



The Effect of Intellectual Capital Drivers on Performance and Value Creation: the Case of Tunisian Non-financial Listed Companies

Inès Ben Cheikh¹ · Hédi Noubbigh²

Received: 15 August 2016 / Accepted: 15 December 2016 /

Published online: 18 January 2017

© Springer Science+Business Media New York 2017

Abstract The value of companies is traditionally estimated from the material wealth they hold. In the context of the knowledge economy (KE), these elements are no longer enough to estimate this value. Many authors are interested on new sources of value creation called immaterial. Nevertheless, the intangible elements, without physical or intangible substance, are difficultly taken into account by old accounting methods. The work done around our problem tries to define a model that reflects the overall performance of firms of the NE, by adding information about the intangibles to the old accounting data. The present study is looking for reliable measures of the performance of Tunisian firms which are operating in the new economy. The failure of accounting and financial data leads us to add other information. The pieces of information are related to intangible capital which is the main source of value creation for firms in the KE; however, they are ignored in traditional metrics. The results obtained, following the different operated regression, indicate the significance of the variables: “book value, BVE;” “return on equity, ROE;” and “return on assets, ROA.” However, the other ratios are insignificant. Furthermore, the explanatory power of the model is fairly low hovering around 20%. This result allows us to confirm the failure of classical accounting and financial data to translate firm performance of KE. Thus, we validated our initial hypothesis that stresses the usefulness of accounting and financial data in evaluating the performance of firms in the KE. Similarly, data on intangible capital is embodied in three aspects—structural, customer, and human—that play important roles in assessing this. The obtained results indicate that the explanatory power of the model, taking into account the intangible component, is higher than that based solely on the

✉ Inès Ben Cheikh
inesibc@gmail.com

✉ Hédi Noubbigh
Noubbigh.h@gmail.com

¹ High Institute of Accounting and Business Administration, Bizerte, Tunisia

² Institute of Higher Commercial Studies, Bizerte, Tunisia

accounting and financial data. Indeed, adjusted R^2 lies in a range between 30 and 66%. This validates our second hypothesis on the role of intangibles in the chain of value creation. This study shows the important role of intangible capital information in the process of decision-making. Thus, investors and managers should give particular attention to immaterial components which allowed a better appreciation of the overall performance of Tunisian firms operating on NE. This is the contribution of our work.

Keywords Intangibles · Intellectual capital · Value creation · Performance · Human capital · Structural capital · Customer capital

Introduction

The economic world has experienced a structural change generated by a rise of globalization and the revolution in information technology and communication ICT. These revolutions caused the emergence of new sources of growth and creation of values materialized by the intangible assets.

Trade and capital flows have become deregulated. International trade and intangible investment now play a leading role in the economy of the countries compared to the past 20 years.

The result of the change is a high economy called knowledge economy (KE), which was able to obtain various appointments such as post-industrial society, information society, innovation economy, knowledge economy, economy of networks, digital economy, and E-economy. Every appointment deserves to be translated by different aspects of structural change which the world of business has experienced.

However, research dealing with this new era is still in its embryonic phase. Indeed, the value of companies is traditionally estimated from the material wealth they hold.

In the context of the knowledge economy (KE), these elements are no longer enough to estimate this value. We speak about new sources—called immaterial—of value creation.

In this work, we target four objectives: first, to test the ability of accounting and financial data to give a reliable measure of the performance of firms in the (KE), by drawing on classical performance measuring models; second, to check whether to disclose information on intangibles to allow better estimates and speculate on firm performance; and third, a trustworthy and relevant measure to the overall performance of firms in the (KE).

We, then, ask about the characteristics of the knowledge economy and in order to assess its impact on the economic development, in particular, the valuation of the financial performance of firms.

The present study is looking for reliable measures of the performance of firms which are operating in the new economy. The failure of accounting and financial data leads us to add other information. These pieces of information are related to intangible capital which is the main source of value creation for firms in the (KE); however, they are ignored in traditional metrics.

The field of intangibles includes elements such as human capital, trademarks, goodwill, skills, customer satisfaction, and efforts of research and development. These elements must be taken into account to give a reliable assessment of the performance of firms.

Nevertheless, the intangible elements, without physical or intangible substance, are difficultly taken into account by old accounting methods. Moreover, they are the weak

link of accounting information, especially in the particular context of the knowledge economy. The utility of traditional accounting metrics is then questioned.

We have tried within this work to find an answer to the following question: Is there an alternative to accounting and financial measures to measure the overall performance of firms operating in the knowledge economy?

We have tested the relationship between the accounting and financial data and the market value of firms which are operating in the particular context of the knowledge economy. Subsequently, we test the contribution of data on intangible capital in new sources of value creation and this is by adding them to traditional accounting metrics. The data in question are simultaneously human capital, structural capital, and customer capital.

The work performed around our problem tries to define a model that reflects the overall performance of firms of the (KE), by adding information about the intangibles to the old accounting data.

We chose the context of Tunisia, given the small number of works dealing with this issue in this context. The data are taken from the site of the Tunis Stock Exchange (TSE).

We have developed a literature review of the works that dealt with this issue. Then, we presented the conceptual framework of the study and the hypotheses to be tested. Finally, we have spread out our research methodology and key results we found.

Literature Review

The Indicators for Measuring the Performance

Classification of performance must be based on the size of the overall performance. So, we will have financial indicators, market indicators, and organizational indicators.

Financial ratios make up the oldest financial measures of the performance in its financial design. They provide information on opportunities of the growth and solvency of the company. There are also other financial indicators such as sales growth, cost calculation, the need for working capital, and the return on assets.

On the market side, there are indicators in place to discern the origin of sales' turnover. The question is to know if the turnover comes from the faithful customers or new customers.

Among these indicators, we mention profitable advertising campaigns, the degree of customer satisfaction, revenue generated by loyal customers, etc.

Other indicators are used to allow the analysis of internal processes and human performance.

Thus, investment in research and development, the measure of human-held skills, optimizing the use of management tools and new technologies, and the quality of after-sales service are the main indicators of organizational performance.

