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Original Article

A Comparative survey of the Correlation between Intellectual Capital, the Capital Employed Efficiency and Profitability in Firms Accepted at the Tehran Stock Exchange

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ABSTRACT

The intellectual capital approach in organizations leads to improved decision making by users, enhanced internal management, better reports being issued out of the organization, transactions of this capital within the firm and developed accounting performances. Furthermore, the role and significance of the output resulted by intellectual capitals employed in firms' profitability and continual stability is nowadays regarded as higher than the output of financial capitals. This research primarily aims to make a comparative study of the correlation between intellectual capital, the capital employed efficiency and profitability in firms accepted at the Tehran Stock Exchange. The statistical sample consists of 5 industrial groups of firms accepted at the Tehran Stock Exchange and the time period involves 2008 to 2010. Multiple regression tests have been used in order to test the hypotheses and examine the correlation between the variables. The obtained results indicated a direct correlation between intellectual capital and the efficiency of the capital employed and the firms' operating profit. Furthermore, according to the results, firms that make more use of intellectual capital have higher net operating profits than firms which use less intellectual capital. The findings of the present research suggest that intellectual capital can be considered as an effective factor in the efficacy of venture units. This finding can come to the attention of the shareholders and managers of these units and encourage them to endeavor, by making managerial modifications, to take the existence of intellectual capitals into consideration and take measures toward using them correctly.

Key words: intellectual capital, the capital employed efficiency, net operating profit

INTRODUCTION

By being involved in knowledge economy, knowledge has been preferred to other production factors such as land, capital and machinery. In economy, knowledge is regarded as, in fact, the most important production factor and the most significant competitive factor among organizations. Furthermore, as advanced technology marched on speedily, in particular in fields such as communications, computers and bioengineering, global economic growth patterns began to change as of the 1970s; consequently, knowledge became the most important capital instead of physical and monetary capitals. [1]

One of the characteristics of knowledge is intangibility, which makes it difficult to measure and evaluate. In the past, on the other hand, organizations were able to make thorough calculations of their assets and production by means of accounting methods. Today, however, such accounting methods lack the necessary efficacy. Knowledge is regarded as one of the most important components of intangible assets. In the past, most of the organizations' assets were tangible, whereas nowadays, organizations mostly have intangible assets. [2]

The modern world has surpassed knowledge economy, and now focuses upon knowledge-based economy. Knowledge-based economy is an economy in which the production and use of knowledge plays the most significant role in the process of creating wealth. One of the distinctive characteristics of knowledge-based economy is the immense trend of investment in human capital and information and communication technology. Modern knowledge economy potentially presents unlimited resources, for the human capacity for generating knowledge has no boundaries. Intangible assets and intellectual capital quickly complement physical assets.

Intellectual capital means the total capital, the possessive right based on the knowledge owned by the firm. In other words, intellectual capital implies the development and employment of resources of knowledge in firms. Thus, in the third millennium, in which intellectual capital – rather than financial capital – forms the basis of a firm's future dynamic ability, and the firm's future status lies in knowledge economy; thus, it is necessary for organizations' key resources and performance and merit stimuli be determined by managers, for higher knowledge and the employment of intellectual capital helps firms be more efficient, more effective, more productive and more innovative. Furthermore, the competitive success of firms depends more upon the strategic management of intellectual capital rather than the strategic allocation of physical and financial resources. [3]

During the industrial age, cost prices for properties included equipment and raw material, and was regarded as important to the success of a business; nowadays, however, it is the effective use of intellectual capacity that is usually decisive in the success or failure of an organization [4]. In fact, Bhardwaj has called intellectual capitals and properties as a firm's most valuable and most important intangible resources. He believes that tangible assets can easily be copied or purchased at the free market. Hence, they cannot be the firm's strategic assets or create competitive advantage for it. Intellectual capitals, on the contrary, are usually created internally, and lie within the skills and businesses of the firm staff. Due to the specific characteristics of these assets, a firm's intellectual resources are unique and exclusive; they cannot be copies, which is what makes them valuable and able to generate competitive advantage for the firm. [5]

