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The Relationship between Components of Intellectual Capital and Performance of Yazd Tile Companies

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Abstract
The purpose of this study was to determine the components of intellectual capital and investigate their relations with Yazd Tile Company. Variables of human capital, structural capital and relational capital as independent variables and productivity, profitability and market value as dependent variables were used to form the research model called company performance. Research method of the present study is practical in terms of purpose and it is based on descriptive correlation method. In this study, questionnaire and data survey methods were used for data collection. Statistical population of this study was Yazd Tile Factories selected using a simple random sampling method. 55 acceptable questionnaires were collected and analyzed using LIZREL software and structural equation modeling was conducted. The results of this study indicate that intellectual capital in general has a direct and significant relationship with performance and among components of intellectual capital; only human capital is directly related to the performance.
Keywords: Intellectual Capital, Human Capital, Structural Capital, Relational Capital, Performance, Productivity, Profitability, Market Shares Value

Introduction

Today, managers, investors, financial institutions and governments are interested *in* particular topic*s* such as intellectual capital, innovation and value creation. Recently, these issues have been increased as topic of studies in universities and professional centers. Nowadays, many organizations have an increasing need of having creativity, competitive advantage and audacious flexibility. The importance of need for competitiveness and productivity to cope with future risks associated with organizational changes has increased every day.

Physical and intangible assets are not considered as the most important component of company resources, rather intangible assets are more important because they are scarce,

valuable and inimitable in nature. In the process of finding a method for measurement and evaluation of intangible assets, intellectual capital can provide a complete new model to observe organizational value. Intellectual capital can be considered as a new tool to observe organizational hidden values (Cho *et al.*, 2006)

Several authors have introduced the change in investment as the emergence of a new knowledge in economy. Other authors have emphasized intellectual capital as the primary source of value creation in the new economy (Zegal & Maloul, 2010). Importance of intellectual capital caused the present study to address this issue and its relation to organizational performance. Therefore, in the present chapter general topics such as general research topic, problem statement, objectives, assumptions and methods are discussed.

Research Theory and Hypotheses

Stewart suggested one of the first definitions of intellectual capital. It was defined as an intangible value generated for human being (such as knowledge, experience, skill and stimulus) and resources (computer and information technology). Other main viewpoints are as follows. IC is the collection of everything and everyone in the company that it gives the company competitive advantage in the marketplace. Other viewpoints refer to this point that IC is considered as an intangible asset that enables company to sustain in the competitive market. A more general definition of intellectual capital represents the difference between the market value of a company and its book value that financially can be useful for company (Phasvat *et al.*, 2011).

For Edivenson, intellectual capital includes practical experience, organizational technology, customer relationships and professional skills that is required by firms to achieve competitive advantage in the market (Curdo and Henriques, 2011, 1082). Intellectual capital can be defined as a source of wealth creation and intangible assets that can be used by an organization to create value by transforming it into new products and services (Anam *et al.*, 2011, 86). Raj and Seetharaman (2012, 465) defined intellectual capital as the difference between market value of an organization and replacement cost of its assets.

Components of Intellectual Capital

A) Human capital

Human capital is a major capital and strategic asset that increases company performance. It includes employees' skills and creativity that can be encouraged through further investment in their training programs section. Human capital is employee's experience and expertise that can increase organizations performance. More performance of employees means more efficiency of organization to increase efficiency of added value (Rehman *et al.*, 2011, 9).

B) Structural capital

Structural capital is related to all cases where the organization employees (human capital) are supported. Structural capital is the support infrastructures which direct human capital to operational boundaries. This kind of capital is considered as the organization that will not be changed by changing of people in the organization. Structural assets include traditional structures such as hardware, software, processes, information systems, proprietary databases of privileges and brand of the organization.

C) Relational capital (customer)

Customer capital include: strong and stable relationships with customers based on customer satisfaction, repeated transactions, financial growth and price sensitivity that can

be used as indicators for customer capital. The distinction made between structural capital, customer capital and human capital is due to the impact of customer capital on organizational value (Tavakoli, 2012).

