

THE IMPACT OF INTELLECTUAL CAPITAL ON THE RISK OF FINANCIAL DISTRESS OF LISTED COMPANIES IN TEHRAN STOCK EXCHANGE, IRAN

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ABSTRACT

Regarding the importance of financial distress in economic institutions and because it is affected by intellectual and physical sources, and also the importance of intellectual capital and utilized capital effects in creating the added value, the purpose of this study was to evaluate the impact of intellectual capital on the risk of financial distress. In this study, the effect of intellectual capital (human and structural capital performance) and utilized capital (physical) on the risk of financial distress (evaluated by the Zavgren model of financial distress) using multiple regression based on panel data for the years 2007-2012 were examined. Pulic model intellectual value added coefficient was used in this paper model to measure the intellectual capital of companies, because the information was credible and documented. Hypothesis test results showed the performance of intellectual, human and physical capital and has a significant negative effect on the risk of financial distress, in such a way that by increasing the aforementioned capitals, the risk of financial distress decreases. The results supports the important role of intellectual capital in value creation for the shareholders. The results of the study also showed that the performance of structural capital has no significant effect on the risk of financial distress of the companies.

Keywords: *Intellectual Capital, The Risk Of Financial Distress, Zavgren*

INTRODUCTION

Nowadays, the rapid technological advances and the wide changes in environment have provided the economy with increased momentum and the increasingly growing competition has limited profit and increased the risk of financial distress. Furthermore, the owners, managers, investors, business partners and creditors are relying on corporate financial statements for evaluating the financial success of a company and its tendency toward financial distress (Technical Committee of Audit Corporation, 2002). Financial statements play a major role in financial decisions of investors and creditors about a particular institute (Accounting and Auditing Research Centre). But conversely, many scientists and management experts believe that intangible resources are factors other than financial and physical assets that contribute to a company's value, but they are not reflected in the financial statements. They believe that the traditional thinking, which is based on measuring the tangible assets and resources is now replaced by the value creation from intangible assets. Intellectual capitals are one of the most important components of organizational assets which organization success is largely rooted in their intellectual capabilities. If there be a conception about the future competitive markets, the economic capital of organizations will no longer have the final say in it. Intellectual capital management will bring organizations to more success in this competitive market for sure.

In fact, this group of experts believe that the employee are the main cores and the base for improving quality and efficiency, and human resources should be considered as a kind of capital and the basic foundation of the process for increasing the efficiency and productivity. Intangible assets and the human resources with quality and knowledge are the most important competitive advantage for an organization and the rarest resource in today's knowledge-based economy which plays an important role in evaluating a company's financial success and its tendency toward financial distress. The recent studies conducted by

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researchers has shown that the efficiency of the intellectual capital is much more important than the financial return on capital in today's knowledge-based societies; This means that compared to the intellectual capital, the role and the important of financial capital in determining sustainable profitability has decreased dramatically; In other words, the success of organizations in today's competitive arena depends on knowledge management and the maintenance and creation of social capital, and the organizations that underestimate the role of knowledge in corporate governance and management, will always have problems in continuing their activities.

Moreover, by realize the important role of intellectual capital in maintaining a competitive advantage and value creation for the organization in the past two decades, seeking to manage it has begun in most countries, and businesses and services agencies. Research findings showed that organizations that efficiently manage their intellectual capital are more successful and their organizational status will be promoted. Because of this and also due to the increasing relative importance of intellectual capital (as the most important part of the total organization capital) in sustainable and long-term profitability, And given the lack of research on the impact of intellectual capital (intangible assets) on the risk of financial distress for the companies in Iran, the main question of this study is the impact of intellectual capital on the risk of financial distress of listed companies in Tehran Stock Exchange.

Research hypotheses were formulated as follows:

The main hypothesis

Intellectual capital efficiency coefficient has a significant effect on the risk of financial distress.

Sub-hypotheses

Since three types of performance indicators should be measured in order to measure the intellectual capital efficiency coefficient, the main hypothesis is divided into three independent sub- hypotheses as follows:

- 1- Human capital efficiency coefficient has a significant effect on the risk of financial distress.
- 2- Structural capital efficiency coefficient has a significant effect on the risk of financial distress.
- 3- Physical capital efficiency coefficient has a significant effect on the risk of financial distress.

According to the research hypotheses, this study is trying to answer the question of whether the intellectual capital affects the risk of failure.