Thus, using the intellectual capital approach in organizations brings about improved decision making by users, enhanced internal management, better reports being issued out of the organization, transactions of this capital within the firm and developed accounting performances. Furthermore, the role and significance of the output resulted by intellectual capitals employed in firms' profitability and continual stability is nowadays regarded as higher than the output of financial capitals. In other words, in today's knowledge-oriented societies, financial capitals are of less importance in determining sustainable profitability compared to intellectual capitals. Thus, the question rises whether intellectual capital and the capital employed efficiency by firms is correlated to their profitability or not.

The term "intellectual capital" was used by John Kenneth Galbraith for the first time in 1969. He believed that intellectual capital steps beyond "thinking in the form of mere thinking," and also involves an extent of intellectual action. In this sense, intellectual capital is not only a static, intangible asset in its own self, but also an ideological process and means to achieve the goal. When research on intellectual capital began in the early 1980s, various definitions were presented for intellectual, all of which conveyed general concepts, for it is difficult to present an exact definition for intellectual capital. Hence, despite a great amount of effort by researchers on intellectual capital, there is no universally approved definition for intellectual capital, and all of the definitions presented are more or less alike. These definitions and basic concepts provide a useful basis for understanding intellectual capital. [6] However, they lack the required features for identification, categorization and measurement. For instance, Lodhi believes that the categorized plans provided by research aids the understanding of the components of intellectual capital. By comprehending the various components of intellectual capital, enhanced management and its use in operational and strategic levels can be achieved. The most common categorization plan divides intellectual capital into three parts – human capital, structural capital and costumer capital. Furthermore, studies on innovation capital are a new subject that has seldom been examined in accounting literature and studies. [7]

Chen studied the correlation between intellectual capital and the financial performance of the firms accepted at the Taiwan Stock Exchange from 1992 to 2002. The results of the hypotheses tests indicated that intellectual capital has a positive impact upon market value and financial performance, and may be a criterion for future performance. Furthermore, the evidence presented implied that expenditures on research and development provide further information on structural capital and enjoy a positive correlation with profitability and market value. [4]

Using value added intellectual coefficients and moderated value added intellectual coefficients; Chang studied the impact of intellectual capital on market value (market-to-book value and price-to-earnings ratios) and profitability (return on asset, return on shareholders' equity, basic earning power and profit margins) upon the information technology industry in Taiwan from 2001 through 2005. His results indicated that intellectual capital and its components only have a positive, significant correlation with profitability and market value throughout the whole industry mentioned above. [5]

Anvari Rostami et al. [8] examined the correlation between intellectual capital and the market value of the stock of firms accepted at the Tehran Stock Exchange. In this research, various methods were suggested and used for measuring intellectual capital. The research findings indicated that only two of the suggested methods have high, significant correlations with the market value of the firms included at the stock exchange.

In his doctoral dissertation, Rahnomai [9] has studied the correlation between intellectual capital and modern variables of performance assessment based on generating values such as the economic value added, market value added and the shareholder value added by means of comparing six models of intellectual capital evaluation. The results of his research convey the existence of a correlation between the scale of intellectual capital and the added market value.

Intellectual capital existing within the venture unit is one of the most significant intangible properties that have come to great attention among venture units through the recent years. Intellectual capital is important to firms because it makes it possible for firms to maintain their competitive capability among other firms through innovative strategies, for venture units need to select and pursue one of the leadership strategies on prices or distinction and innovation in order to maintain their activity. Success in each of these strategies leaves positive, desirable impacts upon corporations' efficiency and performance [6]. Thus, it is predicted that intellectual capital has a direct, significant correlation with firms' financial performance. Hence, this research presents the three following hypotheses:

The First Hypothesis: There is a positive, significant correlation between intellectual capital and net operating profit.

