



Measurement and application of intellectual capital in Turkey

Measurement
and application

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Abstract *The purpose of this paper is to define the elements of intellectual capital of firms in Turkey and to empirically investigate the relationship between intellectual capital and market value of firms in Istanbul Stock Exchange. To create a suitable intellectual capital measurement model for this study, a wide literature research was made. In almost every created intellectual capital measurement model, elements of intellectual capital are defined in three dimensions; i.e. human capital, structural capital and relation capital. For the research, an intellectual capital measurement model is created and four hypotheses are defined. The main conclusions from this study are that: human capital and relation capital of firms have a positive relationship with market/book value of firms in Turkey; and structural capital of firms in Turkey has a correlation with human and relation capital.*

Introduction

The aim of this study is to try to determine the criteria that form intellectual capitals of the firms in Turkey and to reveal the relations between the intellectual capital that is estimated according to these criteria and market values. When the literature of this subject is analyzed, it is seen that, in almost all the models of intellectual capital measurement that are formed until today, the intellectual capital is tried to be defined as having three dimensions which have similar characteristics (Bontis *et al.*, 1999; Stewart, 1997). The human capital, which can be defined as the first dimension, is named as human-centered assets in the model of "Technology Broker" (Brooking, 1996) and named as the individual capability in the model of "Intangible Asset Monitor" (Sveiby, 1997), and in the "Balance Score Card" model, it is named as the learning and development dimension (Kaplan and Norton, 1999). Therefore, when forming our model, one dimension of this model should be saved for the human capital. The second dimension, which will be placed in our model, should explain the relations of the company with the outer world. As regards to the dimension which is mentioned as the customer capital in literature, when the interaction between the company and the environment is observed, it is seen that there are some other effect elements than the customer (Dinçer, 1998). For this reason, as observing this dimension, supplier relations and society relations should be defined. Therefore, it would be more appropriate if this dimension is named as the relation capital. The last dimension, which is used for defining the intellectual capital, is the organizational structure. Names such as intellectual property, infrastructure assets, innovation capital or process capital, are given regarding this dimension. In our model, a frame is constituted under the name of organizational capital dimension that includes all these features. By observing the features of the dimensions that are in this frame, a model can be formed.



The human dimension

The human dimension defines the human capital in intellectual capital. The human capital is the most important asset in this organization, because this asset is the source of creativity. Implicit knowledge assets of the employees in the organization are one of the most crucial elements that affect the work performance of the company. However, only the existence of implicit knowledge is not enough for the performance of the organization. The aim is to make the implicit knowledge of the employees an explicit knowledge in all organizational levels. In this way, it will be possible to create an organizational value. The human capital is composed of a mixture of employees' occupational or general knowledge accumulation, the leadership abilities, risk-taking and problem-solving capabilities. It is really difficult, even impossible to define the human capital in a definite framework, also makes it difficult to measure the human capital. The human capital in a company enhances the operational activity of tangible assets (tools and equipments) and activates intangible assets (Fitz-enz, 2001). It is true that successful companies make investments in their employees in order to increase their visions, capabilities and experiences for the global working environment (Ulrich, 1997). Increasing the employees' capabilities has a direct effect on the financial results of the company (Becker *et al.*, 2001). For these reasons, it can be claimed that, the human capital has a direct relationship with the performance of the company. The problem here is to define the company performance. The company performance can be defined in two ways: qualitative and quantitative.

When we define the firm performance as qualitative, it is difficult to collect data about it and to relate it with a financial value. On the other hand, as it is defined as being quantitative, financial data are used generally. It is obvious that data like the most commonly used market value, market/book value rate, cash flow, and profitability are affected by various factors. However, due to the inadequacy of the data and the undeveloped standards in Turkey, the research field is limited. Therefore, in Turkey, it would be more appropriate to use market/book values. For these reasons, we can defend the following hypotheses.

H1. There is a positive relationship between the human capital and the market/book value of the firm.

The relation dimension

The relation dimension defines the relation capital in the intellectual capital. The relation capital is the sum of all assets that arrange and manage the firm's relations with the environment. The relation capital contains the relations with customers, shareholders, suppliers, and rivals, the state, the official institutions and society. Although the most important criteria of the relation capital are customer relations, it is not the only criteria to be considered. The relation capital is the reflection of the firm. Measuring the relation capital is related to how the environment perceives the firm. The relation capital includes brands, customer loyalty scales, and the image in society, suppliers and customer feedback systems. McKenna (1986) states that there are three steps to establish relations with the environment:

- (1) to understand the market;
- (2) to move with it; and
- (3) to establish relations.