Morin et al. (1994) presented a model that summarizes the richness of the concept of organizational performance. This model has the following dimensions of performance:

The sustainability of the organization: embodied by the product quality, financial profitability, and competitiveness. Economic efficiency was ensured by saving resources and productivity. The human resource development: evidence for employee engagement, a good working environment, and employee performance.

The legitimacy of the organization to external groups: namely the satisfaction of shareholders, customers and regulatory bodies.

The reviewed indicators are related to three axes, as defined by Kaplan and Norton (1996):

- Capital relationship: relationships with customers as measured by customer satisfaction, growth in the volume of business with existing customers.
- Structural capital: internal processes measured by the quality of the product, the return rate of products, flexibility, responsiveness, timeliness of delivery, and the number of new products launched.
- Human capital: the organizational learning measured by the added value per employee, the implementation of the ideas suggested by employees, the reward system, the percentage of training expenditure relative to payroll, and employee satisfaction.

Performance is measured by the ratio “ROI = Profit/invested capital.” Kaplan states that this ratio measures the performance of a firm at its maturity.

Sumedrea (2013) and Kanjo Mantoh (2015), both of them used the model of “Value Added Intellectual Coefficient, VAIC” to measure the value added by intellectual capital’s components and their impact on firm performance. This coefficient is obtained by the difference between outputs and inputs. Where outputs are all the revenues realized by the firm, and inputs are all expenses except staff costs and the capital employed. Staff costs were used as a proxy of human added value. Performance measures were: ROA, ROE and rate of turnover growth.

The first author studied the case of 105 Romanian non-financial listed firms, in period of crisis from 2010 to 2011. The second author treated the case of German public listed companies from 2009 to 2013.

Both of them concluded that human capital and capital employed contribute to firm profitability and performance. However the structural component seems to have no impact of firm performance.

Boudabbous (2011) conducted a survey of 80 agencies of Tunisian banks. The central question was to determine the scope of human resource management in the light of the objective of organizational performance. He concluded that in the Tunisian banking sector, social management is considered a key factor of success and that the actions are mainly directed towards the effective management of human and financial resources.

The Loss of Relevance of Accounting and Financial Data

Aware of the changes sweeping the business world, many authors have questioned the ability of the metrics to measure performance and to evaluate it.

In this line of thought, some have tried to test the ability of the traditional metrics to measure the performance by defining models expressing the value of firms in terms of these metrics. Others have focused on the economic metrics for measuring the performance by testing their ability to reflect the future value of firms.

Bontis et al. (1999) state that the value of intangible capital can positively influence the financial performance of companies. The accounting system has lost its relevance by being unable to translate the contribution of intangible resources in the performance

of firms. In this line of thought, Affes and Siala (2007) tried to quantify the impact of intangible capital on performance by opting for a qualitative evaluation.

Some authors link the loss of relevance to nondisclosure of information on intangibles, the ability of the firm to innovate and the human resources that are at its disposal (Elliott 1995).

Others have managed to trace the link between the market value of a firm and disclosure of intangible assets. Indeed, Lev and Sougiannis (1996) were able to highlight the impact of the disclosure of information on expenditures for research and development on the performance of a firm.

Lev and Zarowin (1999) and Francis and Schipper (1999) investigated the relationship between investment in R&D and the loss of relevance of accounting data. All of them have found that this happens when the rate of investment in R&D changes over time so the result becomes irrelevant.

Finally, the authors cited above have two remedies for the failure of traditional data namely: the capitalization of intangible and financial restatements.

As for the capitalization of intangible, they link the problem to the lack of a reliable measure of future economic benefits of the intangible. Indeed, the recognition of an asset on the balance sheet requires a probable achievement of future economic benefits and the cost of the item can be reliably measured. However, the outcome of R&D expenditure is surrounded by uncertainty and risk.

The authors suggest going into active phase in the expenditure of intangible assets, once they satisfy technological feasibility tests. Thus, once the uncertainty is removed, it is necessary to capitalize on the past and future expenses. The idea is not to accumulate costs but also to include information on the progress and success of the current project.

Francis and Schipper (1999) addressed the problem related to the loss of relevance of the information conveyed by the financial statements. The study they conducted did not intend to propose changes in the financial reporting. Their statements focus on the period extending from 1952 to 1994.

The authors have examined the idea that there is a statistical relationship between accounting information and market value, especially on a long study window. Thus, the relevance of financial statements will be measured by the ability of accounting data to capture all information affecting the value of shares. The tests they have conducted have focused on the explanatory power of the book value of assets and liabilities. However, they contradict the hypothesis about the decline of relevance.

Assuming that the relevance of financial variables remains unchanged during the period from 1975 to 1999, Core et al. (2003) tested whether there is a significant change in their explanatory power.

The study focused on the impact of the knowledge economy on the valuation of firms operating in this sector. It was conducted on a sample of panel data of 108,493 observations (firms/year) over 25 years.

The tests focused on the entire sample and then sub-samples grouped into high-tech firms, small firms, and small firms in deficit.

The authors were able to check the stability of the relationship expressing the future value of firms based on traditional financial variables (book value, operating income, and proxies to express the future growth of revenues...).

The results indicate the relevance of the explanatory variables which have coefficients α to be all significant. They found that the so-called knowledge economy is a normal time period compared to other periods.

However, they have noticed that the explanatory power of the variables mentioned above decreases during this period while the relationship remains constant. The authors have justified this result by omitting variables in the model that are useful for predicting future values of firms.

Conceptual Framework and Hypotheses

Creating Value: Historical Review

Since 1907, economists have focused on the study of value creation as a profit generated by the business after deducting costs associated with its business. The first who studied the concept of value is Fisher 1930. He was followed by Williams 1938. Both have considered that the created value is based on the assessment of stock market investments and this is done by comparing the present value of future returns which are made of dividends to the market rate and the resale value of assets to real income which is earned in the market.

Modigliani and Miler (1958) later modified this approach by introducing certain conditions on the rate of dividend distribution, the date of detachment, and the associated growth rate.

Hax and Majluf (1984) and Rappaport (1986) have focused on the creation of the value, which according to them, occupies a prominent place in the evaluation of companies. These authors considered the creation of value as an estimate of the strategic decisions taken by the leaders based on discounted “free cash flow” by measuring the return on investment regardless of the value and financial structure of the company.

