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The Relationship between Intellectual Capitals and Productivity in the Education Organization

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ABSTRACT

Present study profiting from descriptive analysis (correlation) investigates the expected association between intellectual capitals and productivity in the employee population of the Education Organization of Gilan province in the school year 2010-2011. Using Morgan's Table from the target population (1608 employees in total) a sample of 310 employees was selected. For data collection, two questionnaires were used: 1. Questionnaire of Intellectual Capitals with human, structural and relational dimensions and, 2. Employee Productivity Questionnaire with 21 questions in Likert Scale. The collected data using multivariate regression and Pearson Correlation Coefficient were analyzed. Research findings indicated positive and significant relationship of intellectual capital and its dimensions with productivity of the understudy organization. In addition, our findings confirmed significant ability of intellectual capital's dimensions in predicting productivity in this organization.

Keywords: *intellectual capitals, structural dimension, relational dimension, human dimension, productivity*

1. INTRODUCTION

Bontis believes intellectual capital is the effort for effective use of knowledge (final product) as is opposed to information (raw material). Intellectual capitals are providers of a new base by means of which organization would be able to compete (Bontis, 1999; 186). Intellectual capital is usually conceived in three forms: human capital, structural capital, and relational capital. The human aspect of intellectual capital refers to employee's knowledge and skills on which organization relies for income generation, growth, and improvement of its efficiency and productivity (Roos, 2005: 215). The structural capital is a function of the human capital and these two dimensions through interaction with each other help organizations coordinately form, develop and benefit from the customer capital. On the other hand, relational capital refers to the existing knowledge in relationship of organization with its external stakeholders and the growth of this capital depends on the support for human and structural capital. In general, relational capital contributes to intellectual capital process as a bridge and intermediary and is the key factor in transformation of intellectual capital and eventually organization performance and business into market value (Chen et al, 2004: 47).

Human economic activities have been always motivated by the need and desire for maximization of outcomes generated from the least efforts and resources. This tendency can be expressed as the perpetual longing for still greater productivity. All the human inventions from the most preliminary tools in the primitive ages to the most advanced mechanical and electronic instruments of the present time are the result of such desire and tendency (Abtahi and Kazemi, 2006: 6).

Productivity as a comprehensive and general concept the increase of which is indispensible for promotion of living standards, higher welfare, and comfort of the world's nations, has been always an issue of high interest and concern for statesmen, politicians and economists. Following the significant progression and ever accelerating growth of human knowledge in socio-economic areas, the productivity too has undergone fundamental changes in form and substance with continuously newer and evolving definitions and implications (idem, p.10). Successful organizations usually make optimum use of the available means and resources. Among the most essential organizational resources are human resources who can be optimally utilized in service of organizational objectives, if the employees are sufficiently motivated and provided with suitable work environment to improve and develop their skills and potential capacities (Alem-e-Tabriz, 2009: 42).

Considering the knowledge orientation of the Global Economy and the role of knowledge and intellectual capitals in wealth generation, the knowledge factor enjoys the highest position compared to other tangible and physical assets. In a knowledge economy, contrary to an industrial economy, intellectual assets and especially human capital are considered among the most valuable organizational assets, since in the new economic environment organization potential success depends on its intellectual capacity.

Capitalizing on intellectual capital, especially human capital can help improve effectiveness and efficiency and consequently productivity in organization and this improvement at organizational level will eventually prove beneficial to social welfare and general living standards in society. Therefore, realization of productivity, job creation and fair distribution of wealth requires proper management of intellectual capitals. Considering that the Education Organization is a knowledge-based organization particularly having to do with intellectual capitals and especially human capital of our country the employees of which are in direct contact with students, management of these intangible assets and productivity should be addressed as a top priority for this organization.

2. THEORETICAL BACKGROUND

Ebadiyani and Tavakkoli (2007) investigated the impact of intellectual capitals on productivity in the Iranian Cultural Heritage Organization. They report positive effect of intellectual capitals on the organization productivity, increasing its productivity level. They also found human capital and structural capital had direct and positive effect on productivity of the understudy organization.

Naderi (2009) studied relationship of intellectual capitals with productivity in Fars Center of the National Radio and Television Organization and found a positive and significant relationship between intellectual capitals and productivity of this center. And from among the intellectual capital's dimensions, human and structural capitals were most strongly associated to the organization productivity.

The findings of Ramzanpour (2010) in study of the relationship between intellectual capitals and employee productivity in Iran's Ports and Shipping Organization indicate positive and significant relationship of human and structural dimensions of intellectual capitals with employee productivity. Also the research results by Sokaki and Narimani (2010) confirm positive and significant relationship of intellectual capitals and employee productivity, and from among the intellectual capital's dimensions, they found human capital the strongest one with a high predictive ability.