In the value chain, there is the obligation that the firms should establish relations with all the sections from the customer to the supplier. Many researches show that, being market-focused has an effect on the profit rate of the company and on the increase of the market share (Narver and Slater, 1990). For these reasons, the following hypotheses can be defended.

H2. There is a positive relationship between the relation capital and the market/book value of the firm.

The organizational dimension

The organizational dimension is defined in the intellectual capital as the organizational capital. The organizational capital is the sum of all assets that make the creative ability of the organization possible. The mission of the firm, its vision, its basic values, strategies, working systems, and in-firm processes can be counted among these assets. Organizational capital is one of the foundation stones of creating learning organizations. Even though the employees possess adequate or high capabilities, an organizational structure that is made up of weak rules and systems and which cannot turn these capabilities into a value, prevents the firm from having a high performance. In contrast, a strong organizational capital structure creates a supporting environment to its workers and thus leads to workers' risk taking after their failures. Besides, it leads to the decrease of the total cost and to the increase of the firm's profit and productivity. Therefore, the organizational capital is a vital structure for organizations and in an organizational level; it has a critical importance for the realization of measuring the intellectual capital (Bontis, 1998, 1999, 2001, 2003). Many factors are defined among the models that are made in order to measure the organizational capital. Visible assets such as the patents of the firm, copyrights, databases, computer programs and intangible assets such as the methods related to business management, company strategies, the culture of the company is among these factors. The high investments of technology or the high number of computer and programs in a firm us not feature, which adds a plus value to a firm. In order for these to make a contribution to the company, the workers in the firm should have the abilities to use these systems to interpret the results, to make them knowledge and to use them in the relations (Fitz-enz, 2001). As long as they are not put to use, the existence of systems that possess and transmit knowledge, which is the foundation stone of the organizational capital, is not means of adding value. Therefore, it would be wrong to claim that the organizational capital has a direct and linear relationship with the performance of the company. However, in order for the human capital and relation capital to have an adding dimension to the company, the existence of the organizational structure is indispensable. Therefore, we can shape our hypotheses related to the organizational capital as thus:

H3a. There is a positive relationship between the organizational capital and the human capital.

H3b. There is a positive relationship between the organizational capital and the relation capital.

For these hypotheses, we can define our model of research as shown in Figure 1.

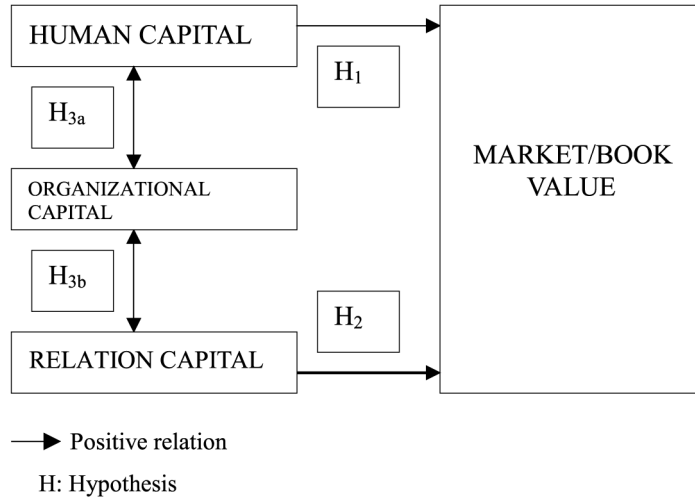


Figure 1.
Research model for
measuring intellectual
capital

The choice of the research method

Sieber claims that qualitative research methods constitute a theoretical substructure for quantitative analysis (Sieber, 1973). In this context, it is natural to use the qualitative research results for quantitative analysis. For the research method, a Likert-type scale is suggested by Bontis (1998), Bontis and Fitz-enz (2002) and Bontis *et al.* (2000, 2002). Moreover, in order to support the survey study, interview and focus group meeting are also suggested (Abeysekera, 2001). For this reason, in our research as regards to measuring the human, relation and organizational capital, applying survey and interview techniques that depend on the Likert-type scale, is determined. The rates of market/book that will be used in our model, is taken from the Istanbul Stock Exchange data.

Determining the general intellectual capital criteria

As appropriate to the aim of the research study, a preliminary work is made to find which intellectual capital criteria are effective in the success of firms that operate in Turkey. For this study, the intellectual capital criteria should be defined broadly. Therefore, in order to determine the intellectual capital criteria a literature research is made and the below mentioned criteria are chosen (Tables I-III). Three characteristics are considered for this choice.