Recently, Mention and Bentis (2013) conducted a study in the field of intellectual capital to investigate the effects of intellectual capital and its components on the performance of banking institutions which entitled "Intellectual Capital and performance in the banking sector in Luxembourg and Belgium". This study was conducted on 200 banks in Luxembourg and Belgium and structural equation method was used to analyze the data. Another study conducted by Joshi *et al* (2013) titled "Intellectual capital and financial performance: a survey of the financial sector in Australia," was aimed at investigating Australia's financial sector performance and evaluating the relationship between the intellectual capital and financial performance in the financial sector.

Research Hypotheses

In order to achieve the objectives of the present study, the following hypotheses are proposed and tested:

1. Human capital includes learning and education.
2. Human capital includes experience and expertise.
3. Human capital includes creativity and innovation.
4. Structural capital includes systems and programs.
5. Structural capital includes research and development.
6. Relational capital includes strategies.
7. Relational capital includes the relationship with customers.
8. Relational capital includes knowledge of the customer.
9. There is a direct relationship between human capital and performance.
10. There is a direct relationship between capital structure and performance.
11. There is a direct relationship between relational capital and performance.
12. Intellectual capital affects performance.
13. Intellectual capital affects productivity.
14. Intellectual capital affects profitability.
15. Intellectual capital affects shareholder value.

Research Conceptual Model

There are much research has been conducted so far on the intellectual capital. Variables of human capital, structural capital and relational capital as independent variables and productivity, profitability and market value as dependent variables were used to form the research model called company performance. Conceptual model of this research is as follows:
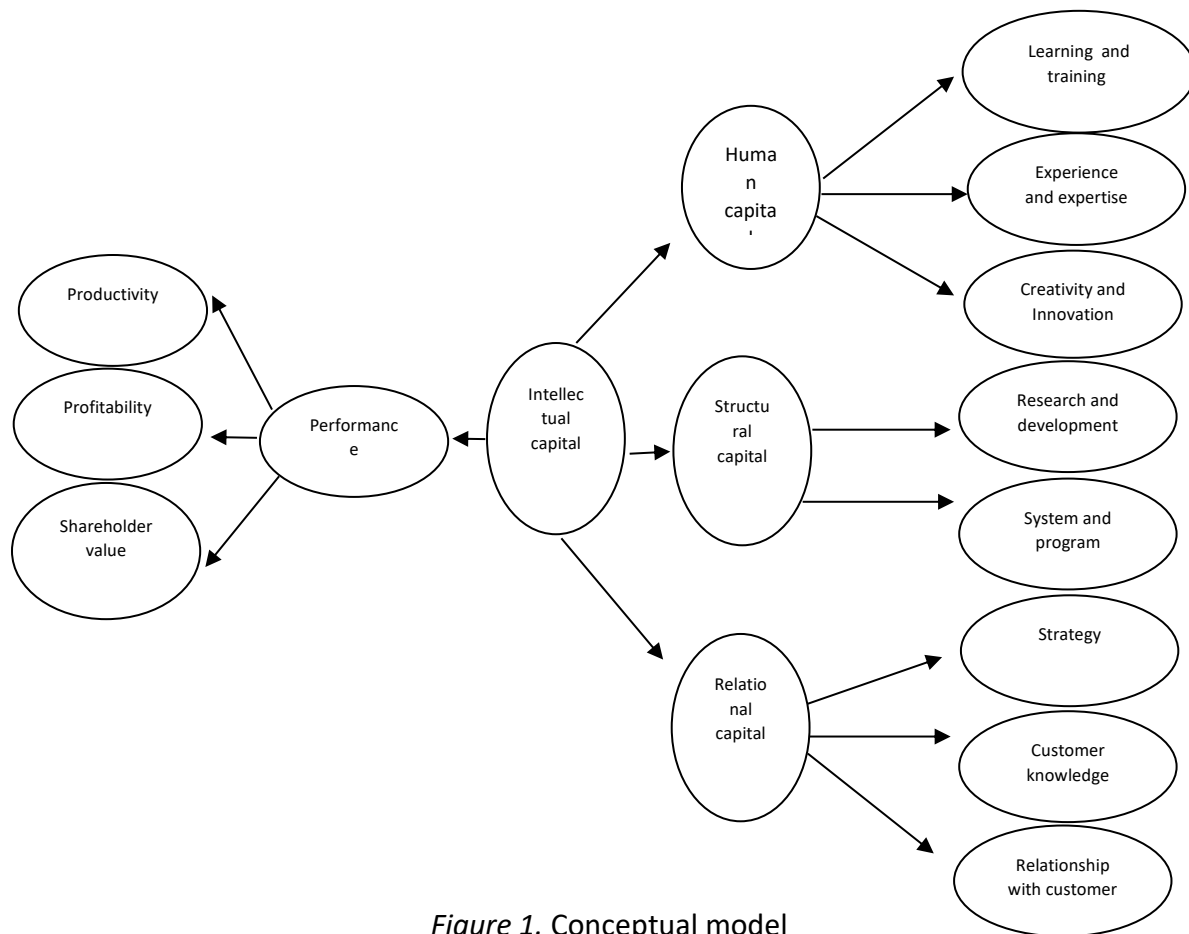
Figure 1. Conceptual model