The Second Hypothesis: There is a positive, significant correlation between the capital employed efficiency and net operating profit.

The Third Hypothesis: Firms making more use of intellectual capital enjoy higher net operating profits compared to firms which use intellectual capital less.

MATERIALS AND METHODS

This research is of the descriptive, correlational type. It is descriptive because it aims to describe the circumstances or phenomena studied and also to provide more knowledge of the existing conditions; on the other hand, it is correlational because the research concerns the correlations between variables. The present research has endeavored to examine the correlations between variables and confirm the existence of these correlations in current circumstances based upon historical data. Thus, it can be regarded as an ex-post facto research. Ex-post facto studies deal with the study of causes and effects (dependent and independent variables) after their occurrence. In such studies, there is a statistical correlation between the variables, which the research aims to study. Moreover, the data cannot be manipulated. This research aims to study the correlation between intellectual capital and the profitability of the firms accepted at the Tehran Stock Exchange. Thus, the data for the sample firms is collected over a five-year period from 2005 through 2010. Subsequently, the research variables are measured and the hypotheses are tested.

The Statistical Population and the Study Sample

In the present research, classified and audited financial data for firms accepted at the Tehran Stock Exchange have been used in order to test the hypotheses of the study. The statistical population of this research consists of 5 industrial groups among the firms accepted at the Tehran Stock Exchange:

1. The group of main metal firms
2. The group of automobile and auto parts firms
3. The group of pharmaceutical materials and products firms
4. The group of cement, lime and plaster firms
5. The group of chemical products firms

Based on the following conditions and considerations, the statistical population is narrowed down, and a statistical sample is extracted.

1. The firm's fiscal year must end at the end of Esfand.
2. The firm studied must not undergo changes in its fiscal year.
3. The firm needs to be present at the stock exchange during the years 2005 to 2010.
4. The firm's exchange symbol must be active and must not have remained inactive for over three months per year.
5. The financial data for the firm studied must be available.

Thus, systematic elimination (screening) sampling has been used; according to the circumstances mentioned above, a number of the firms included in each industry were selected, and the financial data for each were collected. As a result of the conditions and considerations made in systematic elimination sampling, 102 firms were selected for the tests from the statistical population. The study period is 5 years; therefore, the final sample volume consists of 510 *year-companies* (5 x 102).

The Research Variables and the Method for Their Calculation

The most significant and the most useful way for variable categorization is to classify them into dependent and independent ones.

Independent Variables

In this study, intellectual capital and the capital employed efficiency are the independent variables. The method for the measurement and quantification of these variables is one of the most important and the most considerable parts of this research, for the correct and logical measurement of these concepts can provide numerous implications to supplement the theoretical background relevant to the subject of the study.

The Method for Measuring Intellectual Capital

Known as an organization's intangible asset, intellectual capital is a valuable form of capital. Modern economy is based on intellectual capitals, the goods of which are knowledge and information. Intellectual capital consists of knowledge, information, intellectual assets and experiences which can be used to create wealth. Such an assembly includes intellectual power or useful knowledge. To calculate intellectual capital, the calculated intellectual value (CIV) method is used. In this approach, a firm's excess return, such as the excess return to the industry's average return, is resulted from intellectual capital (Firer, S. and William S.M., 2003). Measuring intellectual capital by means of this method consists of several steps, which are as follows:

At first, $\overline{EBT}_t$, $\overline{TA}_t$, and $\overline{ROTA}_t$ are separately calculated for each of the selected firms.