- (1) The criteria are being used in more than one study.
- (2) The criteria are being in accordance with the existing organizational structures in the firms in Turkey.
- (3) The criteria add a qualitative feature to the concept of intellectual capital besides the quantities dimension.

The criteria regarding the human capital

Bontis describes several dimensions for human capital including employee satisfaction, employee commitment company, education, employee motivation, value

Quantitative criteria regarding employee	Qualitative criteria regarding employee	Criteria regarding strategies of human capital
Education hour per employee and its cost	Higher skill and ability level	The strategy of promoting interoperate relation
Higher education rate of employee (masters and doctorate)	Leadership ability of management level	Supporting new ideas
Turnover rate	Successes of work results	Training strategy
The experience of managers in the firm (year)	Determining their own targets	Human resource selection strategy
	Being intelligent and creative	Effective wage system
	Being "the best" in their subject	Succession planning
	Satisfaction level	
	Having ability in their subject	
	Perform their best	
	Sharing and reporting knowledge	
	To be well-grounded about strategies	
	Risk-taking	
	Eagerness to source sharing	
	Freely expressing the opinions	
	Creating results by using knowledge	
	The effectiveness of developing employee	
	Eagerness to share knowledge	

Table I.
The human capital criteria that are placed in the research model

The criteria regarding customers	The criteria regarding market	Other criteria of environmental elements
Customer satisfaction	Market share improving	Participating social activities that are not sponsored
Time resolve the problem	Leadership of market share	Being the sponsor for the social activities
The extent of the relation	Having market-oriented processes	Analysis of rivals
Value added service	Market and customers to be understood by employee	Supplier relations
Customer loyalty	Having a good image in the market	Environment consciousness
Preference in competition	To own the leader brands in the market	Relations with shareholders
Collecting data for customer request		
Interoperate dispersal of customer feedback		
Emphasizing customer request		
To draw benefit from customer request for the customer satisfaction		

Table II.
The relation capital criteria that are placed in the research model

alignment, retention of key people, management leadership, process execution, knowledge generation, knowledge sharing and knowledge integration (Bontis and Fitz-enz, 2002). In another research about the intellectual capitals of companies in Sweden, the illness rate, the index of human capital (regarding education, capability and knowledge), the days of education given to workers are defined as human capital criteria (Johanson *et al.*, 1999). In another research which is made in Canadian

The criteria regarding organizational capital

- The cost of realizing work
- The time of realizing work
- Cost per revenue
- Increase revenue per employee
- Revenue per employee is best
- Implement new ideas
- Supports development of ideas
- Leader in developing new ideas and product
- Increase productivity
- Quick access to information
- Procedures support innovation
- The existence of a bureaucratic system
- Culture is supportive
- Access number of database per second
- Access to information without any limitation
- Determining quality targets
- MIS contains all knowledge
- Strategic definition
- Number of patents
- R&D investment
- Technology investment
- Updating the database

Table III.
The organization capital
criteria that are placed in
the research model

industry, features like the experiences in professional life, the cost rates in employing, worker satisfaction, the knowledge of technology that workers have, leadership abilities, the cost of education of workers, the high education rate of workers (masters and doctorate), worker-manager rate, innovations per worker are defined (Miller *et al.*, 1999). We can sum the criteria of human capital in three main groups. These are the qualitative and the quantitative criteria of workers and criteria that belong to human capital strategies. Totally 27 human capital criteria are defined. These are shown in Table I.

The criteria regarding the relation capital

The relation capital, which is an important dimension of the intellectual capital, defines the relations of the elements that are in the value chain with the firm. It is obvious that the essential criteria of the relation capital are related to customer and market. Except these criteria, the stockholders who are important elements of the firm environment, suppliers and society should be defined in the context of relation capital. In the research in Canadian industry, features like the growth rate, sale rates to permanent customers, loyalty of customer, customer satisfaction, customer complaint rate, market share are defined as the criteria of relation capital (Miller *et al.*, 1999). In another research regarding the intellectual capitals of companies in Sweden the features like the rate of re-purchasing, market capital index are defined (Johanson *et al.*, 1999). The relation capital criteria can be classified into three main groups for our research. These are, the criteria of the relation capital of customers, the criteria of the market and the criteria of the other elements of environment. Totally 21 relation capital criteria are defined. These are shown in Table II.

The criteria regarding the organizational capital

The organizational capital is the sum of all assets that make the creative ability of the organization possible. The mission of the firm, its vision, its basic values, strategies, working systems, and in-firm processes can be counted among these assets. In the research made in Canadian industry, characteristics like number of patents per worker, income rate per research and development expenses, frequency of access to databases, software licenses, frequency of presenting new products are defined as the organizational capital criteria (Miller *et al.*, 1999). For our research, a total of 22 organization capital criteria are defined. These are specified in Table III.