Given that the information on intangible assets is not reflected in the financial statements, theoretically speaking, identifying the effect of intellectual capital on the risk of financial distress is important to those who use the financial statements, since the investors are always looking for tools and information to assess the organizations' financial situation and condition. Since the efficiency of the firm's intellectual capital would reduce the risk of financial distress, if the negative relationship between intellectual capital efficiency and risk of financial distress is confirmed, managers and investors will turn to the methods of measuring intangible assets in order to avoid higher risk of financial distress. Therefore, the models and parameters discussed in this study could be helpful in decision-making for all beneficiary groups who would be affected by the risk of financial distress. Hence, this study is important in terms of theoretical and practical benefits.

The overall goal of this research is the valuation, measurement and explaining the nature of organizations' intellectual capital, since the evaluation of intellectual capital is important in two aspects: one is inside the organization that seeks to better allocate resources in line with the organization's efficiency and minimize costs, the other is outside the organization that aims to make the existing and potential investments information available for the future growth predictions and planning for the long term.

Theoretical basis and literature review

Theoretical basis

The first efforts related to the concept of intellectual capital is due to the of Fritz Machlup studies in 1962. But historically, the concept of intellectual capital was coined in 1969 by the economist John

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Galbraith. However, we should not forget the efforts of James Tobin in the second half of the last century whose comparison-based model managed to empower organizations with an instrument to investigate their intellectual capital performance for the first time. As a result of these efforts, the intellectual capital literature of the organization was developing rapidly. But with a closer examination it may be said that the concept of intellectual capital attracted the opinion of theorists and researchers in the eighties and was more widely considered by organizations in the nineties.

In today's knowledge-based economy, intellectual assets and human capital in particular are among the organization's most important assets and potential success of the organization is depending on their capital market rather than their tangible assets. Moreover, with the growth of knowledge-based economy we see that the organizations' intangible assets are more important in achieving and maintaining a sustainable competitive advantage compared to the tangible assets. In this respect Agram believes that the physical value decreases by using while the value of intellectual and social capital reduced by non-using or misusing them. Intellectual capital provides a new and complete model to view the organization's actual value and contribute to the creation and effective use of value. Hence, it is expected to have a direct relationship with the market value of the companies and an inverse relationship with the risk of financial distress; because intellectual capital increases the firm value and risk of financial distress happens in circumstances where there is a significant drop in value of the company.

Literature review

By surveying conducted researches inside and outside the country, it was understood that there is not a single research on the impact of intellectual capital on the risk of financial distress. Therefore, the studies that are most relevant to the subject are being discussed in this section.

Firer and Williams (2003) investigated the relationship between the efficiency of the value of intellectual capital, human capital and structural capital and profitability of companies listed on the Johannesburg Stock Exchange. Using linear regression and correlation analysis, the results showed that the intellectual capital, the most significant determinants of firm performance.

Chin Chen et al. (2005) studied the relationship between company's intellectual capital and the market value and financial performance of the listed companies in Taiwan's Stock Exchange. In this research, information from the listed companies in Taiwan's Stock Exchange and the Pulic's intellectual capital value added model were used in order to measure the intellectual capital and regression models were used in order to test the relationship between the companies' intellectual capital and their market value and financial performance. Population of this study are companies who were active in Taiwan Stock Exchange during 1992 and 2002; therefore a total of 4254 companies were considered for this study. Experimental studies showed that a higher intellectual capital leads to higher market value and financial performance in the current year and the next. The results discuss the importance of intellectual capital in the profitability evaluation and the income growth of the company. The results show that about 50% of the company's market value has not been reflected in the financial statements, and also shows that financial performance is positively related to the ratio of intellectual value-added.

Young Chu et al. (2006) examines the relationship between intellectual capital components with the Industrial Technology Research Institute specialized industries and concluded that a significant relation exists between the components of intellectual capital and corporate performance and an increase in intellectual capital is subject to the value creation process and their strategic store in organizations.

AnvariRostami and Seraji (2005) attempted to answer three questions in their study: The first question is how to calculate and estimate the value of intellectual capital? The second fundamental question is whether a significant relationship exist between the firms' calculated intellectual capital and their shares market value? Finally, which method of measuring intellectual capital has a higher throughput and a better relationship with the market value of corporate shares? In order to answer these questions, four methods of calculating intellectual capital were tested based on seven years of data from companies in

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Tehran Stock Exchange from 1997 to 2003. Test results show that in the 95% confidence level, the fourth and fifth proposed method of the firms' intellectual capital value have a high and significant correlation (correlation coefficient higher than 97 %) with the shares' market value of companies and industries in Tehran Stock Exchange, and they have a better explanatory power compared to the other three methods considering the higher coefficient determination. The results revealed the importance of intellectual capital, understand the value of intellectual capital by investors and its high correlation with the market value of shares of companies in Stock Exchange.