These flows have been defined by Jensen (1986) as the margin remaining after payment of dividends and investment financing. In 1994, Stern et al. (1995) gave an advanced definition of the value creation. These authors concluded that the measure of value creation is based on shareholder value defined by the EVA “economic value added” and MVA “market value added.”

There appears from what precedes that, since the 1990s, the concept of measuring value creation is under development.

Value creation is a theme that enhances, today, growing interest in various fields of management sciences.

The concept of value creation has several meanings depending on whether it is economic value creation or shareholder value creation.

In a broad sense, there will be an economic value creation if a company, after having paid the lenders, has enriched its shareholders. In other words, value creation appears here as the difference between revenues from assets and the weighted average cost of capital.

In a more narrow conception, but not less important, a company creates value for its shareholders when the market value of equity increases faster than their book values. This means that a shareholder is enriched in a given period if the output value of the investment is greater than what he initially immobilized.

The creation of shareholder value is also known as the Anglo-Saxon concept of “shareholder value added” (SVA).

So, it turns out that the company creates value if its return on equity is higher than the expectation of profitability. It is obvious that these two concepts of economic value creation and shareholder value creation are closely linked: the shareholder will increase its stock price if the company in question creates economic value.

Value creation and stakeholder creating value in a company is to make investments that generate a rate of return greater than the required rate of return taking into account the risk (Vernimmen 2013). As a result, the value of the action in this case tends to increase, otherwise it decreases.

However, the theory of market balance requires that the long-term values of the two rates of return that tend to converge “given technological advances and deregulation that reduce barriers to entry.”

Thus, the financial profitability calculations in no way give a value creation. It's rather the industrial efforts that emanate the created value. Economic rent is the result of a strategy and an estimate of the industrial and commercial tool for the company.

The stakeholder theory is a theory in development that conveys to the leaders other roles and responsibilities, in addition to the maximizing of profits, there is an obligation to organizational ethics.

The term stakeholder is in the vicinity of the term stockholders which both designate shareholders. This pun translated the classical exceeding view of the business that limits the action of the leaders of fiduciary interests of shareholders.

The term “stakeholders” appeared thanks to the pioneers Dodd (1932), Bernard (1938) who insisted on a balance of interests of all participants in the entity to ensure their involvement and cooperation.

The theory states that leaders must protect the interests and rights “of non-shareholder” “stakeholder” or “rights holders.”

S. Mercier (2001) has four stakeholders that play a key role in the entity, namely: customers, employees, communities, and shareholders (quoted by Hummels (1998, p.1406)). Penrose (1959) conceives the enterprise as an institution that contributes to the creation and development of learning. Rhenman and Stymne (1965) described the company as a social and technical system.

Ansoff (1968) seems to be the first to use the term theory of stakeholder. According to him, the entity must equitably satisfy the groups which are in direct contact with it and reconcile their conflicting interests namely: managers, employees, shareholders, and suppliers.

However, the actual development of the theory has developed through Freeman following the publication of his book in 1984, *Strategic Management: A Stakeholder Approach* and the work of Carroll (1989) and Weiss (1994).

The value created must be widespread affecting the company, its customers, and partners. Thus, every business in the knowledge economy needs to rethink its strategy in order to be oriented towards its partners. Such strategy requires the use of ICT.

For customers, the created value corresponds to the decrease of prices accompanied by the best product quality and improved after sale customer service.

Creating value for the company is reflected in cost control, increased revenue, new business development, and branding. The staff side of the business, skills development,

and direction of the initiative are likely to increase the satisfaction and sense of belonging.

Kochan and Rubenstein (2000) define stakeholders from the following criteria: resource supply, exposure to risk, and the provision of power to exert a significant influence on performance. Jones (2001), in turn, requires that companies which maintain good relations with stakeholders can create value. This value is created from the intangible resources and relationship assets by Post et al. (2002).

Tiras et al. (1998) studied the relationship between the market value of the entity and the nature of the relationship undertaken with stakeholders. They found that good customer relations, human resources, community, and the environment increase the performance of firms.

For Yahchouchi (2007), the challenge was to identify measures of the contribution of all stakeholders in the value creation. The measure of the value created by all stakeholders is measured by Figge and Schaltegger (2000) as the difference between revenues (added to the non-operating revenue) and the compensation cost of all stakeholders. Yahchouchi (2007) presents the key stakeholders of the company and the cost of each one: shareholders: cost of equity; employees: global personnel expenses; creditors: total financial expenses; customers: net operating expenses.

To measure the cost of capital, Yahchouchi (2007) used the Fama and French (1993). It was inspired by the work of Feltham and Ohlson (1995), using the linear model of information to identify the value added by each stakeholder to estimate past and future abnormal earnings. Among the explanatory variables, the author introduces the book value and the leverage. Value creation is measured by abnormal results.

Hypotheses

To define a relevant and reliable measure of the overall performance of firms in the (KE) and to check whether to disclose information on intangibles to allow the best estimate and speculate on firm performance, we tried to validate the following hypotheses:

H₁ Accounting and financial information is relevant enough to give a reliable assessment of the performance of firms operating in the knowledge economy.

H₂ The combination of financial measures and those on intangible capital enhancement improves the performance of firms operating in the knowledge economy.

H_{2.1} The addition of variables related to *human capital* improves the perception of the performance of firms operating in the knowledge economy.

H_{2.2} The addition of variables related to *structural capital* improves the perception of the performance of firms operating in the knowledge economy.

H_{2.3} The addition of variables related to *customer capital* improves the perceived performance of firms operating in the knowledge economy.

Research Methodology

Model and Variables Description

In search for explanatory variables of performance of firms operating in the context of the NE, we opted for Tunisian firms listed on the Stock Exchange in Tunis (TSE). Our sample is composed of non-financial corporation.

The size of the sample of the listed Tunisian firms is 26. Data were collected over seven consecutive years from 2005 to 2011 from the database of the TSE, which means 163 observations. The choice of the period is justified by the fact that the IPO of most firms studied is later than 2004.

The study includes a variable of interest which is the market value of listed companies on the stock exchange, as a measure of performance.

To better understand the role of intangibles in the chain of value creation, we specified econometric model to be studied. We used the same variables handled by John Core et al. (2003) to check the information content of the components of intellectual capital (Appendix 1).