Bentis and Serinko (2004) investigated the effect of intellectual capital's dimensions on productivity in Canada and after analysis of the gathered data the result clearly indicated strong association between these dimensions and productivity. Ferigmanz and Jonz (2006) in a study on the effect of intellectual capital on productivity of New York private companies drew the conclusion suggesting positive and direct effect of intellectual capital on productivity in the understudy companies. Vandovan and Feriy(2008) examined relationship of intellectual capital's dimensions with effectiveness of universities in England and their findings suggested a direct and significant relationship between these dimensions and effectiveness of the universities.

Jefferson and Harry (2008) in a study on the "Impact of Intellectual Capital on Employee Productivity in New York City Private Companies" found positive effect of intellectual capitals on the employee productivity and positive and significant association between human, structural and relational dimensions of intellectual capital and productivity and from among these dimensions, human and relational capital were found with the greatest impact on employee productivity in the mentioned companies.

Goodman and Lee (2009) in their study of the "Relationship of Intellectual Capital with Productivity of the Public Schools Principals in Sweden" found a positive and significant association between the two variables.

This paper contributes to the existing literature by exploring and providing further evidence on the "Relationship of Intellectual Capital and its Dimensions with Productivity of the Education System" in Gilan province of Iran. This study, in addition, compares the effect of each intellectual capital's dimension on productivity in the understudy organization.

3. HYPOTHESES

3.1 Main Hypothesis

There is a significant relationship between intellectual capitals and productivity of the Education Organization in Gilan province.

3.2 Sub-Hypotheses

1. *There is a significant relationship between **human capital** and **productivity** of the Education Organization in Gilan province.*
2. *There is a significant relationship between **structural capital** and **productivity** of the Education Organization in Gilan province.*
3. *There is a significant relationship between **relational capital** and **productivity** of the Education Organization in Gilan province.*

4. METHODOLOGY

Present research through correlation analysis examines and explains relationship of the understudy variables suggested in the above hypotheses on a sample of 310 employees of Gilan Education Organization (out of 1608 employees in total) in the school year 2010-2011. The sample was determined based on Morgan Table using random stratified sampling method. To collect the required data, the research employs:

A. Intellectual Capital Questionnaire: this scale has been constructed by Bentis (2001) based on three intellectual capital's dimensions (i.e. human, structural and relational dimensions). This scale is consisted of 47 five-choice questions in Likert Scale.
B. Productivity Questionnaire: this scale is designed by Kazemi et al (2008) for measurement of organization productivity and comprises 21 questions in Likert Scale based on organization productivity variables.

Content validity of the questionnaires was determined after necessary modifications based on suggestions of supervising and advising professors. Given the obtained Cronbach's alphas of 0.92 and 0.90 for Intellectual Capital and Productivity questionnaires, respectively, reliability of the questionnaires was verified and confirmed. For analysis of the obtained data, multivariate regression analysis and Pearson Correlation test were employed.

5. FINDINGS

To examine the main hypothesis suggesting a significant relationship between intellectual capital and productivity of Gilan Education Organization, multivariate regression analysis is employed.

Table 1: Mutual correlation between Productivity (dependent variable) and the predictive variable Intellectual Capitals (human, structural and relational capital)

Variables	Human capital	Structural capital	Relational capital
Productivity	.238** (.0001)	.259** (.0001)	.254** (.0001)
** significance level of p <.01			

The results of table 1 indicate:

1. A significant relationship between human capital and productivity in the understudy organization (r = 0.238, p =.001);
2. A significant association between structural capital and employee productivity in this organization (r = 0.259, p =.001); and
3. A significant relationship between relational capital and productivity of the mentioned organization (r = 0.274, p =.001).

To choose the best productivity predictor from among the predictive variables (human, structural and relational capitals) of the regression model, a stepwise procedure is followed. The results hereof are provided in table 2.

Table 2: Overview of the Stepwise Regression Analysis of variables human, structural and relational capitals

Variables of predictive model	R	R^2	ΔR^2	Standard Error
relational capital	.274	.075	.072	9.55
relational with structural capital	.380	.144	.138	9.20
relational with structural and human capitals	.417	.174	.166	9.05

According to the above table, the variable ***relational capital*** is able to explain 7.5 percent of ***productivity variance*** (R^2 =.075). By adding ***structural capital*** to ***relational capital*** in the second model, about 14 percent ***productivity variance*** (R^2 =.144) can be explained. And ***relational capital*** together with ***structural capital*** and ***human capital*** in the third model are able to explain over 17 percent of ***productivity variance*** (R^2 =.174).

