

## **Methods for Measuring of Intellectual Capital: An Application of Ceramics Sector Companies Listed in Borsa Istanbul (BIST)**

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### **Abstract**

*The rapid changes in our age have an important position in competitive advantage for businesses. Measuring intellectual capitals of businesses gained great importance in terms of issues such as surviving in both local and global markets, competing with existing and potential competitors. In this study, after a description of the concept for intellectual capital are explained with intellectual capital measurement models, the measured values ceramics enterprises in the Borsa Istanbul (BIST) has been analyzed by comparing them. 2006-2010 periods of financial statements for the enterprises were used in the sample of the study. Market Value / Book Value ratio and Tobin's Q ratio which have similar calculation method have come closer to each other with regard to five years average results and business ranking were the same. However, according to calculation of the value of intangible assets which have long calculation method and quite technical has changed the rank of the businesses. In this context; this method has shown that Kutahya Porcelain INC. is the one company that gives importance to intellectual capital and protects its value.*

**Key Words:** Intellectual capital, Measuring intellectual capital, Ceramics sector, Borsa Istanbul (BIST)

### **1. Introduction**

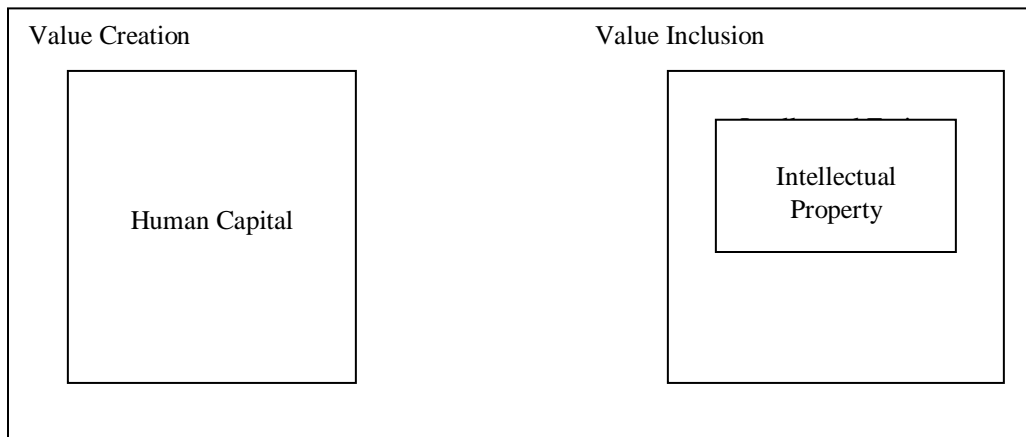
Before defining the concept of intellectual capital terms, intellectual and capital should be separately defined in order to provide a benefit for the further examination of the topic. The word "Intellectual", based on the source and the in western languages, means science, art, and culture one high-level of education, or a term used to express the intellectual part. The word "capital", however, differ according to perspectives. For example, in terms of accounting "the source of all kinds of economic assets", in terms of economics "production tools which are used for production of goods or services", in terms of business administration, "the sum of all tangible and intangible assets which are owned by business with regard to business tools and production goals". On the other hand "in everyday life," means that accumulation of money as a result of past savings.

Rapid change and development in business life for our century have brought these two concepts as a one concept. This change in economic structure and development remained in parallel with the social structure. Concrete (tangible) assets (buildings, machinery, equipment, etc.) which are a common characteristic of industrial society and economy have lost their importance; because instead of these assets, transition to an information society and knowledge economy (mainly the knowledge, skills, and communication assets) has an increasing importance. In general, intellectual capital, which sustains the activities of the entity, can be defined as all intangible assets, such as patents, rights, privileges. Another definition is "intellectual capital, knowledge which is converted to a value" (Şamiloğlu, 2002).

Businesses are the organizations that need to make a profit in order to continue their activities. In this perspective and in a more practical way; intellectual capital can be defined in accordance with perspective of management and employees as convertible information which transforms profit. The main components of intellectual capital and the relationship among them in the light of this definition can be examined with the help of the figure below.

**Figure 1. Intellectual Capital and Main Components**

Intellectual Capital



Source: (Harrison and Sullivan, 2000).