We studied, first, the information content of accounting and financial data including: book value, earnings, and financial ratios such as return on equity (ROE), return on assets (ROA), price earnings ratio (PER), and earnings per share (EPS) (M1).

The explanatory variables are in the number eight combining traditional accounting variables that are the book value per share and net income for the year, to which we associated variables that refer to the intangible capital.

These components are organized around three main pillars which are structural capital, customer capital, and human capital. Also, we introduced the variable staff costs and training costs to test the contribution of the human factor in the (M2).

Then, we introduced detailed structural capital variables as follow: investment in computer software, investment in R&D, and investment in hardware (M3).

Note that we excluded the variable costs of staff training, and this is because of the lack of data on this variable (the sample size decreases to 36 observations once this variable is introduced).

Thus, we have defined three econometric models as follows:

$$M1 \quad MVE = \alpha_0 + \alpha_1 BVE + \alpha_2 ROE + \alpha_3 ROA + \alpha_4 PER + \alpha_5 EPS + \varepsilon$$

$$M2 \quad MVE = \alpha_0 + \alpha_1 BVE + \alpha_2 NI + \alpha_3 INTASS + \alpha_4 FIXASS + \alpha_5 ADV + \alpha_6 INCGROW + \alpha_7 PERSC + \varepsilon$$

$$M3 \quad MVE = \alpha_0 + \alpha_1 BVE + \alpha_2 NI + \alpha_3 INMATINF + \alpha_4 INLOGINF + \alpha_5 INVRD + \alpha_6 ADV + \alpha_7 INCGROW + \alpha_8 PERSC + \varepsilon$$

Variables of each model and their measures are detailed on Table 1 below:

Research Methodology

The choice of the estimation model depends on observations' frequencies.

Table 1 Variable list

| | | |
|-------------------------------|---------------------------------|---------------|
| External data | Market value of the share 31/12 | MVE |
| Model M1 | Variables | Abbreviations |
| Accounting and financial data | Book value of the share | BVE |
| | Return on equity | ROE |
| | Return on assets | ROA |
| | Price earnings ratio | PER |
| | Earnings per share | EPS |
| Model M2 | Variables | Abbreviations |
| Accounting and financial data | Book value of the share | BVE |
| | Net income for the year | NI |
| Human capital | Staff costs | PERSC |
| Customer capital | Advertising costs | ADV |
| | Evolution of business turnover | INCGROW |
| Structural capital | Fixed assets | FIXASS |
| | Intangible assets | INTASS |
| Model M3 | Variables | Abbreviations |
| Accounting and financial data | Book value of the share | BVE |
| | Net income for the year | NI |
| Human capital | Personnel costs | PERSC |
| Customer capital | Advertising costs | ADV |
| | Evolution of business turnover | INCGROW |
| Structural capital | Investment in hardware | INMATINF |
| | Investment in computer software | INLOGINF |
| | Investment On R&D | INVRD |

When we fix the time and we observe individuals, we opt for the ordinary least squares method (OLS) that consider variables at their gross value.

However, when we observe the same person on a different period, time series, we can also use the OLS method or other techniques such as « AREMA » method.

Moreover, when we combine two methods to collect data and we observe a lot of persons on different periods, we obtain a panel data (to not confuse with panel method). In this case, we use also the OLS method.

But, the use of panel method depends on individual characteristics which can influence estimations. Then, we have to know which method we will use.

If the specific effects exist, the panel method is more realistic and gives us robust estimators. That's why the first step consists of performing a homogeneity test or “test of model specification.”

If Fisher statistics are less than 0.05, this means that the individual effect exists, thus we should use panel method rather than OLS method.

We should indicate here that the difference between methods consists only of estimator's quality. Actually, we are looking for "blue estimators": efficient, consistent, and unbiased. Estimators issued from panel method are more efficient and more precise.

The use of OLS method makes us lose the estimators but they are still consistent. It's critically important that the estimator obtained be unbiased.

On the other side, we have to choose the appropriate panel method: fixed or random effects. We performed a Hausman test, and when it's significant we use the fixed effect. We cannot even use the fixed or the random effects.

The fixed effects suppose that individual effects remain unchanged or constant. The random effects, however, suppose that this one changes continuously.

We also have to verify that multicollinearity and heteroscedasticity problems do not exist. The first one will be verified by operating Vif test. The second one will be tested by Breusch-Pagan Test.

Thus, we conducted different estimations using OLS method, fixed effect method, and random effect method. We estimated firstly, financial variables such us ratios and book value. Then, we introduced those related on intangibles which are subdivided to three principal axes: structural capital, human capital, and customer capital.

Then, we performed a first regression with variables: intangible investment and tangible investment instead of detailed variables. The sample size is about 83 observations, and after excluding the extreme values.

Interpretation Results

We report in the following descriptive statistics and the results of various regressions that were carried on the three models: ordinary least squares (OLS), the random effects (Re), and the fixed effects model (Fe) knowing that we have deflated variables to better adjust the figures.

For the first model (M_1), correlation matrix showed significant and high correlation between DEBTR, ROE (-0.6909), and PBR (0.7059). We observed the same thing between NPROM and ROA (0.6717). Thus, both DEBTR and NPROM were dismissed from regression model (Appendix 2).

We conducted a test of specification to check the relationship between the dependent variable and the explanatory variables: homogeneity test (Goaied and Sassi 2012). This one allows us to use either the fixed or the random effects method (Appendix 3).

The results obtained, following the different operated regressions, indicate the significance of the variables: book value, return on equity, and return on assets. However, the PER and the EPS are insignificant (Table 2). This result does not match those found by Beaver (1968) and Affes and Siala (2007).

Furthermore, the explanatory power of the model is fairly low hovering around 20%. This result allows us to confirm the failure of classical accounting and financial data to translate firm performance of NE.