Abbasi and Goldi Sedghi (2010) investigated the performance effects of each element of intellectual capital on firm financial measures in Tehran Stock Exchange. In this study, the effect of intellectual capital (human, physical and structural capital efficiency) on financial performance (earnings per share, return on equity and annual rate) for 99 companies from 2000 to 2003 was studied using data panel regression methods. The results of combined least squares method showed that the performance coefficient of each intellectual capital element has a positive and significant effect on the rate of return on equity. Effects of physical and human capital efficiency coefficient on earnings per share is positive, but the impact of structural capital efficiency coefficient is negative and significant. Effects of physical and structural capital efficiency coefficient on annual returns is positive, but the impact of human capital efficiency coefficient is negative and significant. The results also show that companies that have more intellectual capital have a better financial performance. Moreover, the intellectual capital coefficient averages between the seven industries have a significant difference.

Safdari (2011) investigated the relationship between intellectual capital and financial performance of listed companies in the Stock Exchange. In this study, the criteria used for evaluating the performance were the return on equity, net return on sales and return on assets. In fact, this study sought to answer the question of whether the intellectual capital influences the firm performance. Three main hypotheses were formulated. 183 companies' information during a 5-year period between 2006 and 2010 were verified in order to test the hypotheses. Eviews 6 Software and Data Panel method were used for data analysis.

RESEARCH METHOD

This study is an applied research. The purpose of an applied research is developing a practical knowledge in a particular field and its practical application. The research method is regression and correlation kind of descriptive. This study used historical data to test the hypotheses and it is a causal research. Regarding the data analysis, it is a quantitative data analysis based research.

The population

The population of this study is consisted of all listed companies in Tehran Stock Exchange which their information has been available since 2007, and companies that their full details were not available got eliminated. The research sampling was based on systematic elimination method, thus those companies that are eligible under the following conditions between 2007 and 2012 will be selected:

- 1) The fiscal year does not change during the study period;
- 2) The required information should be available during the research period;
- 3) Banking, finance and insurance industries were excluded from this study;
- 4) In order to increase the comparability, the selected samples should have sufficient data for all the years from 2007 to 2012, which means that the company should actively participate in the Tehran Stock Exchange for the whole length of the study. That's why companies that have been registered in recent years cannot enter the calculations due to the possibility of errors.

Methods of data collection and data

This study uses two methods of data collection which are library and organizational documents.

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1) Library Study: One of the most important steps in collecting research data is collecting the material through library studies. This tool have been used for theoretical understanding, accessing the previous researches' results and research literature.

2) Collecting data from organizational documents: The data required to test the research hypotheses has been extracted from the organizational documents of the Tehran Stock Exchange.

Research Variables

The dependent variable of this study is the risk of financial distress and the independent variable is the intellectual capital performance. Moreover, since the risk of distress may be influenced by other factors, in order to assess the impact of intellectual capital on the risk of financial distress more accurately, the size of the company enters the model as a probable affecting variable and by controlling its effects, the research hypotheses will be tested in a more accurate fashion.

The dependent variable

The dependent variable in this study is the risk of financial distress. From an economic point of view, company's financial distress can be interpreted as the loss of the company; in this case the company has suffered a lack of success. In fact in this case the company's rate of return is lower than the cost of capital. Another case of financial distress occurs when the company failed to comply with one or more of the provisions relating to debt agreements, such as keeping the current assets to total assets ratio, or the ratio of equity to total assets under the contract terms. Another case of the financial distress of the company is when the cash flow is insufficient to pay the original debt and its interest or when the equity of the company is a negative number (Weston and Copeland, 1992).

In the present study, the risk of financial distress is measured using Zavgren model.

Zavgren (1985) developed a model based on nonparametric statistical analysis named "Logit". Unlike previous researchers such as Altman who used the normal assumption in developing their models, Zavgren did not based his work on the assumption of normality.

Since logit analysis has been used for the formulation of the model coefficients, the measurement accuracy of this model was better compared to the other models. The model output is a number in the range of zero and one. Zavgren model has seven independent variables as follows:

X1 = average inventory / sales

X2 = average accounts receivable / average inventory

X3 = cash balance + investments / total assets

X4 = quick assets / current liabilities

X5 = operating profit / total assets - current Liabilities

X6 = long-term debt / Total assets - current Liabilities

X7 = sales / working capital + fixed assets

$Z = 0.23883 - 0.108x_1 - 1.583x_2 - 10.78x_3 + 3.074x_4 + 0.486x_5 - 4.35x_6 - 0.11x_7$

$P = 1 / (1 + e^{-Z})$

P = Risk of financial distress

The risk of financial distress is a number between zero and one, the closer it is to one, the higher is the risk of financial distress and the closer it is to zero, the lower is the risk of financial distress.