The figure shows the relationship between intellectual capital and main components. Human capital with the implicit knowledge which is difficult to reveal is a source that creates value. People, in other words, enterprise employees, they have the system provide information to resolve this implicit knowledge is made to open by injecting. This decoded information is no longer referred to as intellectual property. Intellectual assets are under the legal protection of the environment by entering the name of the legal sense of ownership of intellectual property is gained. Patents, copyrights, trademarks, trade secrets, intellectual property is an example of each one of them. In addition, the acquisition costs of these elements are shown in the financial statements (Üç, 2005).

## 2. Literature Review

Formation of the knowledge economy and information society, in parallel with the start of becoming a major trend all over the world, is attention to come up again by Thomas Stewart "Brainpower" article in 1991, and this time it gathered a huge attention. On the functioning of an organization's intellectual capital cases predictive understanding of the potential size of the actual interest how the metering of the subject, which improved on the methods to be changed (Edvinsson, 1997). Stewart's book, published in 1997 by the "Intellectual Capital: The New Wealth of Organizations" is regarded as a primary source. With universities and businesses in Europe and the United States in bringing their work published in the volume (Roos, 1997), as well as just viewing this topic published in international journals (Journal Of Intellectual Capital). In the literature, every aspect of intellectual capital has been discussed and organizational manipulations of the subject in the context have increasingly become popular. In this context, intangible and invisible assets of enterprises may create differences, until the financial assets, and even beyond them from time to time are very significant emphasis on organizational functioning and the results (Edvinsson, 1997).

When literature review is made on intellectual capital, especially studies which are related to various sectors on intellectual capital can be seen in foreign sources. However there are not enough studies in this subject for the domestic research in Turkey. When this study is created, there are no investigations conducted on the subject of intellectual capital during the ceramic sector. The data which is needed has been obtained from ceramic companies which are traded on the Borsa Istanbul.

## 3. Definition of Intellectual Capital

There is a need for better definition in order to be able to measure and manage intellectual capital. Some of the definitions of the concept in literature can be seen below. Application of knowledge in economic life put into literature the concept of intellectual capital as a new concept.

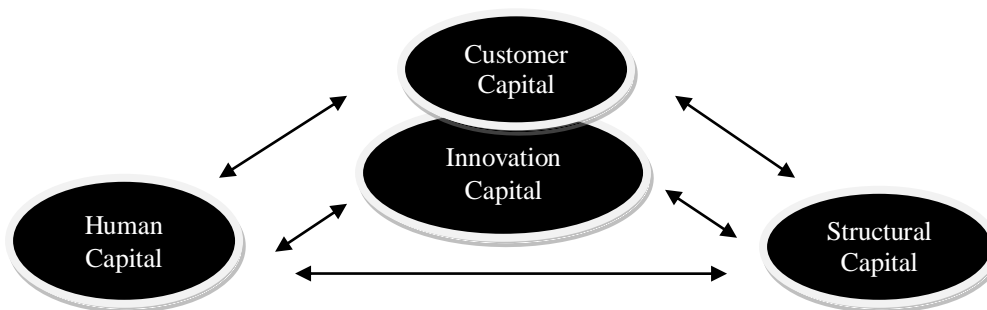
Intellectual capital is composed of the words of "inter" which has expressed Latin relations, "lectio" which has expressed reading and having knowledge and "capital" which has expressed saving and summation. In a nut shell, the knowledge obtained from the management of intellectual capital means that all the networks of relationships (Argüden, 2005). Due to the effect of intellectual capital on the stock market and valuation of the company, the Economic Development Organization has ongoing work in the 1980s and the present day. According to these studies, in order to have better understanding the internal dynamics of an organization should be focused on the intellectual capital (Guthrie, et al, 2001, Bontis, 1999). If intellectual capital is evaluated with regard to its formation and management, and importance and components of business success, when a business purchased other business, definition of traditional goodwill which is the total amount paid over the net assets will have a larger structure. In addition, intellectual capital is used a concept which is broaden than the concept of human capital which is used frequently in the literature (Çıkrıkçı and Daştan, 2002). In other definition that is made by Stewart, the sum of knowledge of all things, which is for members of the organization, that provides an organization converted to a superior organization, competitive advantage, and attributes. (Stewart, 1991).