Table 2 Regression results OLS, fixed and random effects with ratios

| Explanatory variables | Number of observations, 156 | OLS coefficients (<i>p</i> value) | Fixed, fe coefficients (<i>p</i> value) | Random, re coefficients (<i>p</i> value) |
|--|-----------------------------|------------------------------------|--|---|
| BE | | 1.344396 (0.061)* | 2.589491 (0.002)*** | 2.064684 (0.005)*** |
| ROE | | -3.975284 (0.000)*** | -2.517628 (0.009)*** | -3.055731 (0.001)*** |
| ROA | | 12.02235 (0.032)** | 17.18869 (0.015)** | 14.38455 (0.017)** |
| PER | | .0037289 (0.564) | -.0011002 (0.856) | -.0006905 (0.905) |
| EPS | | .1550739 (0.111) | -.2295246 (0.096)* | -.0496871 (0.658) |
| Constant | | 1.498363 (0.001)*** | 1.392851 (0.000)*** | 1.460431 (0.000)** |
| <i>R</i> ² adjusted | | 0.2100 | 0.1306 | 0.1937 |
| Fisher statistics <i>F</i> or (Chi 2: χ^2) | | 9.24 | 13.44 | 63.12 |
| Significance | | (.0000)*** | (.0000)*** | (0.000)*** |

*Significance level at 10%, **significance level at 5%, ***significance level at 1%

Therefore, the use of components of intellectual capital proves to be very useful to measure the unencrypted value of NE firms.

We moved, as well, to the second model (M_2) inspired from Core et al. (2003) to test the content of intangible capital on the apprehension of performance.

Descriptive analysis (the variance-covariance matrix) showed the absence of the problem of multicollinearity between the variables (Appendix 4).

We also noted the absence of a multicollinearity problem between average variables (mean VIF = 7.96 < 10). But the statistics χ^2 shows the existence of a problem of heteroscedasticity (test Breusch-Pagan statistics $\chi^2 = 23.77$ with a *p* value < 0.05) (Appendix 5). To correct this problem, we made the correction by the Student's *t* robust command.

The table below summarizes the results of the various regressions (Table 3).

The obtained results indicate that the explanatory power of the model, taking into account the intangible component, is higher than that based solely on the accounting and financial data. Those results coincide with those found by Bontis et al. (1999) and Affes and Siala (2007).

The book value continues to be useful in assessing the overall performance of non-financial firms contrary to the result which seems to lose its role as an indicator of performance in the context of the NE.

We also concluded that structural capital improves the perceived performance of NE firms, in particular intangible investment made by firms. Similarly, the role of human

Table 3 Regression results OLS, Fixed and Random effects with intangibles components

| Explanatory variables | Number of observations, 83 | OLS coefficients (<i>p</i> value) | Fixed, fe coefficients (<i>p</i> value) | Random, re coefficients (<i>p</i> value) |
|---|----------------------------|------------------------------------|--|---|
| BE | | 3.246997 (0.000)*** | 2.575586 (0.000)*** | 1.572271 (0.018)** |
| NI | | .0000197 (0.090)* | 7.65e-06 (0.492) | -5.23e-07 (0.963) |
| INVINC | | .0010222 (0.000)*** | .0005745 (0.210) | .0018688 (0.000)*** |
| INVCOPR | | -.0000246 (0.036)** | .0000179 (0.091)* | -5.56e-06 (0.635) |
| INCGROW | | -.0060922 (0.905) | -.05768 (0.303) | -.1539597 (0.002)*** |
| ADV | | -3.603777 (0.568) | -20.00123 (0.018)** | -18.49473 (0.020)** |
| PERSC | | .0000378 (0.077)* | .0001272 (0.008)*** | 1.23e-06 (0.955) |
| Constant | | .7498614 (0.003)*** | -.0787631 (0.888) | 1.747757 (0.000)*** |
| R ² adjusted | | 0.6697 | 0.5005 | 0.3002 |
| Fisher statistic <i>F</i> or (chi 2: χ^2) | | 24.75 | 8.30 | 33.58 |
| Significance | | (.0000)*** | (.0000)*** | (0.000)*** |

*Significance level at 10%, **significance level at 5%, ***: significance level at 1%

capital which is measured by the staff costs appears to have a positive effect in the understanding of the performance of these firms.

However, we find a negative sign for the coefficients of the items related to customer capital. This sign is explained by any unwillingness on the part of investors following an investment in customer capital from the companies. This leads us to conclude that investment in customer capital has an inverse influence on the perception of the performance of NE firms.

The same process is carried out but we replace the structural capital with detailed items such R&D investment, hardware investment, and software investment, in the third model (M_3).

Descriptive analysis (the variance-covariance matrix) showed the absence of the problem of multicollinearity between the variables (Appendix 6). We also noted the absence of a multicollinearity problem between average variables (Appendix 7). We have verified that we have not a heteroscedasticity problem (Breusch-Pagan test: χ^2 statistic = 2.37 with a *p* value = 0.1235 > 5%).

Results show a higher level of explanatory power of the model and that exogenous variables explain 86% of the overall performance of NE firms (Table 4).

Table 4 Regression results OLS, fixed and random effects with structural capital detailed

| Explanatory variables | Number of observations, 83 | OLS coefficients (<i>p</i> value) | Fixed, fe coefficients (<i>p</i> value) | Random, re coefficients (<i>p</i> value) |
|--|----------------------------|------------------------------------|--|---|
| BE | | 3.782312 (0.000)*** | 3.777396 (0.000)*** | 3.753793 (0.018)** |
| NI | | .0000509 (0.056)* | .0000126 (0.677) | .0000357 (0.161) |
| INVLOGINF | | -.0003047 (0.219) | -.0001547 (0.497) | -.0002566 (0.247) |
| INVRD | | .0026185 (0.433) | .001491 (0.647) | .0020667 (0.520) |
| INMATINF | | .0020029 (0.010)*** | .0006566 (0.425) | .0015153 (0.032)** |
| INCGROW | | .027995 (0.549) | .0067361 (0.893) | .0244164 (0.571) |
| ADV | | 4.143294 (0.554) | -17.71189 (0.040)** | -2.020118 (0.780) |
| PERSC | | .0001875 (0.000)*** | .0001989 (0.000)*** | .0001966 (0.000)*** |
| Constant | | -.2817439 (0.296) | .1627723 (0.667) | -.1531003 (0.587) |
| R^2 adjusted | | 0.8440 | 0.8242 | 0.8614 |
| Fisher statistics <i>F</i> or (chi 2: χ^2) | | 38.86 | 48.57 | 341.66 |
| Significance | | (.0000)*** | (.0000)*** | (0.000)*** |

We also found that the variables: book value, hardware investment, and human capital are all significant at 5% in assessing the performance of non-financial companies. While the variables “investment in R&D,” variables that measure the Customer Capital and “software investment” are insignificant.