Zavgren calculated his model's variable coefficients for 5 consecutive years from 1975 to 1979 using financial statements of financial distressed and non-distressed companies in the fiscal year 1980.

And then investigated the risk of financial distress of a distressed company based on relevant factors as an example and observed that the risk of financial distress has an ascending trend; then he compared this trend with the company's stock price trend and concluded that this ascending trend the risk of financial distress coincides with the descending trend of company's stock price.

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In using this model, since the model has been designed based on the environment and company structures of other countries and it is not compatible to the environment and structures of Iranian companies, in regard to an study named “investigating the application of Zavgren model in assessing the activity continuation and ranking of the companies in Iran environment” (Mehdi Taghavi, Mohammad Reza Mohammad Ali, 2010), adjusted Zavgren model have been used in which its coefficients are modified based on environmental conditions in Iran.

Zavgren ranked Logistic regression model coefficients based on the population sample according to the environmental conditions of Iran are as follows:

$$Z = 51/006 - 175/04x_1 - 91/52x_2 - 0/489x_3 + 25/411x_4 - 4/375x_5 - 4/501x_6 - 25/417x_7$$

The independent variable

The independent variable in this study is the performance of intellectual capital. Intellectual capital expression was mentioned for the first time by John Kenneth Galbraith in 1969. Peter Drucker has used the term “knowledge workers “before. A brief look at the definitions of intellectual capital shows that researchers still do not agree on a single definition of it. However, many similarities from different perspectives can be seen between these definitions. Most experts suggest that intellectual capital is a non-monetary assets without physical appearance, but it contains some values and it can produce benefits in the future. For example, researchers in areas other than accounting, define intellectual capital as the difference between market value and book value of the corporation (Edvinsson and Malone, 1997). According to this definition, intellectual capital are processes and assets that usually are not reflected in the balance sheet.

In this study, the independent variable is the performance of intellectual capital that was suggested by Pulic.

Pulic introduced an intellectual capital measurement model (VAIC) in 1997 and developed it in 1998 and completed it in 2000. Pulic used the value added intellectual coefficient (VAIC) to measure the performance of intellectual capital of the Australian Stock Exchange companies. In his model, the added value is obtained from the difference between the inputs and the outputs:

$$\text{Value added (VA)} = \text{outputs} - \text{inputs}$$

Inputs are the income from the sale of goods and services and outputs are all of costs used to produce goods and services, excluding staff salary costs and the depreciation. Because salary expenses are an investment in human resources which helps in the development of intellectual and institutional value-added by adjusting the processes and regulations. Depreciation expenses are part of non-monetary costs of the company as well.

$$\text{value added} = \text{depreciation costs} + \text{employee payroll costs} + \text{Operating profit}$$

Value added intellectual coefficient has the following components:

A) Physical efficiency coefficient (VACA):

This coefficient represents the added value created by the use of the physical tangible assets. Which means how many Rials of added value is obtained from each Rial of tangible physical assets. This coefficient can be obtained from the following equation:

$$CA = \text{total assets} - \text{intangible assets} = \text{tangible assets}$$

$$VACA = VA / CA = \text{value added} / \text{tangible physical asset}$$

B) Human efficiency coefficient (VAHU):

This coefficient represents the added value created by the staff and it is obtained by dividing the added value to the staff payroll, which means how many Rials of added value is obtained from each Rial of paid salary. This coefficient can be obtained from the following equation:

$$VAHU = VA / HU = \text{value added} / \text{Staff salary costs}$$

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C) Structural efficiency coefficient (STVA):

This coefficient represents the added value created by the company's processes and structures. It shows that which percentage of the added value of the company is due to the structural capital. Structural capital and structural capital efficiency coefficient can be calculated from the following equation:

Structural capital (SC) = value - Payroll costs for employees

STVA = SC / VA = structural capital / added value

Thus the value added intellectual coefficient can be obtained by adding the aforementioned coefficients:

Intellectual capital = structural capital efficiency + human capital efficiency + physical capital efficiency