Intangible assets which can be used to create wealth such as intellectual, material, information data, experience are defined as intellectual capital (Stewart, 1997). It is the value of intangible assets of a business (Guthrie, 2000). The simplest form of intellectual capital is all knowledge than can be transformed to a "value" for organization (Edvinsson and Sullivan, 1996). Intellectual capital, with a simple and a general definition, is the accumulated information that is owned by a business or organization. This has the knowledge to individuals and other individuals whose personal information was difficult to detect and business professionals that can be used within the framework of the possibilities offered by the operating structure consists of an open knowledge (Nonaka and Takeuchi, 1995). Another definition is that the intellectual capital is expressed the entity formed by all of the intangible assets that allows business to continue its operations (Önce, 1999).

#### 4. Components of Intellectual Capital

The elements of intellectual capital are human capital, structural capital and customer capital.

Figure 2: Components of Intellectual Capital



Source: Chen et al. (2004).

##### 4.1. Human Capital

Human capital is the sum of the elements of human attitudes which are the skills, knowledge, creativity, experience, talent, and intuition of business people. In this sense, human capital is not a concept that firms may have the right of ownership. However, businesses can use of knowledge and skills that individuals have (Edvinsson, 1997). The primary objective of human capital is the need to create new products or services, and business process innovation. Managers can improve human capital thanks to employee training, providing increasing levels of job satisfaction and motivation of employees (Mouritsen, 1998).

### 4.2. Structural Capital

One of the tasks of managers is to provide the information taking into enterprise information and to become property of the company. In this way a continuous and constant development of information can be provided. Business culture, risk estimation methods, the methods used to manage the sales force, financial structure, market and customers on the databases, e-mail or tele-conference systems, communication systems, structural capital can be shown as structural capital. Thomas Stewart has defined structural capital as The values of employees that are left to workplace after workers leave work in the evening (Stewart, 1997).

