Comparative Survey of Intellectual Capital in Cement Industry, Pharmaceutical and Food Products Accepted in Tehran Stock Exchange

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Abstract: In this study, a comparative survey of intellectual capital and its components which are the physical, human and structural capital among the companies of cement industry, pharmaceutical and food products accepted in Tehran Stock Exchange has been addressed. For this purpose, in the time interval of 2006 to 2014, 43 companies were selected among the abovementioned industries. ANOVA (Analysis of Variance) test was chosen using SPSS software to analyze the hypotheses of the research. The results of the analysis showed that cement and pharmaceutical companies have a significant difference in their structural capital and the structural capital of the cement industry is more than that of pharmaceutical industry. Pharmaceutical and food industries are significantly different in terms of their Physical capital and the physical capital of pharmaceutical industry is more than that of food industry and ultimately, there is a significant difference between cement and the pharmaceutical industry in terms of their human capital and human capital in the industry Cement is more than that of pharmaceutical industry.

Keywords: Intellectual capital; physical capital; human capital; structural capital; cement industry; pharmaceutical industry; food industry

JEL Classification: C120

1. Introduction

Information development and rapid technological progress in the last decade has revolutionized all aspects of human life and activities caused to move towards a knowledge-based economy and resulted in a change in the paradigm governing the industrial economy. So that nowadays, knowledge- based economy can be seen which its foundation is based on the axis of intangible assets and intellectual capital. In such condition, the intellectual capital of organizations is increasingly considered

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as competitive advantages. In fact, after the agricultural and industrial revolution in which land, capital and labor were considered the main sources of information, the world is witnessing an informative revolution in which the main sources are based on knowledge and information. In the age of knowledge, intellectual capital is an issue of importance and by moving in the third millennium, the intellectual power is more valuable than muscular strength, mechanical strength, or even technical power (Mojtahedzadeh, 2002).

Undoubtedly, the present era can be known as a different era from other periods in varies aspects. In the era of industry, the costs of assets, factories, equipment and raw materials were considered as the main factors of success. But in the current era, the effective use of intellectual capital is usually known as the most effective factor in the success or failure of an institution.

The movement of industrial economy towards the knowledge-based economy and physical and material capitals fading away and the importance of non-material assets, such as human, knowledge, intellectual and social capital are among the most important features of this era which have attracted the attention of researchers more than other characteristics. Knowledge-based economy is an economy in which the production and exploitation of knowledge play a key role in the process of creating value (Nemazi & Ebrahimi, 2009).

Unfortunately, most industries in different countries of the world are using traditional methods of financial accounting that have been created centuries ago for businesses based on manual work and intangible assets. While a knowledge-based business environment requires an approach that involves new intangible organizational assets such as knowledge and competencies of human resources, innovation, relationships with customer, organizational culture, systems, processes, organizational structure etc. Meanwhile, intellectual capital issues have attracted the attention of academic researchers and organizational executives (Ghulichly et al., 2006).

The importance and necessity of the current research is due to the increasing importance of this less-known capital (intellectual capital) in the profitability ratio of companies and their financial performance and consequently, in their success and failure in today's competitive and complex environment. On the other hand, due to the importance of corporate life cycle and its influence on corporate performance, the impact of intellectual capital on earnings per share can be examined and analysis over the life cycle of companies, because most information users should know that the company is at what stage of its life cycle and whether the interest payments or corporate dividend policy is correct or whether it should be in a way that the company does not lose its market value and meanwhile, make the necessary plans for future activities (Chen et al., 2004).

Due to its special importance in the national development process and economic growth, cement industry is of great importance in the field of national economy and macroeconomic policies. According to available predictions, the country's demand for cement will reach about 70 million tons per year by 2021. This high level of domestic consumption encouraged the government to put cement its basket of supportive goods and minimize the imports share of this high consuming domestic product. In recent years, the presence of cement companies in the capital market, in the form of publication shares and investments and the supply of cement products in stock exchanges, has been bolder than before. On the other hand, food industry is known as one of the defensive industries that are less affected by stagnations and economic change, because food is considered as essential and tensionless commodities. Major economic indicators of food industry in the country, according to the existed information, reflects few numbers of food industry units at the beginning of the Islamic revolution and a large part of people's food needs was provided through import and this matter resulted in the outflow of large currency from the country. After the end of the war, food industry units were developed, and many of them, according to the time requirements, rebuilt and refurbished production lines and increased their production. On the other hand, medicine, because of its impact on human health, is one of the most important commodities in today's human trade. Today, the pharmaceutical industry is considered to be one of the world's most important and largest industries. The possession of such industry is known as one of the most important criteria for recognizing the development of countries. Drugs are so important that all governments would prefer to directly control and monitor their production and distribution. The pharmaceutical industry, as one of the strategic industries that plays an important role in the health and security of the community has always been the center of economists and policymakers' attention. The Iranian drug industry has undergone various conditions over the past few decades. Nevertheless, this industry is now considered as one of the most important and strategic industries of the country (Montaseri, 2006).

According to the mentioned topics above, the purpose of the present study is to compare intellectual capital and its components among the three companies, the cement industry, food industry and pharmaceutical industry accepted in Tehran Stock Exchange. In other words, this study aimed to answer this fundamental question that whether the intellectual capital and its components differ significantly between the three industries?