VAIC = VACA + VAHU + STVA

Control variable

The variables that are needed to eliminate or counteract its effects when doing the research are called controlled variables. Control variable in this study is the natural logarithm of the book value of total assets. This variable is measured as follows:

SIZE: LN (A_i, t)

Research model

According to the main and sub-hypotheses in regard to the impact of intellectual capital on the risk of financial distress, the below regression models were examined:

Regression model of the main hypothesis of the research:

$$P_{i,t} = \beta_0 + \beta_1 VAIC_{i,t} + \beta_2 SIZE_{i,t} + \varepsilon_{i,t}$$

Regression model of the first sub-hypothesis of the research:

$$P_{i,t} = \beta_0 + \beta_1 VAHU_{i,t} + \beta_2 SIZE_{i,t} + \varepsilon_{i,t}$$

Regression model of the second sub-hypothesis of the research:

$$P_{i,t} = \beta_0 + \beta_1 STVA_{i,t} + \beta_2 SIZE_{i,t} + \varepsilon_{i,t}$$

Regression model of the third sub-hypothesis of the research:

$$P_{i,t} = \beta_0 + \beta_1 VACA_{i,t} + \beta_2 SIZE_{i,t} + \varepsilon_{i,t}$$

Hypotheses tests of the research

The main hypothesis test

In the main hypothesis of the research, the impact of intellectual capital performance on the risk of financial distress has been tested. Accordingly, the risk of financial distress and intellectual capital performance were considered as the dependent and independent variables respectively. Panel data regression model was used to test this hypothesis. The results of the model are presented in Table 1. Results of the combined or integrated model (Chow test) showed that based on Lymerf-statistic and its probability (statistic probability is less than 5% error level), using the model with effects is appropriate; furthermore, the results of the random or fixed effects model (Hausman test) showed that in the model based on chi-square statistic and its probability (statistic probability is less than 5% error level) using the fixed effects model is preferred. Fisher F-statistic and its probability in the model shows an overall significance in the regression model (statistic probability is less than 5% error level). Durbin - Watson statistic in the model (between 1/5 and 2/5) implies the independence of model residues; in other words, there is no autocorrelation between the model residues. Jarque-bera statistic and its probability showed that model residues values (statistic probability is less than 5% error level) do not have a normal distribution; this is related to the abnormal distribution of the research variables and the adjusted coefficient of determination explains the percent changes in risk of financial distress for percent changes of entered variables in the model.

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Table 1- The results of practicing the main hypothesis model

$P_{i,t} = \beta_0 + \beta_1 VAIC_{i,t} + \beta_2 SIZE_{i,t} + \varepsilon_{i,t}$			
Explanatory variables	Coefficients of the variables	T-statistic	Probability
y-intercept	1.5511	2.4280	0.0155
Intellectual Capital Efficiency	-0.0012	-4.4465	0.000
Company size	-0.0709	-1.4230	0.1552
Examining the significance of the model	Fisher F-statistic (statistic Probability)	5.6470 (0.001)	
Examining the explanatory power of the model	The coefficient of determination (Adjusted)	0.5966 (0.4910)	
Independence review of model residues	Durbin-Watson statistic	2.0555	
Examining the normality of model residues	Jarque-bera statistic (statistic Probability)	24.2136 (0.000)	
Examining the combined or integrated model	Lymer F-statistic (statistic Probability)	5.4994 (0.000)	
Examine the fixed or random effects model	Chisquare statistic (statistic Probability)	9.4599 (0.008)	

Results of practicing the research model according to t-statistic and its probability indicates the significance of intellectual capital performance variable (statistic probability is less than 5% error level) and insignificance of company's size (statistic probability is more than 5% error level) in the risk of financial distress model. Since the sign of intellectual capital performance coefficient is negative, evidence suggest a significant and inverse impact of intellectual capital performance on the risk of financial distress. This means that when the intellectual capital performance increases, the risk of financial distress is reduced simultaneously. Therefore, the main research hypothesis is accepted.

Sub-hypotheses tests

First sub-hypothesis test:

In the first sub-hypothesis of the research, the impact of human capital performance on the risk of financial distress has been tested. Accordingly, the risk of financial distress and human capital performance were considered as the dependent and independent variables respectively. Panel data regression model was used to test this hypothesis. The results of the model are presented in Table 2. Results of the combined or integrated model (Chow test) showed that based on Lymerf-statistic and its probability (statistic probability is less than 5% error level), using the model with effects is appropriate; furthermore, the results of the random or fixed effects model (Hausman test) showed that in the model based on chi-square statistic and its probability (statistic probability is less than 5% error level) using the fixed effects model is preferred. Fisher F-statistic and its probability in the model shows an overall significance in the regression model (statistic probability is less than 5% error level). Durbin - Watson statistic in the model (between 1/5 and 2/5) implies the independence of model residues; in other words, there is no autocorrelation between the model residues. Jarque-bera statistic and its probability showed that model residues values (statistic probability is less than 5% error level) do not have a normal distribution; this is related to the abnormal distribution of the research variables and the adjusted coefficient of determination explains the percent changes in risk of financial distress for percent changes of entered variables in the model.