$$\overline{EBT}_t = \frac{\sum_{t-1}^{-3} EBT}{3}$$

$$\overline{TA}_t = \frac{\sum_{t-1}^{-3} TA_t}{3}$$

$$\overline{ROTA}_t = \frac{\overline{EBT}_t}{\overline{TA}_t}$$

EBT_t: earnings before tax during the period t

TA_t: the firm's tangible fixed assets during the period t

$ROTA_t$: the rate of return on tangible fixed assets during the period t

Subsequently, $\overline{EBTI}_t$, $\overline{TAI}_t$ and $\overline{ROTAI}_t$ are separately calculated for all industries the firms belong to.

$$\overline{EBTI}_t = \frac{\sum_{t-1}^{-3} EBTI}{3}$$

$$\overline{TAI}_t = \frac{\sum_{t-1}^{-3} TAI_t}{3}$$

$$\overline{ROTAI}_t = \frac{\overline{EBTI}_t}{\overline{TAI}_t}$$

In this stage, the return on asset figures for the firms in the statistical sample are compared with the runs on assets of the industries each of these firms belong to ($ROTA_t$ and $ROTAI_t$). As in the intangible method, if a firm's return on assets exceeds the assets of the industry, it is due to the existence of intellectual capital in the specific firm, which has caused the firm's physical capital efficiency to be higher than the standard results expected by the industry.

$$ER_t = (ROTA_t - ROTAI_t) \times \overline{TA}_t (1 - \bar{t})$$

$$IC_t = \frac{ER_t}{1 + WACC}$$

IC: the firm's intellectual capital

ER_t: the firm's excess return on assets compared to the industry concerned

$WACC_{it}$: the weighted average company capital, which is calculated as:

$$WACC_t = \frac{L_t}{L_t + E_t} \times K_d (1-t) + \frac{E_t}{L_t + E_t} \times K_e$$

L_t: the firm's total bad debts

E_t : total stockholders' equities

K_d : the interest rate for securities issued by the Central Bank

K_e : return rate expected by stockholders, calculated as follows:

$$K_e = \frac{D_o(1+g)}{P_o} + g$$

D_o: dividends per share

P_o: selling price for each share of the firm at the beginning of the fiscal period

g: profit growth rate per share of the firm

Measuring the Capital Employed Efficiency

In order to calculate the capital employed efficiency, the firm's value added is used.

$$CEE = \frac{VA_{it}}{CE_{it}}$$

CEE: the capital employed efficiency

CE: the capital employed, equal to the book value of all of the firm's assets minus its intangible assets
VA_{it}: the firm's added value, which is calculated by means of the following formula:

$$VA_{it} = GM - SgaE_{xp} + LE_{xp}$$

GM: the firm's gross profit (the difference between sales earnings and the cost for goods and services)
SgaExp: total selling, general and administrative expenditures
LE_{xp}: labor expenses

The Dependent Variable of the Study

In the present study, the dependent variable is the net operating profit, a criterion for the firm's financial performance arising from mainstream and continual activities during the fiscal period.

The figures for this variable are obtained from the audited income statement of the firms in the statistical population, and to make them compatible with the other variables, they are divided to the book value for all of the firm's assets at the onset of the period.

$$ONI = \frac{ONI_{it}}{TA_{it-1}}$$

The Method for Testing the Hypotheses

Multi-variable regression models are used to test the hypotheses in this study. In these models, the firm's net operating profit is regarded as a function of the independent variables – intellectual capital and the capital employed – and the control variables of the study. In the present research, in order to further clarify the correlation between the independent variables and the dependent ones, three controlling variables – the sales growth rate, firm size and the market-to-book ratio – have been used.