Table 3: Analysis of variance for the multivariate regression equation of human, structural and relational capitals

Statistical measures of change source	Sum of squares	df	Mean squares	F-test	Sig.
Relational capital regression	2277.997	1	2277.997	24.962	.001
Residual	28107.812	308	91.259		
Total	30385.810	309	-		
Structural capital regression	4376.929	2	2188.464	25.832	.001
Residual	2600.881	307	84.719		
Total	30385.810	309	-		
Relational, structural and human capital regression	5290.077	3	1763.359	21.501	.001
Residual	25095.732	306	82.012		
Total	**30385.810**	**309**	**-**		

According to the results of ANOVA in the above table, the calculated F for the variable relational capital is significant at 0.05 (f (1.308) = 24.962, p =.05) and at 95 percent confidence level it can be inferred that between relational capital and productivity there is an association and this variable is able to predict productivity. The calculated F value for relational and structural capitals is significant at .05 (f (2.307) = 25.832, p =.05) and at 95 percent confidence level association of variables relational and structural capitals with productivity is confirmed so as the two variables are able to predict productivity as well. In addition, the calculated F-value for relational, structural and human capitals is found significant (f (3.306) = 21.501, p = .05). Hence, at 95 percent confidence level association of variables relational capital, structural capital and human capital altogether with productivity is confirmed and the three variables in aggregate are able to predict productivity as well.

Table 4: Regression analysis of the variables entered into the regression equation using stepwise model

	Measure of change source	**Partial regression coefficient (B)**	**St. Error**	**Standardized partial regression coefficient (β)**	**T-test for slope significance of regression line**	**Sig.**
Step 1	Constant	60.250				
	Relational	.682	.137	.274	4.996	.001
Step 2	Constant	44.719				
	Relational	.692	.132	.277	5.254	.001
	structural	.191	.038	.263	4.977	.001
Step 3	Constant	26.632				
	Relational,	.701	.130	.281	5.414	.001
	structural	.151	.040	.270	3.802	.001
	human	.240	.072	.182	3.337	.001

Given the calculated t-value of slope significance of the regression line (*b*) for relational capital in the above table (t = 4.996) at p =.05, ability of the relational capital for prediction of productivity is significant. Also the t-value for structural capital is found significant at.05 (t = 4.977, p =.05), so ability of the structural capital for prediction of productivity is statistically significant as well. In addition, the slope of regression line for human capital with (t = 3.337, p =.05) is found significant and predictive ability of this variable for productivity is also statistically significant.

However, the judgment on contribution of each IC component to prediction of the dependent variable (amount of productivity) should be left to values of standardized partial regression coefficients (β) which are presented in table 5.

Table 5: Share of each component of intellectual capital in prediction of changes in the dependent variable productivity

Productivity predicting variable (relational, structural and human capital)	**Productivity prediction scores of intellectual capital's components based on their standardized β values according to the Stepwise Regression Equation**	**Scores of amount of changes in St. dev. of the dependent variable productivity for one unit change in St. dev. of each predictive variable based on the obtained standardized β**
Relational capital (X_1)	.274	.137
Structural capital (X_2)	.263	.038
Human capital (X_3)	.182	.072

The data of table 4 were introduced into the regression equation based on the partial regression coefficient (*b*) of intellectual capital's components (relational, structural and human capitals) as follows.

In the first model, the variable ***relational capital*** entered the equation:

$$\hat{Y} = a + b_1 x_1$$

Replacing the respective values from table 4 in the above equation, we have:

Productivity = 60.250 + 0.682 (*Relational capital*)

Given the results in table 5, ***relational capital*** has been able to predict 27.4 percent of changes in the dependent variable ***productivity*** and therefore it is found with the strongest effect on productivity, so as one unit change in St. Deviation of relational capital accounts for 0.137 changes in St. Deviation of productivity.

In the second model, relational capital and structural capital together are introduced into the regression equation and after replacing the respective values the following regression equation is obtained:

$$\hat{Y} = a + b_1 x_1 + b_2 x_2$$

Productivity = 44.719 + 0.692 (*Relational capital*) + 0.191 (*Structural capital*)

According to the results of table 2 for step 2 of the stepwise regression model, the variable ***structural capital*** predicts 26.3 percent of changes in the dependent variable ***productivity***, so as one unit change in standard deviation of structural capital accounts for 0.038 changes in standard deviation of productivity (dependent variable).

In the third model, all the three independent variables (i.e. relational, structural and human capitals) are included and regression equation is composed as follows:

$$\hat{Y} = a + b_1 x_1 + b_2 x_2 + b_3 x_3$$

Productivity = 26.632 +.701 (*Relational capital*) + .151 (*Structural capital*) + .240 (*Human capital*)

As is seen in table 5 and based on the third stepwise regression model, human capital has been able to predict 18.2 percent of the changes in productivity, while one unit change in standard deviation of human capital accounts for 0.072 of changes in St. deviation of productivity.