Methodology of Research

Research method of the present study is practical in terms of purpose and it is based on descriptive-correlational method. This study is non-experimental in terms of researcher control on variables.

Reliability and Validity of Research Tools

To ensure the face validity of the questionnaire, comments of university teachers and experts in the field were used. According to their opinion, the questionnaire was valid. Cronbach's alpha was used to determine the reliability of the questionnaire. Alpha coefficient greater than 0.7 indicates the questionnaire acceptable reliability (Momeni, 2008).

Table 1
Calculation of the questionnaire reliability

	Cronbach's alpha	Number
Intellectual capital	0.928	35
Performance	0.879	24
Total questionnaire	0.942	59

Above table indicates the Cronbach's alpha and the number of questions related to the variables in the questionnaire. Since the alpha value is above 0.7, the reliability of the research instrument is acceptable.

Data Analysis Method

In this study, description of the demographic data was conducted using descriptive statistics, frequency tables and circle and bar graphs while relations analyzed through using single variable regression and spss18 software. Investigation of confirmed relationships between variables and factors was conducted through confirmatory factor analysis and PLS technique using PLS Graph2 Smart software (variance-based path modeling technique which allows simultaneous study of the theory and measures). This method is used in cases where the sample size is small, or the distribution of variables is not normal.

Findings

External Model

In structural equation modeling methodology, we first need to study the validity of the selected structure in order to determine that items selected to measure the desired variables have the needed accuracy. For this purpose, confirmatory factor analysis (CFA) is used so that the loading factor of each item with its variable has t value above 1.96. In this case, the item includes required accuracy to measure the construct or latent variable (Gefen *et al*, 2005). The following table shows the values for the factor loadings on each latent variable.

Table 2

Confirmatory factor analysis (factor loading and t values)

Variable	Item		Symbol	Factor loading	Standard error	T statistics
Human capital (HC)	Learning training	and	L_E	0/667290	0/105237	6/338946
	Experience expertise	and	E_E	0/902065	0/025697	35/103756
	Creativity innovation	and	I_C	0/88496 9	0/033817	26/169523
Structural capital (SC)	System programs	and	S_P	0/757291	0/146416	5/172191
	Research Development	and	R_D	0/833504	0/129220	5/450281
Relational capital (RC)	Strategy		S_L_A	0/867070	0/134277	6/457312
	Customer relationship		C_S_R	0/900236	0/139611	6/448197
	Customer knowledge		C_K	0/877054	0/114247	7/676812
Function (BP)	Productivity		Prod	923996/0	022708/0	690584/40
	Profitability		Prof	917247/0	043146/0	259353/21
	Shareholder value		M_V	915818/0	022754/0	288885/40

If items of the studied variables include t statistics less than 1.96, they are not appropriate for measurement and therefore they should be excluded from the analysis. Hence, the structure validity to check the accuracy and importance of selected items for the measurement of variables was performed. It showed that all items provide appropriate factor structures for measuring aspects of the study in the research model.