The preparation of the general intellectual capital survey

While planning a survey study, the first step is to determine the hypotheses or the question of research (Baş, 2001). The aim of the general intellectual capital survey is to find out the intellectual capital criteria that play an effective role in the firms in Turkey. Therefore, from the firms that operate in Turkey market, people like the founders of firms, CEOs, presidents, and top-level executives – general managers, directors, assistant directors – who are experienced in the work field, are chosen as the target audience. There is no industrial discrimination in the research. For every single criterion that takes place in the research model, questions are prepared according to the survey questionnaire forms. As the research subject has qualitative characteristics, positive evaluating, judgmental question forms are chosen (Baş, 2001). As the answer form, seven-Likert-type conduct scale is chosen. From those who participate in the survey, their names and surnames, their positions in their work, their years of work and the total number of workers that work in the firm are requested as demographic data. A total of 71 valid surveys are evaluated. After the analysis of the demographic data, it is accepted that the subjects who participate in the survey have adequate work experience and as they are in the top management position in their firms, they have the knowledge to express their opinions on the intellectual capitals of the firms. The second step in the statistical analysis is to make a study on the reliability of the questions. Reliability is the consistency of the independent scales of the same thing. A survey that has a low reliability does not have a scientific value, however the high level of reliability does not guarantee the correct application of measurement. Nunnally suggests Cronbach's α test for the development and simplification of the survey, that is to say that, for determining, the valuables that do not represent the common value that is to be measured (Bontis, 1998). Nunnally advises α coefficient to be 0.7 or higher. To the human capital, relation capital and organizational capital criteria in our survey results, Cronbach's α test is applied by using the SPSS Version 10.0 separately. As a consequence of Cronbach's α test, the alpha coefficient for human capital is found as 0.8744, the α coefficient for organizational capital is 0.8702 and the α coefficient for the relation capital is found as 0.8663. As all these three rates are over the critical point of 0.7; the last status of the survey's reliability is accepted.

However, the fact that the survey is being reliable does not guarantee that the survey is fitting its purpose. In order to enable this, the survey's factor structure should be confirmed numerically. For this, making a factor analysis is necessary. Factor analysis is a statistical method, which is generally used to summarize data. In factor analysis, by attributing a factor per criteria, the structure of the criteria is tried to be determined (Hair *et al.*, 1987). In factor analysis, generally the VARIMAX

rotation approach is being used (Bontis, 1998). The factor analysis related to our survey is made by SPSS version 10.0 program. As a result of the factor analysis eight different factors are defined in the human capital. These eight factors have 73.248 percent initial eigenvalues (cumulative). As a result of the factor analysis four different factors are defined in the organizational capital. These four factors have 65.577 percent initial eigenvalues (cumulative). As a result of the factor analysis seven different factors are defined in the relation capital. These seven factors have 74.104 percent initial eigenvalues (cumulative).

The preparation of a private intellectual capital survey about the criteria specific to Turkey

The aim of the private intellectual capital survey is to detect the level of the presence of the intellectual capital criteria that are determined according to the results of the general intellectual capital survey, in firms whose shares affect transactions in the Istanbul Stock Exchange. The results of the general intellectual capital survey show us the intellectual capital criteria which are used by the top-level executives in Turkey in order to increase the performance of their firms. The target audience of this study are the top-level executives of firms whose shares affect transactions in the Istanbul Stock Exchange. Since the research for the relations between the intellectual capital and the market/book value of the firms, our target audience only consist of the firms whose shares affect transactions in the Istanbul Stock Exchange, as only the firms that operate in the Istanbul Stock Exchange have a market/book value rate. Considering the first week of July, in Istanbul Stock Exchange, shares of 280 firms have been treated. Therefore, our target firm number is 280. Reaching the top-level executives of these firms and to ensure these people's participation in the survey is a difficult process. For this reason, it was decided that the survey to be applied should be put online in a web site over the internet, instead of applying the paper pen method. In order to serve this aim, a web site was constructed. In order to make the firms aware of the survey, a pre letter was sent to these 280 firms. In this letter, subjects about the aim of the study, the web address of the survey, the (estimated) period of filling the survey, the number of questions in the survey, and the discreetness of the survey have been covered. The factors regarding human, organization and relation capitals that are defined after the general intellectual capital survey and the questions defining these factors, are re-created by changing some of their characteristics and the weight of the questions. A total of 21 questions are created according to the general intellectual capital survey analysis. Nine of these questions are for human capital, five questions are for organizational capital and seven questions are for the relation capital. The factors related to the private intellectual capital survey is given in Table IV. The questions in the survey are arranged randomly according to their subjects, without having a designated line. As in the previous survey, seven-Likert-type conduct scale is chosen for the answer form.