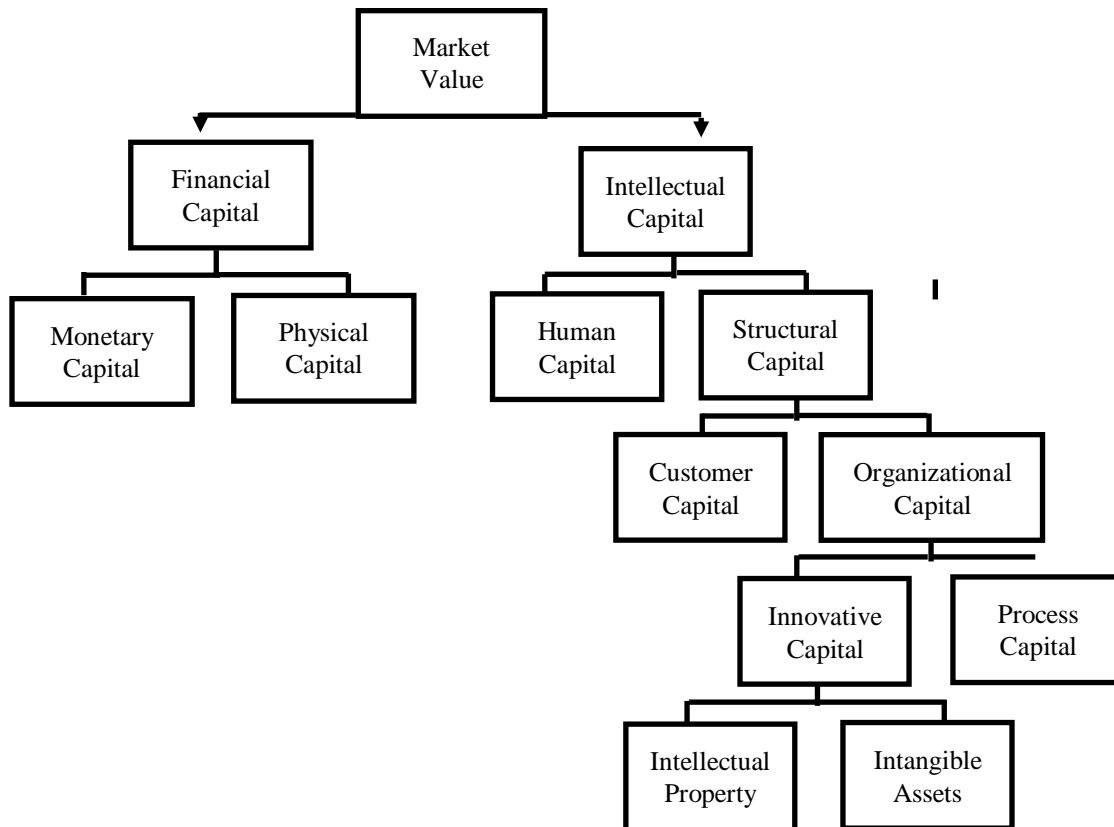
### 4.3. Customer Capital

Customer capital covers business relationship, interaction and intimacy with clients, (Stewart, 1994). Today, it is clear that one of the most important elements for the activities of enterprises is customers. Naturally, this element that directs the activities of enterprises to participate in the entity's core values will be useful. Customer satisfaction can be measured by customer claims that company's goods or services. These demands will turn to business as human and organizational capital, and all the channels are caused by changes in the level of service (Önce, 1999). Structural capital and human capital management more concerned with internal elements, customer capital which is other elements of intellectual capital is closely related to people and organizations around the outside of the entity (Arikoğa, 2003).

### 5. Factors Affecting the Market Value of Property

Determinants that specify the market value of the entities are physical and financial assets with intangible assets from the perspective of the concept that includes intellectual capital.

**Figure 3: Factors Affecting the Market Value of Property**



Source: Aşıkoğlu (2008)

The existence of intellectual capital which is not seen in the financial statements plays an active role in the formation of the market price of the entity. For that reason, the high difference between the book value and the market price of firms can be explained by the presence of intellectual capital. Many countries which are developed and companies operating in these countries devote a large portion of revenues to R & D activities (Aşıkoğlu, 2008).

## **6. Measuring Intellectual Capital**

In the literature, many measurement models have been developed based on the measurement of intellectual capital which has financial origin. In this study, three of them are attributed to the most frequently used and important ones will be included as the market value / book value ratio, and the methods of calculating the value of intangible assets.

### **6.1. Market Value to Book Value Ratio MV/BV**

The most well-known indicator of intellectual capital is the difference between market value and book value. Intellectual capital of a firm is based on the estimate of the difference between the book value and market value (Dzinkowski, 2000). In this method, the positive difference as a result of the market value is higher than the book value of a company is considered as elements of intellectual capital. The realization of the carrying amount of the operation under the market value of the investment in intellectual capital elements can give the impression of being done. Using this method to measure intellectual capital has provided an advantage for easy calculation and simple operations. However, in some ways, a clear presentation of the actual situation can be said to make it difficult for the same rate (Ertuğrul, 2000).

### **6.2. Tobin's Q Ratio**

The method for the evaluation of investment projects put forward by the famous economist James Tobin. However, it has been used extensively in the measurement of intellectual capital (Stewart, 1997). With this method, the total market value of a business relationship between the replacement costs of assets with the help of the name of 'Q' describes the rate. An important innovation of the concept which is called as innovation cost has existed.

This concept has been built on the idea that is similar owned assets for evaluations of alternative roads. In other words, if the renewal or replacement cost of assets is owned by the entity, at least not synchronize the market price of these assets would be better invested in another channel. Q is formulated as Tobin's method which is indicated below.  $Q = \text{Market Value of Business} / \text{Cost of Business Renewal Assets}$ . The ratio must be greater than 1. If the ratio is smaller than 1, it means that business has not given a value to intellectual capital.

### **6.3. Calculating the Value of Intangible Assets**

This method has been developed for the calculation of the fair value for intangible assets of business. Much of the value of intangible assets to calculate the return on tangible assets, and the calculation of this amount is used to determine the share of return on intangible assets. The main element of this method, the essence of the past and future earnings or the sum of potential earnings growth is defined as a firm's performance (Şamiloğlu, 2002).