The Model for the First Hypothesis

In the first hypothesis of the research, it has been claimed that a positive, significant correlation exists between intellectual capital and the net operating profit. To test this hypothesis, a regression model has been used in which the net operating profit is regarded as a function of the intellectual capital level of the firms included in the statistical sample and the control variables of the study. The regression model mentioned is as follows:

$$OIN_{it}=\beta_0+ \beta_1 IC_{it}+ \beta_2 SIZE_{it}+ \beta_3 GROW_{it}+ \beta_4 MTB_{it} +\varepsilon_{it}$$

OIN: the firm's net operating profit
IC: the firm's level of intellectual capital
SIZE: the size of the firm as a controlling variable (the natural logarithm of the firm's assets)
GROW: the sales growth rate as a controlling variable
MTB: the market-to-book ratio

In the regression model above, the coefficients β2 to β4 show the correlation between the control variables and the dependent variables. Furthermore, the coefficient β1 reflects the correlation between the intellectual capital and the net operating profit. In accordance with the claim mentioned above, the following statistical assumptions can be made about this coefficient:

H0: $\beta_1 \leq 0$
H1: $\beta_1 > 0$

The Model for the Second Hypothesis

The second hypothesis concerns the correlation between the net operating profit and the capital employed. As in the model for testing the first hypothesis, a regression model has been used in which the net operating profit is regarded as a function of the intellectual capital level of the firms included in the statistical sample and the control variables of the study. The regression model is as follows:

$$OIN_{it}=\beta_0+ \beta_1 CEE_{it}+ \beta_2 SIZE_{it}+ \beta_3 GROW_{it}+ \beta_4 MTB_{it} +\varepsilon_{it}$$

In the regression model above, the coefficients β2 to β4 show the correlation between the control variables and the dependent variables. Furthermore, the coefficient β1 reflects the correlation between the capital employed and the net operating profit. In accordance with the claim mentioned above, the following statistical assumptions can be made about this coefficient:

H0: $\beta_1 \leq 0$
H1: $\beta_1 > 0$

The Method for Testing the Third Hypothesis

The third hypothesis of the study predicts that firms making more use of intellectual capital enjoy higher net operating profits than firms who use intellectual capitals less. In order to test this prediction, all of the firm-years in the statistical population are categorized into two groups – firms with high and low intellectual capital – based on the obtained amounts. The basis for this categorization is the average amounts for the calculated intellectual capital for all year-firms in the statistical sample. Thus, if the intellectual capital of a firm is higher

than the average mentioned above, the firm is regarded as one with high intellectual capital; otherwise, it is categorized as a firm with low intellectual capital. Having done this categorization, the net operating profits for the two groups mentioned above are compared by means of the analysis of variance (ANOVA) test (the comparison of means). The statistical assumptions concerning the test of the comparison of means are as follows:

$H0: \mu_1 = \mu_2$

$H1: \mu_1 \neq \mu_2$

$\mu 1$: the average operating profit for firms with low intellectual capital

$\mu 2$: the average operating profit for firms with high intellectual capital

RESULTS

The first hypothesis of the study emphasizes a significant correlation between intellectual capital and net operating profit. This hypothesis can be expressed in the form of the following research hypotheses:

H0: There is no positive, significant correlation between intellectual capital and net operating profit.

H1: There is a positive, significant correlation between intellectual capital and net operating profit.

To examine the precision of this hypothesis, the regression model presented in Chapter 3 has been used. The results for the regression fitting have been displayed in Table 1.

Table 1. Statistical analysis of the first hypothesis test

$OIN_{it}=\beta_0+\beta_1 IC_{it}+\beta_2 SIZE_{it}+\beta_3 GROW_{it}+\beta_4 MTB_{it}+\varepsilon_{it}$					
R^2 Adjusted	Durbin-watson test		F	P	
0.292	1.54		66.63	0.001	
Variable	**β**	**T value**	**P**	**Collinearity Statistics**	
				Tolerance	VIF
IC	0.117	3.503	0.001	0.999	1.001
SIZE	-0.009	-0.276	0.782	0.999	1.001
GROW	0.318	9.517	0.001	0.996	1.004
MTB	0.407	12.191	0.001	0.996	1.004