Table 2- The results of practicing the first sub-hypothesis model

$P_{i,t} = \beta_0 + \beta_1 VAHU_{i,t} + \beta_2 SIZE_{i,t} + \varepsilon_{i,t}$			
Explanatory variables	Coefficients of the variables	T-statistic	Probability
y-intercept	1.4777	2.1520	0.0318
Human Capital Efficiency	-0.0013	-3.8431	0.000
Company size	-0.0653	-1.2191	0.2233
Examining the significance of the model	Fisher F-statistic (statistic Probability)	5.6378 (0.000)	
Examining the explanatory power of the model	The coefficient of determination (Adjusted)	0.5967 (0.4908)	
Independence review of model residues	Durbin-Watson statistic	2.0570	
Examining the normality of model residues	Jarque-bera statistic (statistic Probability)	23.5915 (0.000)	
Examining the combined or integrated model	Lymer F-statistic (statistic Probability)	5.4898 (0.000)	
Examine the fixed or random effects model	Chi square statistic (statistic Probability)	9.6652 (0.008)	

Results of practicing the research model according to t-statistic and its probability indicates the significance of human capital performance variable (statistic probability is less than 5% error level) and insignificance of company's size (statistic probability is more than 5% error level) in the risk of financial distress model. Since the sign of human capital performance coefficient is negative, evidence suggest a significant and inverse impact of human capital performance on the risk of financial distress. This means that when the human capital performance increases, the risk of financial distress is reduced simultaneously. Therefore, the first sub-hypothesis is accepted.

Second sub-hypothesis test:

In the second sub-hypothesis of the research, the impact of structural capital performance on the risk of financial distress has been tested. Accordingly, the risk of financial distress and structural capital performance were considered as the dependant and independent variables respectively. Panel data regression model was used to test this hypothesis. The results of the model are

presented in Table 3. Results of the combined or integrated model (Chow test) showed that based on Lymer f-statistic and its probability (statistic probability is less than 5% error level), using the model with effects is appropriate; furthermore, the results of the random or fixed effects model (Hausman test) showed that in the model based on chi-square statistic and its probability (statistic probability is less than 5% error level) using the fixed effects model is preferred. Fisher F-statistic and its probability in the model shows an overall significance in the regression model (statistic probability is less than 5% error level).

Durbin - Watson statistic in the model (between 1/5 and 2/5) implies the independence of model residues; in other words, there is no autocorrelation between the model residues. Jarque-bera statistic and its probability showed that model residues values (statistic probability is less than 5% error level) do not have a normal distribution; this is related to the abnormal distribution of the research variables and the adjusted coefficient of determination explains the percent changes in risk of financial distress for percent changes of entered variables in the model

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Table 3- The results of practicing the second sub-hypothesis model

$P_{i,t} = \beta_0 + \beta_1 STVA_{i,t} + \beta_2 SIZE_{i,t} + \epsilon_{i,t}$			
Explanatory variables	Coefficients of the variables	T-statistic	Probability
y-intercept	1.7361	2.1239	0.0341
structuralCapital Efficiency	-0.0005	-0.0105	0.9916
Company size	-0.0709	-1.4501	0.1476
Examining the significance of the model	Fisher F-statistic (statistic Probability)	5.6090 (0.000)	
Examining the explanatory power of the model	The coefficient of determination (Adjusted)	0.5954 (0.4893)	
Independence review of model residues	Durbin-Watson statistic	2.0438	
Examining the normality of model residues	Jarque-bera statistic (statistic Probability)	22.1464 (0.000)	
Examining the combined or integrated model	Lymer F-statistic (statistic Probability)	5.5575 (0.000)	
Examine the fixed or random effects model	Chi square statistic (statistic Probability)	9.5087 (0.008)	

Results of practicing the research model according to t-statistic and its probability indicates the insignificance of structural capital performance and company’s size variables (statistic probability is more than 5% error level) in the risk of financial distress model. This means that when the structural capital performance increases or decreases, the risk of financial distress remains unchanged. In finance literature, it is expected that when the structural capital success in creating the added value increases, the risk of financial distress is reduced. Therefore, the second sub-hypothesis is rejected due to a lack of significant effect.