Therefore, the main hypothesis suggesting a significant relationship between intellectual capitals and productivity in the Education Organization of Gilan Province is confirmed.

First sub-hypothesis: there is a significant relationship between intellectual capital's human component of intellectual capital and productivity of Gilan Education Organization.

Table 6: Correlation between human capital and productivity

	r	n	p
Human capital and productivity	.238**	310	.001

P < .01

Given the obtained correlation coefficient and p-value in table 6 (r =.238, p =.001), there is a significant positive and direct relationship, i.e. with an increase in score of human capital, score of productivity increases as well. Hence, at 0.05 significance the calculated correlation coefficient is statistically significant, and at 95% confidence the first sub-hypothesis suggesting a significant relationship between human component of intellectual capital and employee productivity in Gilan Education Organization is confirmed.

Second sub-hypothesis: There is a significant relationship between intellectual capital's structural component and productivity Gilan Education Office.

Table 7: Correlation between structural capital and productivity

	r	**n**	**p**
Structural capital and productivity	0.259**	310	.001

** P < .01

The obtained correlation coefficient and p-value in table 7 (r = .259, p = .001) indicate a significant positive and direct association between structural capital and productivity, so with an increase in score of structural capital, productivity score increases accordingly. Hence, at .05 significance the calculated correlation coefficient is statistically significant and at 95% confidence the second sub-hypothesis suggesting a significant relationship between structural capital and employee productivity in the Education Organization of Gilan province is confirmed.

Third sub-hypothesis: There is a significant association between relational component of intellectual capital and productivity in the Education Organization of Gilan Province.

Table 8: Correlation between relational capital and productivity of Gilan Education Organization

	r	n	p
Structural capital and productivity	.274**	310	.001

** P <.01

The calculated correlation coefficient and p-value in table 8 (r = .274, p = .01) indicate a statistically significant positive and direct relationship between relational component of Intellectual capital and employee productivity in Gilan Education Organization. This means with an increase in score of relational capital, an increase in productivity score is expected. Therefore, at 95 percent confidence the sub-hypothesis suggesting a significant association between relational capital and productivity in the education organization is confirmed.

6. DISCUSSION AND CONCLUSION

The results of the multivariate regression indicated positive and significant relationship of intellectual capitals and its dimensions (components) with productivity in the understudy education organization. On the other hand, according to the test results of the main hypothesis, from among the intellectual capital's dimensions, relational capital as the strongest predictor of productivity level in this organization could explain 7.5 percent of productivity variance and predicted 27.4 percent of changes in the dependent variable (productivity of the education organization). After relational capital, structural capital by predicting 26.3 percent of changes in productivity was found the second best predictor of productivity in this organization. And finally, human capital by prediction and explanation of 18.2 percent of productivity changes in the understudy organization became the third important predictor of productivity.

These findings are consistent with the results of Ebadiyan and Tavakkoli (2007), Ramzanpour (2010), Sokaki and Narimani (2010), Bentis and Serinko (2004), Ferigmanz and Jonz (2006), and Jefferson and Harry (2008), which report a positive and significant relationship between intellectual capital and productivity of organizations and direct and positive effect of intellectual capital and its components on organization productivity.

In addition, in test of the first sub-hypothesis, the obtained correlation coefficient from Pearson Correlation Test (r = 0.238) for human capital and productivity of the understudy organization indicated a positive and significant relationship between the two variables at 0.05 significance level. This result is consistent with findings of Ebadiyan and Tavakkoli (2007), Naderi (2009), Behrouzieh (2009), Ramzanpour (2010), Ferigmanz and Jonz (2006), and Jefferson and Harry (2008) which also

document a positive and significant association between human capital and productivity of organizations and confirm human capital ability for prediction of productivity.

Also, in test of the second sub-hypothesis, the calculated correlation coefficient for structural capital and productivity of the organization (r = 0.259) indicate a positive and significant relationship. This result is in line with findings of Ebadiyan and Tavakkoli (2007), Naderi (2009), Behruzieh (2009), Sokaki and Narimani (2010), and Jefferson and Harry (2009) which also report a significantly direct and positive effect of structural capital on productivity of organizations, i.e. with an increase in structural capital, an increase in productivity of organization is likely.

Finally, in test of the third sub-hypothesis, the obtained correlation coefficient for relational capital and productivity of the mentioned organization (r = 0.274) indicated a positive and significant relationship between the two variable at 0.05 confidence level. This result is in line with findings of Behruzieh (2009), Ramzanpour (2010), Sokaki and Narimani (2010), Bentis and Serinko (2004), Ferigmanz and Janz (2006), Jefferson and Harry (2008), and Goodman and Lee (2009) which also report appositive and significant relationship between relational capital and organization productivity meanwhile the relational capital compared to other two components was found most related to organization productivity.

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