The first part of the table above shows the results for the statistical analysis on the validity of the regression model. The coefficient of determination for the model is 0.292. Thus, the fitted regression has accounted for 29.2 percent of the changes in operating profit by means through changes in independent variables. The results show that the Durbin-Watson statistic is between 1.5 and 2.5; therefore, there is no intense correlation between the errors of the regression model itself. The last two columns in Table 1 show the results for the regression variance analysis, which is decided upon based on the F statistic, for the regression fitness model given in the test for the first hypothesis of the study. The statistical assumptions of the variance analysis for the regression model are as follows:

$H0: \beta i=0$ The regression model is not significant

$H1: \beta i\neq 0$ The regression model is significant

The level of significance of the statistic F is lower than the error level of the test ($\alpha= 0.05$); thus, the hypothesis H0 is nullified, and the fitted regression is, therefore, statistically significant, and the variables have linear correlation.

The statistical analysis results for each of the independent and controlling variables in the model for the test of the first hypothesis have been displayed in Table 1. The results show the estimated statistics for the multicolinearity tests to be approximately 1 for all of the variables. Therefore, there is no intense multicolinearity between the independent variables of the regression model, and the hypothesis of the lack of multicolinearity between independent variables – one of the basic assumptions of regression for the fitted model – is true. As for the analysis of the results obtained for the coefficients for independent and controlling variables, the following statistical assumptions can be made based upon the claim stated:

$H0: \beta_1 \leq 0$

$H1: \beta_1 > 0$

In other words, the first hypothesis can be accepted if the intellectual capital coefficient ($\beta 1$) is positive and significant. The results show the estimated coefficient for this variable to be 0.117 with a 0.001 level of significance. This finding indicates a direct, significant correlation between the level of intellectual capital and the operating profit (or loss) of the firms included in the statistical sample during the research period; this shows that employing more intellectual capital increases the firm's profitability. This finding implies the positive role of intellectual capital in the firms included in the statistical sample during the research period, indicating that firms

with higher levels of intellectual capital have enjoyed more profitability. The results of this test are in conformity with the theoretical background of the study, which emphasize that employing physical capital with the desired efficiency and efficacy depends on the existence of appropriate intellectual capital in the venture unit, by which the maximum efficiency and efficacy can be achieved using the resources available. The results obtained by the statistical tests confirm the above mentioned theoretical background.

Regarding the controlling variables of sales growth rate and the market-to-book ratio, the results indicate a direct, significant correlation between these variables and operating profit (or loss). These findings imply that firms with higher sales growth rates and also higher market-to-book ratios are more profitable. Furthermore, as for the variable of firm size, the results do not show a significant correlation between this variable and operating profit (or loss).

All in all, the results indicate the lack of convincing evidence for accepting the hypothesis H0: $\beta 1 \leq 0$; moreover, during the research period, there has been a significant correlation between the level of intellectual capital and operating profit (or loss). Therefore, the first hypothesis of the research is accepted with95 percent certainty.

In the second hypothesis of the study, the correlation between the capital employed efficiency and the net operating profit is considered. This hypothesis can be defined in the form of the following research assumptions:

H0: There is no positive, significant correlation between the capital employed efficiency and the net operating profit.

H1: There is a positive, significant correlation between the capital employed efficiency and the net operating profit.

To examine the precision of this hypothesis, the regression model presented in Chapter 3 has been used. The results of the regression fitting have been displayed in Table 2.

Table 2. Statistical analysis of the second hypothesis test

$OIN_{it}=\beta_0+\beta_1 IC_{it}+\beta_2 SIZE_{it}+\beta_3 GROW_{it}+\beta_4 MTB_{it}+\varepsilon_{it}$					
Adjusted R^2	Durbin-watson test		F	P	
0.628	1.515		270.75	0.001	
Variable	**β**	**T value**	**P**	**Collinearity Statistics**	
				Tolerance	VIF
CEE	0.63	24.43	0.001	0.876	1.141
SIZE	0.04	1.645	0.101	0.992	1.008
GROW	0.165	6.609	0.001	0.934	1.07
MTB	0.264	10.58	0.001	0.938	1.066