Intangible value method that is calculated arose from the need to find a value that will be shown a knowledge-based enterprises and banks as collateral. Bank assets, which are shown as collateral, are a serious problem for knowledge-intensive businesses that do not have enough physical assets. The NIC method is the other name of the implemented and developed method which is firstly used by NIC Company in the United States, (Uzay and Savaş, 2003).

## 7. Measurement of Intellectual Capital of Ceramics Sector Companies Quoted on BIST

### 7.1. According to MV/ BV

<b>UŞAK CERAMICS INC.</b>					
<b>ITEMS</b>	<b>2006</b>	<b>2007</b>	<b>2008</b>	<b>2009</b>	<b>2010</b>
Shareholder's Equity	21.833.766	23.172.650	21.306.352	40.519.667	43.589.332
Paid in Capital	14.445.310	14.445.310	14.445.310	14.445.310	14.445.310
Average Equity Value	1,89	1,85	0,50	1,27	2,05
Market Value	27.301.636	26.723.824	7.222.655	18.345.544	29.612.886
Book Value	21.833.766	23.172.650	21.306.352	40.519.667	43.589.332
Market Value / Book Value Rate	1,25	1,15	0,34	0,45	0,68
<b>KÜTAHYA PORCELAIN INC.</b>					
Shareholder's Equity	85.026.648	85.263.783	86.692.903	112.393.006	114.806.933
Paid in Capital	2.592.000	2.592.000	28.512.000	39.916.800	39.916.800
Average Equity Value	1,00	0,82	0,65	2,85	2,55
Market Value	2.592.000	2.125.440	18.532.800	113.762.880	101.787.840
Book Value	85.026.648	85.263.783	86.692.903	112.393.006	114.806.933
Market Value / Book Value Rate	0,03	0,02	0,21	1,01	0,89
<b>EGE CERAMICS INC.</b>					
Shareholder's Equity	70.332.344	77.986.423	120.683.303	124.291.349	142.241.670
Paid in Capital	52.632.000	52.632.000	75.000.000	75.000.000	75.000.000
Average Equity Value	3,32	2,08	0,47	1,04	2,24
Market Value	174.738.240	109.474.560	35.250.000	78.000.000	168.000.000
Book Value	70.332.344	77.986.423	120.683.303	124.291.349	142.241.670
Market Value / Book Value Rate	2,48	1,40	0,29	0,63	1,18

### 7.2. According to Tobin's Q Ratio

<b>UŞAK CERAMICS INC.</b>					
<b>ITEMS</b>	<b>2006</b>	<b>2007</b>	<b>2008</b>	<b>2009</b>	<b>2010</b>
Shareholder's Equity	21.833.766	23.172.650	21.306.352	40.519.667	43.589.332
Paid in Capital	14.445.310	14.445.310	14.445.310	14.445.310	14.445.310
Average Equity Value	1,89	1,85	0,50	1,27	2,05
Market Value	27.301.636	26.723.824	7.222.655	18.345.544	29.612.886
Replacement Cost of Business Assets	24.017.143	25.489.915	23.436.987	44.571.634	47.948.265
Tobin's Q Ratio	1,14	1,05	0,31	0,41	0,62
<b>KÜTAHYA PORCELAIN INC.</b>					
Shareholder's Equity	85.026.648	85.263.783	86.692.903	112.393.006	114.806.933
Paid in Capital	2.592.000	2.592.000	28.512.000	39.916.800	39.916.800
Average Equity Value	1	0,82	0,65	2,85	2,55
Market Value	2.592.000	2.125.440	18.532.800	113.762.880	101.787.840
Replacement Cost of Business Assets	93.529.313	93.790.161	95.362.193	123.632.307	126.287.626
Tobin's Q Ratio	0,03	0,02	0,19	0,92	0,81
<b>EGE CERAMICS INC.</b>					
Shareholder's Equity	70.332.344	77.986.423	120.683.303	124.291.349	142.241.670
Paid in Capital	52.632.000	52.632.000	75.000.000	75.000.000	75.000.000
Average Equity Value	3,32	2,08	0,47	1,04	2,24
Market Value	174.738.240	109.474.560	35.250.000	78.000.000	168.000.000
Replacement Cost of Business Assets	85.785.065	85.785.065	132.751.633	136.720.484	156.465.837
Tobin's Q Ratio	2,26	1,28	0,27	0,57	1,07

### 7.3. According to Calculation of Intangible Assets

The calculation of the financial value of intellectual capital is examined in 7 steps. In the first step, the average pre-tax profits of enterprises need to be calculated.