Those results approve theories advanced by Stern et al. (1995), Mauritsen (1998) & Lev (2000), about the intellectual capital informational content undisclosed but useful for evaluating firm global performance.

Conclusion

In search of reliable performance measures of firms operating in the knowledge economy, we were interested in information related to intangible, new sources of growth and value creation. Subsequently, we added to these data information which

are not included in the financial statements and which are related to intangible capital, the main source of value creation for NE firms.

There is a range of indicators of value creation which are namely, indicators of account nature mid-book hybrid nature, mid-financial, indicators of financial and stock market indicators in nature. In trying to answer the following question: “Is there an alternative to accounting and financial measures to measure overall performance of firms operating in the knowledge economy?”

We, first, tested the ability of accounting and financial data to give a reliable measure of the performance of firms in the NE. Subsequently, we tested the improved perception of the performance of firms in the knowledge economy, as measured by market value, by adding to it the accounting and financial data. Others refer to the intangible by creating new sources of value. The data in question are simultaneously human capital, structural capital and customer capital. Both tests have allowed us to define a reliable and relevant measure of the overall performance of firms in the NE. Also, they allowed us to check the opportunity to disclose information on intangibles to allow better estimates and speculate on NE firm performance.

Subsequently, we test the informational input of data on intangible capital and this is by adding them to traditional accounting metrics. Given the small number of works dealing with this issue in the context of Tunisia, we opted for this context which is referring to the site of the Tunis Stock Exchange (TSE) for the build-up of our database. Our sample included non-financial listed companies.

The study period covers 7 years from 2005 to 2011. The choice of the period depends on the date of the Initial Public Offering (IPO) of most companies. The constructed data represent data unbalanced panel. The sample size of non-financial Tunisian listed companies is firms, which means 163 observations. Our basic model depends on the model of John Core et al. (2003).

After performing tests of multicollinearity and the specification of the model, we tested the informational content of financial ratios, the carrying value of the result as well as measures of intangible capital.

In terms of financial ratios, regressions averted most ratios except the “return on equity ratio ROE” and the “return on assets, ROA” ratio which is significant at 5% level. They seem to be the only ones benefiting in assessing the performance of non-financial corporations. In addition, the “book value” and the following financial ratios ROE and ROA continue to help investors to better assess the performance of financial corporations in the NE.

Thus, we validated our initial hypothesis that stresses the usefulness of accounting and financial data in evaluating the performance of firms in the NE.

The main results found for non-financial companies, reinforce the emphasis hitherto of the outcome, the book value and structural capital variables.

However, they dismiss the research and development variable: this result is explained by the lack of data disclosure by the Customer Capital, which seems to be insignificant, with negative coefficients. We explain the negative sign by

reluctance on the part of investors faced with the expenses in the Customer Capital.

Conversely, expenditure on the staff of the company seems to be appreciated by investors. Indeed, the variable expense which refers to human capital is significant with a positive coefficient.

When we carried out the same process with detailed items of structural capital, we found that the same variables are significant at 5% level in assessing the performance of non-financial companies. The results show that exogenous variables explain 86% of the overall performance of NE firms. We also found that the variables: hardware investment and personal expenses are all significant at 5% level, while the variables “investment in R&D” and “software investment” are insignificant.

Results show a higher level of explanatory power of the model. However, variables that measure the customer capital are insignificant.

Similarly, data on intangible capital is embodied in three aspects: structural, customer, and human play an important role in assessing this. This validates our second hypothesis on the role of intangibles in the chain of value creation.

Therefore, we want to draw the attention of corporations in order to disclose more data on their investment in intangibles to better understand their overall performance. Besides, the contribution of this work is to underline the role of intangibles on firm value creation in knowledge economy. In fact, investors seem to be interested by firm intangible investment which is a sign of future growth and survival. The model defined can be used to identify criteria by which the Tunisian market evaluates firm’s performance.

The introduction of economic metrics such as “The Economic Value Added” and “The Market Value Added” is a way for future research that reflects the overall value of NE firms. “The Market Value Added” can be calculated from the simplified formula, while “The Economic Value Added” will be defined once we calculate the cost of capital by the method of “downside risk.” This domain will be the subject of our future work.

Appendix 1: John Core Model and Variables (2003)

The established empirical model is the following:

$$\begin{aligned} \text{MVE} = & \alpha_0 + \alpha_1\text{BVE} + \alpha_2\text{NI} + \alpha_3\text{NEG_NI} + \alpha_4\text{RND} + \alpha_5\text{ADVERT} \\ & + \alpha_6\text{CAP_EX} + \alpha_7\text{SALES_GR} + \varepsilon \end{aligned}$$

Such as MVE is the market value of the share, BVE is the book value of the share, NI is net income before extraordinary items, NEG_NI is net income before extraordinary items if this variable is <0 or equal; otherwise, it is set to 0, R&D are research and development expenses, ADVERT are advertising costs, CAP_EX is investment in property, and SALES_GR is a proxy for income growth.

Appendix 2: Matrix Correlation of Ratios

| | MVE | BVE | ROE | RMN | REND | EPS | ROA | PER |
|------|------------------------|-----------------------|------------------------|-----------------------|------------------------|-----------------------|----------------------|---------|
| MVE | 1.0000 | | | | | | | |
| BVE | 0.3247 (0.0000)*** | 1.0000 | | | | | | |
| ROE | -0.2818 (0.0004)*** | -0.4262 (0.000)*** | 1.0000 | | | | | |
| RMN | 0.0701 (0.3894) | -0.0139 (0.8619) | 0.3808 (0.0000)*** | 1.0000 | | | | |
| REND | 0.7106 (0.0000)*** | 0.5164 (0.0000)*** | -0.6909 (0.0000)*** | -0.1824 (0.210) | 1.0000 | | | |
| EPS | 0.1163 (0.1481) | -0.2332 (0.0028)** | 0.4449 (0.0000)*** | 0.4711 (0.0000)*** | -0.1518 (0.0544) | 1.0000 | | |
| ROA | 0.1051 (0.1915) | -0.0188 (0.8127) | 0.6239 (0.0000)*** | 0.6717 (0.0000)*** | -0.2550 (0.0011)*** | 0.6852 (0.0000)*** | 1.0000 | |
| PER | 0.0475 (0.5562) | 0.0473 (0.5559) | 0.1562 (0.0508)** | 0.1580 (0.0503)** | -0.1625 (0.0434)** | 0.1155 (0.1497) | 0.1835 (0.0214)** | 1.00000 |