The coefficient of determination for the model for testing the second hypothesis is 0.63, which is higher than the coefficient of determination for the model for testing the first hypothesis and indicates that the fitted regression has accounted for 63 percent of the changes in operating profit by means of the changes in independent variables. This finding shows that the variable of the capital employed efficiency has had a more intense impact on the profitability of the firms in the statistical sample compared to the effect of the intellectual capital. Moreover, the results show that the Durbin-Watson statistic is between 1.5 and 2.5; therefore, there is no intense correlation between the errors of the regression model itself. The level of significance for the statistic F as a criterion for the general significance of the fitted regression implies that the fitted regression is statistically significant and that at least one significant independent variable exists in the regression model.

The results show that the estimated statistics approximate 1 in the multicolinearity tests for all variables. Therefore, there is no intense multicolinearity among the independent variables of the regression model, and the assumption of the void of multicolinearity among the independent variables – one of the basic assumptions of regression in the fitted regression model – is true.

The statistical analysis results for the independent variable coefficients show the coefficient for the capital employed efficiency variable to be 0.63 with a 0.001 level of significance. This finding implies a direct, significant correlation between the efficiency level of the capital employed and the operating profit (or loss) of the firms included in the statistical sample throughout the period of the study, indicating that an increase (or reduction) in the capital employed efficiency leads to higher (or lower) profitability for the firms included in the statistical sample.

The results obtained by the test for the second hypothesis are in conformity with the claim made in this hypothesis and also with the theoretical background of the test, indicating that the capital employed efficiency can leave desired effects upon firms' profitability. Hence, attention on venture unit managers' behalf toward this issue can enhance the performance of these units by means of making correct use of physical resources. As for the controlling variables, the results are similar to the findings obtained by the test for the first hypothesis, indicating

that sales growth rates and market-to-book ratios are the results of direct, significant correlations between these variables and operating profit (or loss). Furthermore, as for the variable concerning firm size, the results convey no significant correlation between this variable and operating profit (or loss).

All in all, the results indicate that during the research period, there has been a significant correlation between the level of efficiency of the capital employed and the operating profit (or loss). Therefore, the second hypothesis of the research can be accepted with a 95 percent level of certainty.

The third hypothesis is defined as:

H0: The net operating profit of firms making more use of intellectual capital is not higher than firms making less use of intellectual capital.

H1: The net operating profit of firms making more use of intellectual capital is higher than firms making less use of intellectual capital.

Thus, the statistical assumptions for the third hypothesis can be defined as follows:

H0: $\mu_1=\mu_2$

H1: $\mu_1\neq\mu_2$

μ1: the average operating profit for firms with low intellectual capital

μ2: the average operating profit for firms with high intellectual capital

In the third hypothesis of the present research, it is predicted that firms making more use of intellectual capital enjoy higher net operating profits than those who use intellectual capital less. To test this hypothesis, using the approach discussed in the descriptive analysis, the firms in the statistical sample were divided into two groups – firms with high intellectual capital and those with low intellectual capital – and subsequently compared through the means comparison test. In the categorization, the number 1 indicates the group of firms with high intellectual capital. The results obtained from the test mentioned above have been displayed in Table 3.

Table 3. Summary of t test between groups with high and low intellectual capital

Groups	N	Mean	Mean difference	levene's Test for Equality of Variances		t-test for Equality of Means	
				f	sig	t	sig
0	422	0.1379	-0.1012	30.079	0.000	-.7.37	0.000
1	218	0.2391					

The results obtained by the test indicate a -0.1012 difference between the mean operating profits of the firms subjected to the study. This comparative test of the means aims to determine the significance or insignificance of the above-mentioned difference. The assumption for this test was the equality of the variances of the two groups of data studied, which is done by means of Levene's test. The statistical assumptions for the equality of the variances are as follows:

H0:$\delta_1= \delta_2= \delta_3....= \delta_n$

H1:$\delta_1\neq \delta_2\neq \delta_3.... \neq \delta_n$

The results imply that the level of significance of the Levene's test statistic F is less than 0.05; thus, hypothesis H0 cannot be accepted. Hence, the results of the test of comparison of means assuming variances as unequal come to our attention. The statistical assumptions concerning the test of the comparison of means are as follows:

H0: $\mu_1=\mu_2$

H1: $\mu_1\neq\mu_2$

μ1: the average operating profit for firms with low intellectual capital

μ2: the average operating profit for firms with high intellectual capital

The results show the t-test statistic to be -7.37 with a 0.001 level of significance. Such a finding indicates that there is a statistically significant difference between the net operating profit for firms with high intellectual capital and those with low intellectual capital. These results are in conformity with the theoretical background of the research and the prediction made in the third hypothesis. This finding also confirms the results obtained by the first hypothesis of the research, showing that higher intellectual capital has led to statistically higher profitability in the firms included in the statistical sample during the study. The existence of a significant difference between the net operating profit of firms with high intellectual capital and those with low intellectual capital implies that intellectual capital can to be regarded by managers and investors as an effective factor in the profitability of venture units. Considering the results presented in Table 3, no convincing evidence is obtained to accept the hypothesis H0. Thus, the third hypothesis of the research and its claim is accepted with a 95 percent level of certainty.

DISCUSSION

The results of the statistical analyses indicated a direct correlation between intellectual capital and the capital employed and the firm's operating profit. Furthermore, according to the results, firms making more use of intellectual capital enjoy a higher net operating profit than firms who use intellectual capital less. Based on these findings, intellectual capital appears to be an effective factor in the efficiency of venture units. This conclusion can be of attention to the managers and stockholders of these units, and encourage them to take intellectual capitals in their units into consideration and, by making a few managerial modifications, create strategies to make correct use of them. Such an approach may enhance managers' awareness and hence lead to the enhancement of positive, desirable effects resulting in by the intellectual capacity. Furthermore, it should be noted that the capital employed efficiency is influenced by the level of the venture unit's intellectual capital; clearly, these two variables are directly correlated. The capital employed efficiency is, in fact, a part of the intellectual capital, and these two variables change in the same general way. Thus, it can be expected that in firms with the potential levels of intellectual capital, employing physical capital can provide the efficiency needed to achieve the desired performance. Godinho et al [10] have reasoned that such efficiency is correlated to two factors exclusive to any firm – managerial characteristics and the firm's specific characteristics. Hence, the manager's operational capabilities and his/her insight into evaluating the operating environment of the firm in order to achieve maximum values is probably a major part of the capital employed efficiency. Moreover, as stated by Godinho et al [10], characteristics exclusive to firms, such as size, opportunities for growth and the power to access financial resources outside the firm can be influential in the capital employed efficiency.

Suggestions Concluded from the Research

1. Based on the results of the first hypothesis, it is suggested – in the practical domain – that joint-stock firm managers endeavor to update their knowledge and awareness of factors such as intellectual capital and use such strategies in order to enhance their firms' output and as well as creating higher values for stockholders.
2. Based on the results obtained for the second hypothesis of the research, it is recommended that venture unit managers calculate the amount of efficiency the resources employed have had and compare them with indices and characteristics relevant to the industry, so that any inefficiencies can be identified and resolved, thus paving the way for achieving desired levels of efficiency.
3. Moreover, in accordance with the results obtained from the first and third hypotheses, investors are advised to examine the criteria relevant to the capabilities of the manager and the staff of venture units – such as their experience and expertise – when making investment decisions. The results of this research depict that firms with higher intellectual capital prove to be more profitable. Hence, including the variable of intellectual capital in decision-making and evaluation models of joint-stock firms can lead to better investment decisions.

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