In structural equation model, in addition to the validity of structure selected to examine the selected items used to measure the variables, the diagnostic validity is also considered. It means that finally items in each variable provide a good separation of variables compared with variables in other models.

Table 3
Evaluation of AVE and reliability of variables

Variable	AVE (>0.5)	Composite reliability (> 6.0)	Cronbach's alpha (> 7.0)
BP	0/844611	0/942217	0/908164
HC	0/680634	0/862753	0/754502
RC	0/777153	0/912737	0/861475
SC	0/634109	0/775693	0/725657

In other words, each item only measures its variable and they should separate all variables. This process will be determined with the help of obtained average variance index (AVE). AVE coefficients show that what percentage of the structure variance or model variable is described by a single item. If structures or variables in the model have the average variance (AVE) above the criterion index of 0.5 proposed by Bagozzi and Yi (Bagozzi & Yi, 1988). Therefore, it can be concluded that items could be enough to explain the variance of the research model (Gefen *et al.,* 2005).

In the measurement model, internal consistency of the model or reliability is measured by calculation of composite reliability. Reliability coefficients are shown in the following table. In this model, all constructs have a high composite reliability greater than criterion index of 0.6 proposed by Bagozzi and Yi (Bagozzi & Yi, 1988). Composite reliability reflects the internal validity of the research data.

Table 4
External weight values for each variable item

Items	Weight	Item	Weight	Item	Weight
L_E	0/360424	R_D	0/687342	Prod	0/374534
E_E	0/445252	S_L_A	0/332179	Prof	0/377290
I_C	0/404442	C_S_R	0/491838	M_V	0/334145
S_P	0/573887	C_K	0/306944		

According to the model structure, PLS determines weights for survey scales that increases its ability to explain the last dependent or on external variable. Estimated weights (external weight) are used to calculate the values of the structural parameters (Fornel *et al.*, 1996). These values are listed in the table above. At this stage, considering the fact that refinement phase is completed and accuracy of the measured variables and related concepts is ensured, research hypotheses can be tested.

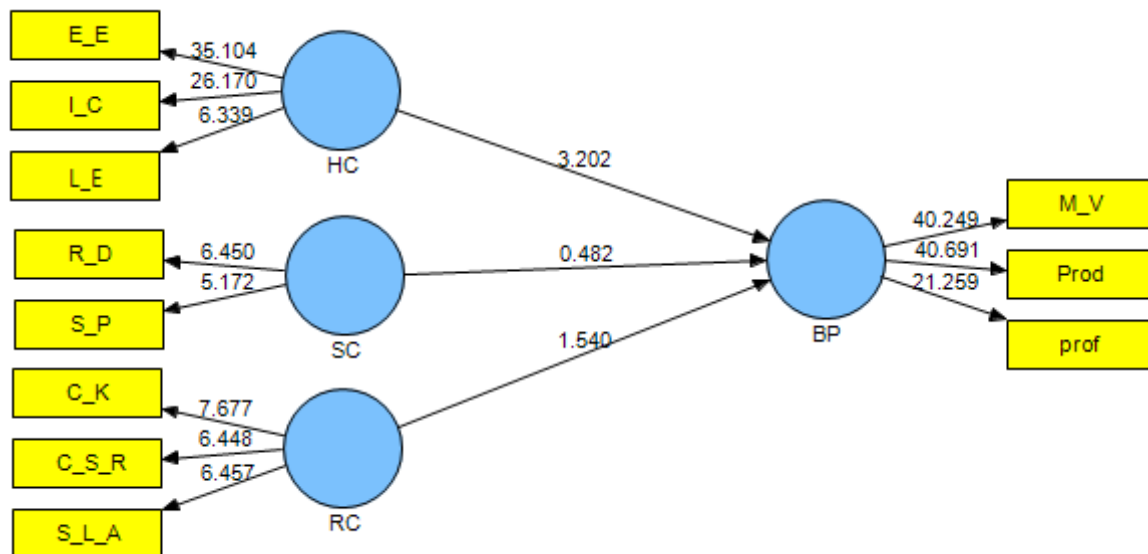***Evaluation of the Model in Significant Numbers***

Figure 2. Model in the significant numbers (t-value)

Numbers on the paths indicate t-value for each path. To determine the significance of the path coefficients, t value in each path must be larger than 1.96.