#### 1. Step

Company	2006	2007	2008	2009	2010	Total Profit	Average Tax Before Profit
Uşak Ceramics INC.	2.082.958	2.082.958	-82.432	587.092	3.037.780	7.708.356	1.541.671
Kütahya Porcelain INC.	2.413.925	464.323	2.113.838	18.400.943	3.000.000	26.393.029	5.278.606
Ege Ceramics INC.	18.217.522	7.113.093	18.866.667	4.873.868	4.873.868	16.211.684	3.242.337

In the second step, the average values of tangible fixed assets for businesses which are implemented by the study are calculated as follows.

#### 2. Step

Company	2006	2007	2008	2009	2010	Total Tangible Assets	Average
Uşak Ceramics INC.	30.657.786	30.810.193	32.090.331	51.977.433	49.705.171	195.240.914	39.048.183
Kütahya Porcelain INC.	38.336.382	35.936.354	32.804.143	41.405.559	41.405.559	189.887.997	37.977.599
Ege Ceramics INC.	90.071.058	85.585.819	83.025.712	79.938.335	79.938.335	418.559.259	83.711.852

In the third step, average profitability of ratios for tangible assets is calculated.

#### 3. Step

Company	Average Net Income	Average Tangible Assets	Profit on Average Tangible Assets %
Uşak Ceramics INC.	1.541.671	39.048.183	3,95
Kütahya Porcelain INC.	5.278.606	37.977.599	13,90
Ege Ceramics INC.	3.242.337	83.711.852	3,87

The fourth step, the profitability of the sector average ratio of tangible fixed assets must be calculated.

#### 4. Step

Company	Average Net Income	Average Tangible Assets	Profit on Average Tangible Assets %
Uşak Ceramics INC.	1.541.671	39.048.183	3,95
Kütahya Porcelain INC.	5.278.606	37.977.599	13,90
Ege Ceramics INC.	3.242.337	83.711.852	3,87
	10.062.614	160.737.634	6,26

In calculating the return on tangible assets; if the profit rate is under the sectoral average, the companies having profit on average tangible assets under sectoral average aren't incorporated in the so-called calculation (Şamiloğlu ve Akgün, 2010: 291). According to 4. Step; it is seen that Kütahya Porcelain INC. is the one company having profit on average tangible assets over sectoral average. So the other two companies aren't incorporated into further calculation.

The fifth step, the excess returns of enterprises need to be calculated. More return the entity's fixed assets amounting to an average rate of return in the sector multiplied by the average of the sum of tangible fixed assets; the entity is calculated by subtracting the average income for the period.

#### 5. Step

Company	Average Tangible Assets	Sector Average Return on Assets %	Normal Yield	Profit for The period	Yield Surplus
Kütahya Porcelain INC.	37.977.599	6,26	2.377.501	5.278.606	2.901.105

In the sixth step, the net excess returns of enterprises need to be calculated. But firstly known that business corporate income tax rate is known as 20 % and tax burden of every businesses have changed for the corporate tax and income tax according to exemptions and discounts of legislation. Therefore tax types are different in accordance with business to business. Income tax and corporation tax paid stoppages taken into consideration as well as the average tax rate of 20 % is adopted. Accordingly, Net excess return of enterprises is calculated by multiplying tax rate and excess return of enterprises (Şamiloğlu and Akgün, 2010).