Third sub-hypothesis test:

In the third sub-hypothesis of the research, the impact of physical capital performance on the risk of financial distress has been tested. Accordingly, the risk of financial distress and physical capital performance were considered as the dependent and independent variables respectively. Panel data regression model was used to test this hypothesis. The results of the model are

presented in Table 2. Results of the combined or integrated model (Chow test) showed that based on Lymer f-statistic and its probability (statistic probability is less than 5% error level), using the model with effects is appropriate; furthermore, the results of the random or fixed effects model (Hausman test) showed that in the model based on chi-square statistic and its probability (statistic probability is less than 5% error level) using the fixed effects model is preferred. Fisher F-statistic and its probability in the model shows an overall significance in the regression model (statistic probability is less than 5% error level). Durbin - Watson statistic in the model (between 1/5 and 2/5) implies the independence of model residues; in other words, there is no autocorrelation between the model residues. Jarque-bera statistic and its probability showed that model residues values (statistic probability is less than 5% error level) do not have a normal distribution; this is related to the abnormal distribution of the research variables and the adjusted coefficient of determination explains the percent changes in risk of financial distress for percent changes of entered variables in the model

Table 4- The results of practicing the third sub-hypothesis model

$P_{i,t} = \beta_0 + \beta_1 \text{VACA}_{i,t} + \beta_2 \text{SIZE}_{i,t} + \varepsilon_{i,t}$			
Explanatory variables	Coefficients of the variables	T-statistic	Probability
y-intercept	1.3463	1.6932	0.0909
physical Capital Efficiency	-0.2004	-2.9274	0.003
Company size	-0.0546	-0.8816	0.3784
Examining the significance of the model	Fisher F-statistic (statistic Probability)	5.7086 (0.000)	
Examining the explanatory power of the model	The coefficient of determination (Adjusted)	0.5997 (0.4946)	
Independence review of model residues	Durbin-Watson statistic	2.0723	
Examining the normality of model residues	Jarque-bera statistic (statistic Probability)	24.9220 (0.000)	
Examining the combined or integrated model	Lymer F-statistic (statistic Probability)	5.6638 (0.000)	
Examine the fixed or random effects model	Chi square statistic (statistic Probability)	11.6475 (0.003)	

Results of practicing the research model according to t-statistic and its probability indicates the significance of physical capital performance variable (statistic probability is less than 5% error level) and insignificance of company's size (statistic probability is more than 5% error level) in the risk of financial distress model. Since the sign of physical capital performance coefficient is negative, evidence suggest a significant and inverse impact of physical capital performance on the risk of financial distress. This means that when the physical capital performance increases, the risk of financial distress is reduced simultaneously. Theoretically, this result is in agreement with the current theories in economic and financial literature. Physical capital performance suggests the intellectual power of the companies toward using the physical capital for creating added value. Companies that have higher rates of physical capital performance are actually better able to create value and generate wealth from their tangible assets. Therefore it is expected that the performance of physical capital as a component of intellectual capital is effective in reducing the risk of financial distress. Hypothesis test results also show that when intellectual ability of companies toward utilizing the tangible resources increases, the risk of financial distress is reduced. Therefore, the third sub-hypothesis is accepted.

CONCLUSION

The main hypothesis test results showed that intellectual capital performance has a significant effect on the risk of financial distress of companies included in research statistical sample. Due to a negative relationship between intellectual capital performance and risk of financial distress in the model, evidences showed that as the performance of intellectual capital increases (decreases), the risk of financial distress decreases (increases). Theoretically, intellectual capital has a special place on the world level and can be considered as a valuable resource for organizations and an indicator of countries development and key capital in entrepreneurial growth. Nowadays, the intellectual capital is used to create value for the organization and the success of any organization depends upon the ability to manage these assets. What makes these companies competitive in current economic stage is their intangible assets and intellectual capital. Each organization which has more knowledgeable staff, more agile structure, better management,

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more capabilities, better culture, more valuable relationships and more learning, would be less at the risk of financial distress. In the first research sub-hypothesis, results showed that human capital performance has a significant effect on the risk of financial distress of companies included in research statistical sample. Due to a negative relationship between human capital performance and the risk of financial distress in the model, evidences showed that as the human capital performance increases (decreases), the risk of companies financial distress decreases (increases). Theoretically, because human capital is the source of innovation and strategic renewal, so it is considered as an important factor in the growth and vitality of the organization. Companies with higher human capital efficiency coefficient can using their employees' abilities better in order to create value and generate wealth. So, they will be less at the risk of financial distress.