Evaluation of the model in the state of path coefficients and factor loadings
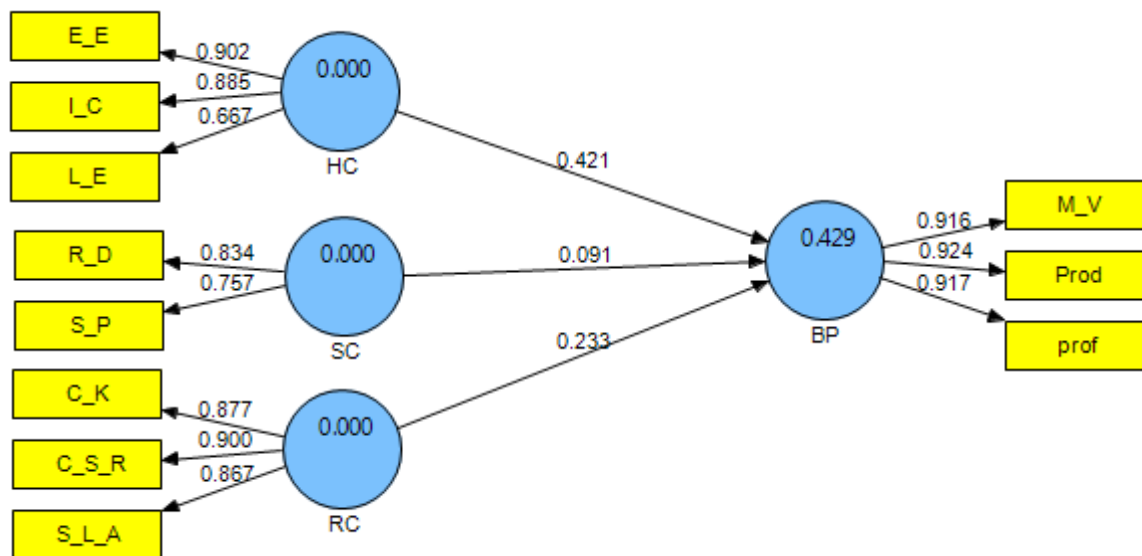
Figure 3. Model in the state of path coefficients and factor loadings

The numbers written on the lines are actually the beta coefficients obtained by the regression equation between the variables, i.e. the path coefficient. The number in each circle represents the value of R ^{2} Model in which the previous variables are inserted to the circle by arrows.

Internal Model (Structural Model)

In the structural equation model, the research hypotheses were examined and the path of structural model was assessed. Each path corresponds to one of the model hypotheses.

Each hypothesis is conducted by investigation of the sign, size and statistical significance of the path coefficients (beta) between each latent variable and the dependent variable. Considering the results of the relationships between independent and dependent variables and by using the related coefficient, it is possible to investigate significant effects between variables. To evaluate the significance of the path or beta coefficient, t-value for each path coefficient should be considered. Therefore, iterative procedure was simulated in two cases of 500 and 800 samples. The results showed that in both cases, no change was observed in significant or non-significant parameters and the results validation was confirmed (Jansun *et al.*, 2001).

Table 5
Direct linear effect of research variables function

Path	Beta	Average	Standard error	T statistics	Iterative procedure	
					500	800
Human capital Performance ⟶	0/421171	0/398332	0/131534	3/201998	1/218472	3/147368
Structural capital ⟶ Performance	0/090788	0/119369	0/188233	0/482315	0/470801	0/440750
Relational capital function ⟶	0/233079	0/228106	0/151386	1/539634	1/683 044	0/560478

According to the t statistics at confidence level of 95% for the path of human capital to performance, the performance is greater than 1.96 which indicates that there is a relation between human capital and performance at confidence level of 95%. On the other hand, in the paths of structural capital to performance and relational capital to performance, t statistics value is smaller than 1.96 which indicates that there is a significant relation between structural capital and performance at confidence level of 95% while there is relation between relational capital and performance.