*Significative a 10%, **significative a 5%, ***significative a 1%

Appendix 3: Vif Test and Breusch-Pagan Test (Applied on Ratios)

```
.vif
```

| Variable | VIF | 1/VIF |
|----------|-------|----------|
| fpers | 26.29 | 0.038032 |
| invcorp | 21.86 | 0.45741 |
| rt | 2.67 | 0.374499 |
| invinc | 1.24 | 0.807535 |
| crrev | 1.23 | 809,863 |
| BVE | 1.21 | 825,178 |
| pub | 1.18 | 847,006 |
| Mean VIF | 7.96 | |

```
.hettest
```

Breusch-Pagan/Cook-Weisberg test for heteroskedasticity

Ho: constant variance

Variables: fitted values of MVE

Chi2(1) = 23.77

Prob > chi2 = 0.0000

Appendix 4: Matrix Correlation of Intangible Components

| | MVE | BVE | INVINC | FIXASS | NI | INCGROW | ADV | PERSC |
|---------|-----------------------|-----------------------|---------------------|-----------------------|---------------------|---------------------|---------------------|---------|
| MVE | 1.0000 | | | | | | | |
| BE | 0.3255 (0.0000)*** | 1.0000 | | | | | | |
| INVINC | 0.4334 (0.0000)*** | -0.0890 (0.2974) | 1.0000 | | | | | |
| FIXASS | -0.0696 (0.3940) | -0.0234 (0.7712) | 0.0851 (0.3211) | 1.0000 | | | | |
| NI | 0.0442 (0.5828) | -0.0312 (0.6927) | 0.0742 (0.3855) | -0.0765 (0.3412) | 1.0000 | | | |
| INCGROW | 0.0481 (0.5524) | -0.0075 (0.9250) | 0.1444 (0.0934)* | -0.0283 (0.7271) | 0.0721 (0.3713) | 1.0000 | | |
| ADV | -0.1458 (0.1521) | -0.2354 (0.0167)** | -0.0716 (0.5077) | -0.0728 (0.4695) | 0.0419 (0.6746) | -0.1158 (0.2490) | 1.0000 | |
| PERSC | -0.0561 (0.4893) | -0.0693 (0.3838) | 0.1123 (0.1882) | 0.8153 (0.0000)*** | -0.0321 (0.6862) | 0.0751 (0.3512) | -0.0942 (0.3415) | 1.00000 |

*Significance level at 10%, **significance level at 5%, ***significance level at 1%

Appendix 5: Vif Test and Breusch-Pagan Test (Applied on Intangible Components)

| Variable | VIF | 1/VIF |
|----------|-------|----------|
| fpers | 26.29 | 0.038032 |
| invcorp | 21.86 | 0.45741 |
| rt | 2.67 | 0.374499 |
| invinc | 1.24 | 0.807535 |
| crrev | 1.23 | 809,863 |
| BVE | 1.21 | 825,178 |
| pub | 1.18 | 847,006 |
| Mean VIF | 7.96 | |

Breusch-Pagan/Cook-Weisberg test for heteroskedasticity
 Ho: constant variance
 Variables: fitted values of MVE
 Chi2(1) = 23.77
 Prob > chi2 = 0.0000

Appendix 6: Matrix Correlation of Intangible Components with Detailed Structural Component

| | MVE | BVE | RT | INVLOGINF | INVRD | INMATINF | CRREV | PUB | FPERS |
|-----------|-----------------------|-----------------------|----------------------|-----------------------|---------------------|-----------------------|---------------------|---------------------|--------|
| MVE | 1.0000 | | | | | | | | |
| BVE | 0.3255 (0.0000)*** | 1.0000 | | | | | | | |
| RT | 0.0442 (0.5828) | -0.0312 (0.6927) | 1.0000 | | | | | | |
| INVLOGINF | 0.1235 (0.1550) | -0.0707 (0.4082) | 0.0740 (0.3847) | 1.0000 | | | | | |
| INVRD | -0.0730 (0.3637) | -0.0140 (0.8597) | 0.0851 (0.3211) | -0.0433 (0.7447) | 1.0000 | | | | |
| INMATINF | 0.3194 (0.0013)** | -0.0386 (0.6960) | 0.1283 (0.1920)** | 0.5780 (0.0000)*** | -0.0222 (0.8195) | 1.0000 | | | |
| CRREV | 0.0481 (0.5524) | -0.0075 (0.9250) | 0.0721 (0.3713) | 0.1393 (0.1046)* | -0.0194 (0.8091) | 0.2390 (0.0166)** | 1.0000 | | |
| PUB | -0.1458 (0.1521) | -0.2354 (0.0167)** | 0.0419 (0.6746) | -0.0458 (0.6643) | 0.0848 (0.3923) | -0.0456 (0.7121) | -0.1158 (0.2490) | 1.0000 | |
| FPERS | -0.0561 (0.4893) | -0.0693 (0.3838) | -0.0321 (0.6862) | 0.1207 (0.1538) | -0.0559 (0.4795) | 0.3828 (0.0001)*** | 0.0751 (0.3512) | -0.0942 (0.3415) | 1.0000 |

*Significance level at 10%, **significance level at 5%, ***significance level at 1%

Appendix 7: Vif Test (Applied on Intangible Components with Detailed Structural Component)

| Variable | VIF | 1/VIF |
|-----------|------|----------|
| FPERS | 2.40 | 0.416693 |
| INVMATINF | 2.25 | 0.444979 |
| INVLOGINF | 1.82 | 0.550938 |
| BVE | 1.69 | 0.590936 |
| RT | 1.25 | 0.799889 |
| CRREV | 1.21 | 0.824290 |
| PUB | 1.16 | 0.860190 |
| INVRD | 1.07 | 0.935149 |
| Mean VIF | 1.61 | |