#### 6. Step

Company	Pre- Tax Return on Surplus	Tax on Excess Return Rate %	Tax on Excess Return	Net Yield Surplus
Kütahya Porcelain INC.	2.901.105	20	580.221	2.320.884

In the last step, the ratio of net yield surplus of business to weighted average cost of capital is calculated and amount of intellectual capital is found. In calculating Weighted Average Cost of Capital (WACC); Capital Assets Pricing Model (CAPM) has been used and for each company's cost of equity; average of five years has been used. For this calculation; firstly the weight of each category of capital is multiplied by the after-tax cost of each category of capital and then two these items are summed up (Aydın 2003):

Weighted Average Cost of Capital = (Percentage of financing that is debt x Cost of debt) + (Percentage of financing that is equity x Cost of equity)  $\implies k_{wacc} = w_i \times k_i + w_e \times k_e$

In determining the cost of equity ( $k_e$ ); this formula has been used:

$$k_e = k_{rf} + \beta (k_m - k_{rf})$$

- $k_{rf}$ : Risk free rate of interest rate
- $k_m$ : The expected return on the overall stock market
- $\beta$ : Beta coefficient

According to this formula; firstly the beta coefficient values of three companies have been calculated. Then the arithmetic mean of net of inflation monthly return of BIST 100 index has been calculated in determining the expected return on the overall stock market. As a risk free rate of interest rate; the reel annual internal borrowing interest rates have been used.

In determining the cost of debt; a common borrowing criteria comprising the companies included in the study has been developed. Short and long term interest rates that banks claim to Central Bank have been regarded as the cost of debt (Yıldır, 2005, Önal ve Karadeniz, 2004).



## 7. Step

Company	Net Yield Surplus	Weighted Average Cost of Capital %	The Amount of Intellectual Capital
Kütahya Porcelain INC.	2.320.884	12,70	294.752

Summary of the results for these three methods are indicated below:

### 7.4. Results of Ceramics Industry Measuring of Intellectual Capital

#### 7.4.1. Results of Market Value to Book Value Ratio Method

Company	2006	2007	2008	2009	2010	Average
Uşak Ceramics INC	1,25	1,15	0,34	0,45	0,68	0,77
Kütahya Porcelain INC.	0,03	0,02	0,21	1,01	0,89	0,43
Ege Ceramics INC.	2,48	1,40	0,29	0,63	1,18	1,19

#### 7.4.2. Tobin's Q Ratio

Company	2006	2007	2008	2009	2010	Average
Uşak Ceramics INC.	1,14	1,05	0,31	0,41	0,62	0,70
Kütahya Porcelain INC.	0,03	0,02	0,19	0,92	0,81	0,39
Ege Ceramics INC.	2,26	1,28	0,27	0,57	1,07	1,09

#### 7.4.3. Results of Calculation of the Value of Intangible Assets

Company	Explanation	I.C. Value
Kütahya Porcelain INC.	I.C. Value	294.752

## 8. Conclusion

Competitiveness began in the highest level with the process of globalization is main agenda for businesses. At the present time one of the different methods of competitive advantage for businesses are process for managing and measuring of intellectual capital. Brought to life in today's global business enterprises within the framework of changing economic conditions, competitive conditions and the basic operating characteristics required to achieve their ambitions to ensure that business continuity and profit objectives in the development of new solutions and new approaches in order to accomplish this measurement as a result of the measurement and management of intellectual assets is a critical requirement.

The data were collected by examining the financial statements of the three companies in the ceramic industry of the BIST. Then these data were analyzed by measuring the three intellectual capitals in the theoretical part of the study. When taking five years average in accordance with market value/ book value method, Ege Ceramics INC. is first with 1,19, Uşak Ceramics INC. is second with 0,77, and Kütahya Porcelain INC. is third with 0,43. The highest value of the analysis is based on the five-year average in accordance with of Tobin's Q ratio is Ege Ceramics INC. 1.09 and the second highest value belongs to Uşak Ceramics INC as 0.70 and Kütahya Porcelain INC is still in last place with 0.39.

According to the method of calculating the value of intangible assets which is the last method, the single positive value of intellectual capital belongs to Kütahya Porcelain A.Ş. Market Value / Book Value ratio and Tobin's Q ratio came close to each other in terms of the method of calculation and businesses methods of ranking the five-year average results have been the same. However, the calculation of the value of intangible assets which is a long calculation and technical method has been changed to the ranking of the companies.

When the intellectual capital values over the years are examined, Uşak Ceramics INC. and Ege Ceramics INC. have fluctuations. On the other hand Kütahya Porcelain has a steady increase in its operations. This situation indicates That Kütahya Porcelain INC. gives importance to intellectual capital and protects this value. In addition this situation shows that Kütahya Porcelain INC. has a positive perception from the side of investors.

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