Investigation of the Effect of Intellectual Capital on Performance
The multiple linear regression method was used to investigate the existence of relations.

The results of regression model:
Table 6
Significance tests for the regression equation

Model		Sum of Squares	D f	Mean Square	F	Sig.
1	Regression	3.631	3	1.210	11.416	.000 [A]
	Residual	5.302	50	0.106		
	Total	8.933	53			

Table 7
Summary of model

Model	R	R Square	Adjusted R Square	Durbin-Watson
1	.638 [A]	0.407	0.371	1.885
b. Dependent Variable: Performance				

Table 8
Coefficients table

Model		Non-standardized coefficients		Standardized coefficients	t	Sig.	Collinearity statistics	
		B	Standard error	Beta			Tolerances	VIF
1	(Constant)	2.057	0.373		5.516	0.000		
	Human capital	0.318	.118	0.439	2.704	0.009	0.450	2.223
	Structural capital	0.082	0.125	0.116	0.659	0.513	0.383	2.612
	Relational capital	0.130	0.110	0.164	1.176	0.245	0.612	1.633
A. dependent variable : performance								

In the part A of the above table, regression significance testing has been performed. Significance level (0.000) less than 0.05 is obtained. Therefore, the linear regression equation is significant.

In the part B of the above table, a summary of the model is given. According to the coefficient of determination, it can be said that about 41% of the change in the response variable (dependent) can be represented by the predictor variables (independent). Moreover, the Durbin-Watson test statistic for this model is close to 2, which indicates that the residuals are random. According to the output obtained in the part t in the above table, the coefficients of the regression line equation and zero coefficients testing, it is indicated that human capital coefficient is the only significant coefficient in the regression equation.

Research Hypothesis Testing

The research model hypotheses were evaluated after investigation of the research model. In this section, hypotheses associated with each part of the questions are tested.

Hypothesis 1: Human capital includes component of learning and training

H0: Human capital does not include the components of learning and training.

H1: Human capital includes the components of learning and training.

Table 9
Factor loading and T-statistic for hypothesis 1

Factor loading	Error	T-statistics	Conclusion
0/67	0/11	6/34	Confirmed

Regarding the confirmatory factor analysis for variables such as absolute value of t-statistic equal to 34/6 and larger than the value in Table (1/ 96), hypothesis 1 is confirmed. It means that human capital includes component of learning and training and its effect equals 0/67.

Hypothesis (2): human capital includes components of experience and expertise
H0: Human capital does not include the components of experience and expertise.
H1: Human capital includes the components of experience and expertise

Table 10
Factor loading and T-statistic for hypothesis 2

Factor loading	Error	T-statistics	Conclusions
0/90	0/30	35/10	Confirmed

Hypothesis (3): human capital includes creativity and innovation
H0: Human capital does not include the components of creativity and innovation.
H1: Human capital includes the components of creativity and innovation.

Table 11
Factor loading and T-statistic for hypothesis 3

Factor loading	Error	T-statistics	Conclusions
0/88	0/30	26/17	Confirmed

Hypothesis (4): structural capital includes systems and programs
H0: structural capital does not include the components of systems and programs.
H1: structural capital includes the components of systems and programs.

Table 12
Factor loading and T-statistic for hypothesis 4

Factor loading	Error	T-statistics	Conclusions
0/76	0/15	5/17	Confirmed

Hypothesis 1 is confirmed. It means that structural capital includes the component of systems and programs and its effect equals 0/76.

Hypothesis (5): structural capital includes research and development
H0: Structural capital does not include the component of research and development.
H1: Structural capital includes the component of research and development.

Table 13
Factor loading and T-statistic for hypothesis 5

Factor loading	Error	T-statistics	Conclusions
0/83	0/13	6/45	Confirmed

Hypothesis (6): relational capital includes the component of strategy
H0: relational capital does not include the component of strategy.
H1: relational capital includes the component of strategy.

