alpha_0+\beta_1 VAHU_{it}+\beta_2 STVA_{it}+\beta_3 VACA_{it}+\beta_4 TAI_{it}+\beta_5 END_{it}+\mu_{it}$		
	Coefficient	Significativity
VAHU	0.784***	0.000
STVA	0.142568**	0.051
VACA	-0.047	0.325
TAI	-0,1197836***	0,003
END	-0,2135115	0,425
Constant	-1,804488***	0,009
*** significatif coefficient at 1%, ** significatif coefficient at 5%		

Table 8- The regression results of Model 2

$ROA_{it}=\beta_0+\beta_1 VAHU_{it}+\beta_2 STVA_{it}+\beta_3 VACA_{it}+\beta_4 END_{it}+\beta_5 TAI_{it}+£_{it}$		
	coefficient	significativity
VAHU	0,3848467***	0,005
STVA	1,271672***	0,000
VACA	0,0100474	0,955
END	1,02306***	0,000
TAI	-0 ,1445303**	0,029
CONSTANT	-0,8846582	0,373
*** significatif coefficient at 1%, ** significatif coefficient at 5%		

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Table 9- The regression results of Model 3

$MB_{it}=\varphi_0+\beta_1 VAHU_{it}+\beta_2 STVA_{it}+\beta_3 VACA_{it}+\beta_4 END_{it}+\beta_5 TAI_{it}+\varepsilon_{it}$		
	coefficient	significativity
VAHU	0,1612002***	0,002
STVA	-0,3535769	0,083
VACA	-0,0879975**	0,042
END	0,3414229 ***	0,009
TAI	-0,1472508**	0,037
Constant	1,258612	-1,077519
*** significatif coefficient at 1%, ** significatif coefficient at 5%		

Table 10 - Summary of results

Model	Hypothesis	relation	expected sign	sign obtained	Validation/reject
Economic Performance	H1	VAHU/ROS	+	+	Valid
	H1	STVA/ROS	+	+	Valid
	H1	VACA/ROS	+	-	Reject
Financial Performance	H2	VAHU/ROA	+	+	Valid
	H2	STVA/ROA	+	+	Valid
	H2	VACA/ROA	+	+	Valid
Market Performance	H2	VAHU/MB	+	+	Valid
	H2	STVA/MB	+	-	Rejet
	H2	VACA/MB	+	-	Rejet