In the second research sub-hypothesis, the impact of structural capital performance on the risk of financial distress of companies in statistical sample was tested. The results of the hypothesis test showed that structural capital performance has no significant effect on the risk of companies' financial distress. In other words, parallel to the increase (decrease) of the structural capital performance, the risk of financial distress will not increases (decreases). Theoretically, structural capital is all non-human assets or organizational capabilities that can be used to estimate the market needs. If an organization has poor systems and work procedures, intellectual capital will not reach its maximum potential. While organizations with strong structural capital will achieve a supportive culture which allows individuals to do new things, fail and learn. Also the structural capital can help the staff in achieving optimal performance and organization business performance. However, the research results showed, structural capital performance was not effective in reducing the risk of financial distress of listed companies in Tehran Stock Exchange. According to Chen (2004), structural capital can affect other three capital, especially human capital, and be influenced by them in return. For example, a strong culture can be an important factor in motivating employees. In fact, structural capital is a function of human capital, because human capital is a determining factor of organizational form. It is human capital which determines the structural capital operational forms. Once structural capital affected by human capital, it will be created independent of human capital. Thus, structural capital and human capital in interaction with each other will help the organizations. Results of testing correlation coefficient of this study showed that there is a positive and significant correlation between human and structural capital performance. Thus, in Iranian companies, structural or organizational capital plays no role in

reducing the risk of financial distress by itself and according to its continuous relationship with human capital performance and significant effect of human capital in reducing the risk of financial distress, we can state that structural capital performance is implicitly effective in reducing the risk of financial distress, because presence of hardware, software, processes, information systems, exclusive databases, concessions and organization brand provide required context for using staff talents and supporting them.

In the third research sub-hypothesis, the results of physical capital performance impact on the financial distress of companies in statistical sample showed that due to the negative correlation between physical capital performance and risk of financial distress in the model, parallel to physical capital performance increasing (decreasing), the risk of financial distress decreases (increases).

Theoretically, the more effective the staff are in utilizing tangible assets, the more value creation and wealth generation will be. So, the risk of financial distress, reduces even more.

As in the theoretical basics and research literature mentioned, no local and foreign research on the effect of intellectual capital on the risk of financial distress has been done till now and we are not able to evaluate these results with previous studies, but since today's intellectual capital is used to create and enhance enterprise value and an organization's success depends on its ability to manage this scarce resource and it can be assumed that there is a positive correlation between the amount of the company's intangible assets and knowledge on the one hand and market value of companies stock on the other hand. Summary of hypothesis test results are shown in Table 5:

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Table 5- A summary of the research hypotheses test results

Hypothesis	Description	Result
Main hypothesis	Intellectual capital performance coefficient has a significant effect on the risk of financial distress.	approved
First sub-hypothesis	Human capital performance coefficient has a significant effect on the risk of financial distress.	approved
Second sub-hypothesis	Structural capital performance coefficient has a significant effect on the risk of financial distress.	denied
Third sub-hypothesis	Physical capital performance coefficient has a significant effect on the risk of financial distress.	approved

Research suggestions

Applied research suggestions

The results of this study show that when the intellectual, human and physical capital performance is higher, companies will face lower risk of financial distress. It is therefore recommended:

1. Make some policies and strategies in financial statements to reflect the value of companies' intellectual capital. It can lead to better economic decisions.
2. Managers should provide a basis for increasing the profitability and reducing the risk of financial distress by appropriate investment in intellectual capital, including human and physical capital and its efficient management, and be aware that having only an efficient and effective organizational capital cannot reduce the risk of financial distress.
3. Administrators can use the value added intellectual coefficient model for investigating the performance levels of human and physical capital of their company in order to manage intellectual capital of their company better and compare it with the competitors in the industry.

Suggestions for future research

- 1- Investigating the effect of intellectual capital on corporate financial distress risk using other methods (including the balanced scorecard, intellectual capital indicators, etc.). Balanced scorecard examine the organization from four perspectives, and tries to develop measures and collect and analyze data for each one of them. Looking at this frameworks, it is clear that the financial perspective is the financial capital, the customer perspective is the customer capital, internal processes perspective is the structural capital, and learning and growth perspective is the human capital.
- 2- It is suggested to examine the influence of intellectual capital on the risk of financial distress of companies in advanced and traditional industries separately.
- 3-

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