Table 14
Factor loading and T-statistic for hypothesis 6

Factor loading	Error	T-statistics	Conclusions
0/86	0/13	6/46	Confirmed

Hypothesis (7): relational capital includes the relationship with the customer
H0: relational capital does not include the component of relationship with the customer.
H1: relational capital includes the component of relationship with the customer

Table 15
Factor loading and T-statistic for hypothesis 7

Loading factor	Error	T-statistics	Conclusions
0/90	0/14	6/45	Confirmed

Hypothesis 1 is confirmed. It means that relational capital includes the component of relationship with the customer and its effect equals 0/90.

Hypothesis (8): relational capital includes the component of knowledge of the customer
H0: relational capital does not include the component of knowledge of customer.
H1: relational capital includes the component of knowledge of customer.

Table 16
Factor loading and T-statistic for hypothesis 8

Loading factor	Error	T-statistics	Conclusions
0/88	0/11	7/68	Confirmed

Hypothesis (9): There is a direct relationship between human capital and performance
H0: Human capital has no (direct) significant effect on performance.
H1: Human capital has a (direct) significant effect on performance.
If the absolute value of t-statistics is smaller than the value in the Table (1/96), the H0 is confirmed but if the absolute value of the t-statistic is greater than the table value (1/96), the H1 is confirmed.

Table 17
t-statistic for hypothesis 9

T-statistics	Value of table	Conclusion	Effect value
3/201	1/96	It has an effect	0/421

Because the absolute value of the t-statistic equals 3/20 which is larger than the value in the table (1/96), H1 is confirmed. It means that human capital has a direct significant (positive) impact on the performance and its effect equals 0/42.

Hypothesis (10): There is a direct relationship between structural capital and performance

H0: structural capital has no (direct) significant impact on the performance

H1: structural capital has a (direct) significant impact on the performance

Table 18

t-statistic for hypothesis 10

T-statistics	Value of table	Conclusion	Effect value
0/482	1/96	It has effect	0/091

Because the absolute value of the t-statistic equals 0/482 which is smaller than the value in the table (1/96), H0 is not confirmed. It means that structural capital has no significant impact on the performance.

Hypothesis (11): There is a direct relationship between relational capital and performance

H0: relational capital has no (direct) significant impact on the performance.

H1: relational capital has a (direct) significant impact on the performance.

Table 19

t-statistic for hypothesis 11

T-statistics	Value of table	Conclusions	Effect value
1/54	1/96	It has no effect	0/233

Hypothesis (12) intellectual capital has an impact on the performance

H0: there is no significant relationship between intellectual capital and performance.

H1: there is a significant relationship between intellectual capital and performance.

Table 20

Analysis of variance and model summary

The coefficient of determination	R	Significance level	F- Statistics
0/391	0/626	0/000	33/434

Table 21

Coefficients

B Coefficient	T-Statistics	Significance level	Beta Standardized coefficient
0/539	5/782	0/000	0/626

Single variable regression was used to investigate the existence of relations. Regression significance testing conducted in the variance analysis and model summary tables. Significance level (0.000) less than 0.05 was obtained; therefore the linear regression equation was significant. According to the coefficient of determination, it can be said that about 39% of the change in the response variable (dependent) can be represented by the predictor variables of human capital (independent). According to the output obtained in the table of coefficients of the regression line equation and zero coefficients testing, it is indicated that absolute value of the t-statistic is equal to 5/782 which is greater than the table value (1/96) and the significance level (00/0) is less than 0.05. Therefore, the H1 is confirmed. It means that the intellectual capital has a significant positive (direct) impact on the performance and the value of this effect equals 0/ 626.

Hypothesis (13): intellectual capital has an impact on productivity

    H0: There is no significant relationship between intellectual capital and productivity.

    H1: There is a significant relationship between intellectual capital and productivity.

Table 22

Analysis of variance and model summary

The coefficient of determination	R	Significance level	F Statistics
0/369	0/607	0/000	30/361

Table 23

Coefficients

B Coefficient	T-Statistics	Significance level	Beta Standardized coefficient
0/559	5/510	0/000	0/607

Single variable regression was used to investigate the existence of relations. Regression significance testing conducted in the variance analysis and model summary tables. Significance level (0.000) less than 0.05 was obtained; therefore the linear regression equation was significant.