References

- Affes H., Siala R. (2007). «L'évaluation de l'impact du pilotage à base d'indicateurs non financiers du tableau de bord prospectif du capital immatériel sur la performance financière des entreprises tunisiennes.» *Colloque de l'Association Tunisienne des Sciences de Gestion*.
- Ansoff, I. (1968). *Stratégie du développement de l'entreprise*. Paris: Hommes et Techniques.
- Beaver, W.H. (1968). The information content of annual earnings announcements. *Journal of Accounting Research*, Supplement : 67–92.
- Bernard, C. I. (1938). *The functions of the executive*. Cambridge: Harvard University Press.
- Bontis, N., Dragonetti, N. C., Jacobsen, K., & Roos, G. (1999). «les Indicateurs de l'Immatériel », *Expansion. Manag Rev*, 37–46.
- Boudabbous, S. (2011). «Pratiques de gestion des ressources humaines et performance organisationnelle : le cas des banques en Tunisie» *Recherches en comptabilité et finance N°7*.
- Carroll, A. B. (1989). *Business and society*. Cincinnati: South-Western Publishing.
- Core J., et al. (2003). Market valuations in the knowledge economy: an investigation of what has changed. *Journal of Accounting & Economics*: 43–67.
- Dodd, M. E. (1932). For whom are corporate managers trustees. *Harvard Law Review*, 45(7), 1145–1163.
- Elliott, R. (1995). The future of assurance services: implications for academia *Accounting Horizons* 118–127.
- Fama, E., & French, K. (1993). Differences in the risks and returns of NYSE and Nasdaq stocks. financial analysts journal (1993)—the cross section of expected stock returns. *The Journal of Finance*, 47.2, 345–373.
- Feltham, G., & Ohlson, J. (1995). Valuation and clean surplus accounting for operating and financial activities. *Contemp Account Res*, 1, 689–731.
- Figge, F., & Schaltegger, S. (2000). *Was is it stakeholder value?* Germany: Universitat Lunberg.
- Fisher, I. (1930). “The theory of interest: as determined by impatience to spend income and opportunity to invest it”. Édition Clifton, 1974, Augustus, M. Kelley Publishers.
- Francis J., Schipper K. (1999). Have financial statements lost their relevance? *Journal of Accounting Research* 37.2.
- Goaied, M., & Sassi, S. (2012). *Econométrie des données de panel sous stata*. Tunisie: Laboratoire LEFA IHEC Carthage.
- Hax, A. C., & Majluf, N. S. (1984). *Strategic management: an integrated perspective*. New Jersey: Prentice Hall.
- Hummels, H. (1998). Organizing ethics: a stakeholder debate. *Journal of Business Ethics*, 17, 1403–1419.
- Jensen, M.C. (1986). «Agency costs of free cash flow, corporate finance and takeovers» *The American Economic Review* 76. 2.

- Jones, G. (2001). *Organizational theory: text and cases* (Third ed.). New Jersey: Prentice Hall.
- Kaplan R. S., & Norton D. (1996). The balanced score card: measure that drive performance *Harvard Business Review*, 71–79.
- Kochan T., Rubenstein S. (2000). Toward a stakeholder theory of the firm: the saturn partnership *Organizational Science* 367–386.
- Kanjo Mantoh, R. (2015). “Intangible assets, firm performance and value creation :an empirical study of German public limited companies.” Aarhus University Business and Social Science: Department Of Economics and Business Economics. <http://pure.au.dk/portal-asb-student/files/90835035/201302214.pdf>.
- Lev, B., & Sougiannis, T. (1996). The capitalization, amortization, and value-relevance of R&D. *J Account Econ*, 21.1, 107–138.
- Lev B., & Zarowin P. (1999). «The Boundaries of Financial Reporting and How to extend them», *Journal of Accounting Research*, Autumn.
- Mauritsen, J. (1998). Driving growth: economic value added versus intellectual capital. *Manag Account Res*, 9, 461–482.
- Mercier, S. (2001). L’apport de la théorie des parties prenantes au management stratégique : une synthèse de la littérature. X^{ème} Conférence de l’Association Internationale de Management Stratégique. juin.
- Modigliani F., Miler M.H. (1958). The cost of capital, corporation finance and the theory of investment, *The American Economic Review*, XLVIII, 3.
- Morin M., et al. (1994). L’efficacité de l’Organisation Organisation : Théorie, Représentations et Mesures. Montréal: Ceatan, Morin Editeur.
- New, W. H. (2000). Ice crystals. *Journal of Modern Literature*, 23(3), 565–573.
- Penrose, E. (1959). *The theory of the growth of the firm*. Oxford: Basil Blackwel.
- Post J., Preston L., Sachs S. (2002). “Redefining the corporation: stakeholder management and organizational wealth,” Standford Business.
- Rappaport, A. (1986). *Creating shareholder value: a guide for managers and investors*. Free Press.
- Rhenman, E., & Stymne, B. (1965). *Corporate management in a changing world*. Stockholm: Aldus/Bonniers.
- Stern, J. M., Stewart III, G. B., & Chew, D. H. (1995). The EVATM financial management system. *Journal of Applied Corporate Finance*, 8.2, 32–46.
- Sumedrea, S. (2013). Intellectual capital and firm performance:a dynamic relationship in crisis time. *Procedia Economics and Finance*, 6, 137–144.
- Tiras S., Ruf B. & Brown R. (1998). The relations between stakeholder’s implicit claims and firm value. www.ssm.com.
- Vernimmen, P. (2013). *Finance d’entreprise*, 11^{ème} édition Dalloz.
- Weiss, J.W. (1994). A managerial stakeholder approach *Business Ethics*.
- Williams, J. B. (1938). *The theory of investment value* (Édition ed.). Cambridge: Harvard University Press.
- Yahchouchi, G. (2007). Valeur ajoutée par les parties prenantes et création de valeur de l’entreprise. *La Revue des Sciences de Gestion, Direction et Gestion. Finance*, 224–225. doi:10.3917/rsg.224.0085.

Reproduced with permission of copyright owner.
Further reproduction prohibited without permission.