As it is made in the general intellectual capital survey analysis, the reliability of this survey study is tested. The Cronbach's α test is applied separately by using SPSS version 10.0 to the human capital, relation capital, and organizational capital factors in our survey study results. As a consequence of private intellectual capital survey and Cronbach's α test, among all the 21 factors that are defined while preparing the survey, only a factor regarding the relation capital is excluded from the analysis.

Human capital factor description	Organization capital factor description	Relation capital factor description
Encouraging team working and the development of employees	The efficiency of the management information system in the company	Customer satisfaction
Employees' possessing various information for reaching success and by using these information heading for the result	The strategic definition of the company	The results of the customer relation
The importance of the investment to education and consequently to employee	The financial results created by the organization	The effect of the firm to the society and environment
Encouraging risk-taking and innovation of employee	Supporting creativity	Being customer-oriented
The satisfaction of workers in the organization and for this reason their being eager to sharing all the sources		Reporting the information of the firm to the environment
The ideal level of the general skills of employees		Using customer information in whole firm
The leadership abilities of employees		Long-term relation with customers
The effectiveness of the wage system		

Table IV.
Factor descriptions regarding the private intellectual capital survey

The description of this factor is “the firm’s reporting its knowledge to the environment”. We can deduct such a consequence from this; firms avoid giving information and knowledge about themselves to the third parties and shareholders. It can be said that these deductions are in accordance with the realities. Therefore, it is appropriate to exclude this factor as analysis and result from the research. As it is made in the general intellectual capital survey analysis, a factor analysis test is made after the reliability test of this survey study. As a result of the factor analysis only one factor is defined in the human capital, relation capital and organizational capital. The factor of the human capital has 66.912 percent; the factor of the organizational capital has 55.018 percent; and the factor of the relation capital has 70.226 percent initial eigenvalues (cumulative). As a result of the private intellectual capital survey analysis, it is determined that human capital, organizational capital and relation capital are described by one factor each. As it questions the firm’s condition of the filling time of the survey, the private intellectual capital survey’s market/book value rate data should be up-to-date as well. Therefore, on the 2nd of August, data acquired after the closing session are used as the firms’ market/book value.

To prove hypothesis of the model a multiple regression equation is created. For the *H1* and *H2*, an equation can be written as follows:

$$\hat{Y} = \beta_0 + \beta_1 \text{HUMANMEAN} + \beta_2 \text{RELATIONMEAN}$$

where \hat{Y} is the market/book value ratio (estimated); β_0 is the intercept; β_1 is the slope for human capital; HUMANMEAN is human capital items mean; β_2 is the slope for relation capital; RELATIONMEAN is relation capital items mean.

The analysis was made in SPSS version 10.0 program. Adjusted R^2 is 0.90 and F -ratio is 46.505 ($p < 0.0000$), therefore the whole equation is meaningful.

After the hypothesis test of the slope for the human capital (β_1) it is found that $t = 2.136$ ($p = 0.038$; significant at < 0.05). For β_1 the H_0 hypothesis could be rejected. The coefficient of β_1 is 0.766. After the hypothesis test of the slope for the relation capital (β_2) it was found that $t = 2.045$ ($p = 0.046$; significant at < 0.05). For β_2 the H_0 hypothesis could be rejected. The coefficient of β_2 is 0.710. After these tests, a strong positive relation from human capital to market value of Turkish firms and from relation capital to market value of Turkish firms can be described. Then the following equation can be written:

$$\hat{Y} = -6.151 + 0.766 \text{ HUMANMEAN} + 0.710 \text{ RELATIONMEAN}$$

For the $H3a$ and $H3b$ the SPSS version 10.0 program is used for correlation analysis. After analysis the Pearson correlation coefficient between human capital and organizational capital ($H3a$) is $r = 0.721$ (significant at < 0.01), and the Pearson correlation coefficient between relation capital and organizational capital ($H3b$) is $r = 0.758$ (significant at < 0.01). Therefore, it is argued that there is a strong positive relation between organizational capital and human capital; and between organization capital and relation capital.

Conclusion

In this research it is shown that the research model is valuable in the Turkish industry. The main conclusions from this study are that: human capital and relation capital of firms have a positive and strong relationship with market/book value of firms in Turkey; and organizational capital of firms in Turkey has a positive and strong correlation with human and relation capital.

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