According to the coefficient of determination, it can be said that about 37% of the change in the response variable (dependent) can be represented by the predictor variables (independent). According to the output obtained in the table of coefficients of the regression line equation and zero coefficients testing, it is indicated that absolute value of the t-statistic is equal to 5/510 which is greater than the table value (1/96) and the significance level (00/0) is less than 0.05. Therefore, the H1 is confirmed. It means that the intellectual capital has a significant positive (direct) impact on the productivity and the value of this effect equals 0/607.

Hypothesis (14): intellectual capital has an impact on profitability

    H0: There is no significant relationship between intellectual capital and profitability.

    H1: There is a significant relationship between intellectual capital and profitability.

Table 24

Analysis of variance and model summary

The coefficient of determination	R	Significance level	F Statistics
0/378	0/615	0/000	31/620

Table 25

Coefficients

B Coefficient	T-Statistics	Significance level	Beta Standardized coefficient
0/549	5/623	0/000	0/615

Single variable regression was used to investigate the existence of relations. Regression significance testing conducted in the variance analysis and model summary tables. Significance level (0.000) less than 0.05 was obtained; therefore the linear regression equation was significant.

According to the coefficient of determination, it can be said that about 38% of the change in the response variable (dependent) of profitability can be represented by the predictor variables of intellectual capital (independent). According to the output obtained in the table of coefficients of the regression line equation and zero coefficients testing, it is indicated that absolute value of the t-statistic is equal to 5/623 which is greater than the table value (1/96) and the significance level (00/0) is less than 0.05. Therefore, the H1 is confirmed. It means that the intellectual capital has a significant positive (direct) impact on the profitability and the value of this effect equals 0/615.

Hypothesis (15): intellectual capital has an impact on the shareholder value

H0: There is no significant relationship between intellectual capital and shareholder value**.**

H1 There is a significant relationship between intellectual capital and shareholder value.

Table 26
Analysis of variance and model summary

The coefficient of determination	R	Significance level	F Statistics
0/260	0/510	0/000	18/296

Table 27
Coefficients

B Coefficient	T-Statistics	Significance level	Beta Standardized coefficient
0/510	4/277	0/000	0/510

Single variable regression was used to investigate the existence of relations. Regression significance testing conducted in the variance analysis and model summary tables. Significance level (0.000) less than 0.05 was obtained; therefore the linear regression equation was significant.

According to the coefficient of determination, it can be said that about 26% of the change in the response variable (dependent) of shareholder value can be represented by the predictor variables of intellectual capital (independent). According to the output obtained in the table of coefficients of the regression line equation and zero coefficients testing, it is indicated that absolute value of the t-statistic is equal to 4/277 which is greater than the table value (1/96) and the significance level (00/0) is less than 0.05. Therefore, the H1 is confirmed. It means that the intellectual capital has a significant positive (direct) impact on the shareholder value and the value of this effect equals 0/510.

Conclusions and Recommendations

According to the obtained results of this study, there is a direct and significant relationship between intellectual capital and performance while among components of intellectual capital; only human capital is directly related to the performance. Therefore, it is recommended that managers of manufacturing companies increase the company performance development by considering development of intellectual capital. Moreover, it is recommended that investors and capital market decision-makers pay special attention to the intellectual capital for prediction of firm performance. Among three components of intellectual capital; only human capital has a significant relationship with performance, therefore managers and investors should pay more attention to their intellectual capital and

attempt for its development. Since superior performance is the key to the survival in today's competitive world, so paying attention to performance improvement and whatever affects this development can be considered as the main concern of organizations' managers. It is obvious that companies operating in a dynamic competitive environment require more continuous improvement of measures and performance ratios. Therefore, the intellectual capital and its components in the companies require more attention and appropriate investment.

In the present study, Yazd Tile Companies were selected as statistical population. It is recommended that researchers consider a broader target population, like Iran's Tile Companies in their studies. This study investigated the effect of intellectual capital variable by considering three indicators of productivity, profitability and shareholder value. It is also suggested to researchers to use and investigate other variables such as employee performance (including employee satisfaction, commitment and their loyalty) as intellectual capital efficiency.

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