1.2. Research Hypotheses

- There is a significant difference between intellectual capital in cement industry, food industry and pharmaceutical industry;

- There is a significant difference between physical capital in the cement industry, food industry and pharmaceutical industry;

- There is a significant difference between structural capital in cement industry, food industry and pharmaceutical industry;

- There is a significant difference between human capital in the cement industry, food industry and pharmaceutical industry.

1.3. The Conceptual Definition of the Research Variables

Intellectual capital:

Different scholars have defined this concept in various ways (Pablos, 2004) considers intellectual capital to include all the knowledge-based sources that generate value for the organization but do not enter into financial statements. Martinez (2005) defines intellectual capital as the knowledge, information, intellectual property and experience that can be used to create wealth (quoted by Zahedi et al., 2007). Intellectual capital is divided into three categories of human capital, structural capital (organizational), and physical capital. Human capital is the most important asset of an organization and is the source of creativity and innovation. In an organization, the implicit knowledge assets of employees are one of the most vital components that have a significant impact on the performance of the organization. Human capital is also a combination of knowledge, skill, innovation and the ability of individuals to carry out their duties and embody the values, culture and philosophy of the company.

Edwinson and Malone have defined structural capital as hardware, software, databases, organizational structure, corporate monopoly rights, trademarks, and all abilities of the organization that support the productivity of employees. Structural capital is something that stays in the company when employees go to the house at night. Structural capital is divided into several categories: corporate culture, organizational structure, organizational learning, operational process, and information system.

Physical capital, considered to be a bridge and a catalyst in intellectual capital activities, is one of the essential and determinant requirements for the transformation of intellectual capital into market value and consequently, the company's business performance. Physical capital is the main and basic component of intellectual capital which places value in the marketing and communications channels that the company has with its industry leaders. (Zahedi et al., 2007)

1.4. Operational Definition of Variables

Intellectual capital:

In this study, the value added intellectual capital coefficient (VAIC), developed by Public has been used to measure the intellectual capital. This model has five steps as follows:

Step 1: calculate the value added

VA = OUT- IN

VA: value added company;

OUT: Total revenue from sales of goods and services,

IN: Total cost of materials, parts and services purchased

In this model, because of the active role of human resources in the process of creating value, salary and wage costs are not included in the input. Therefore, the cost of staff is not considered as a cost, but as an investment. Value added can be calculated using the information in the annual reports as follows:

VA= OP + EC + D + A

OP: operating profit

EC: Staff costs

D: Amortization

A: Amortization of Intangible Assets.

From the Public viewpoint, the criteria for measuring the intellectual capital of a company is consist of three criteria: Value-added coefficient of employed capital, the value-added coefficient of human capital and the value added coefficient of structural capital.

Second step: Calculating the value-added coefficient of the applied capital

This relationship shows the added value created by the capital used in the company, including the physical and also financial capital.

VACA = VA/CE

VACA: Value-added coefficient of the used capital

CE: Total assets of the company minus its intangible assets

The third Stage: Determining the Value Added coefficient of Human Capital

This stage is the relationship between value added and human capital and shows that how much added value is generated for each Rials spent on employees, According to this model, all staff costs are considered as human capital. As a result, we have:

VAHU = VA/HC

VAHU: The Value Added coefficient produced by Human Capital

HC: The total cost of company's wages.

Fourth Step: Determining the Value added coefficient of Structural Capital

This coefficient reflects the share of structural capital in creating value, which is obtained from the following equation:

STVA = SC/VA

STVA: Value-added factor of structural capital

SC: is the company's structural capital calculated by the following equation:

SC = VA – HC

Fifth Step: Determining the Value-added coefficient of Intellectual Capital

The final step is to calculate the value-added coefficient of intellectual capital obtained from the sum of the above-mentioned coefficients and is a means of measuring intellectual capital in the Palick Model.

VAIC = VACA + VAHU + STVA

VAIC: Value-added coefficient of intellectual capital

2. Statistical Population

The statistical population of this research includes companies accepted in Tehran Stock Exchange between 2006 and 2014. But since the size of the statistical population is large and there are also some heterogeneities and the lack of needed information among the companies accepted in Tehran Stock Exchange resulted in selecting a sample from the statistical population, therefore, the Systematic elimination sampling method was used and all companies with the following features are considered and selected as examples:

• Attending a stock take from 2006 to 2014;

• Their financial year ends by the end of March;

• The company did not change its financial year between 2006 and 2014;

• The company does not have a Long-term operational interruption between 2006 and 2015.

Table 1. Sample selection conditions

Description	Number		
Number of companies in the studied industries	80		
The number of companies in industries that have entered the stock after 2008	13		
The number of companies in the selected industries whose financial year is not at the end of March	22		
Companies whose financial information is incomplete or unavailable	2		
The number of companies studied	43		
industry	Cement	pharmaceutical drugs	Foodstuffs
Number of companies	11	18	14

Based on the items mentioned above, a total of 43 companies were selected as the research sample, 18 companies from the pharmaceutical industry, 11 companies from the cement industry and 14 companies from the food industry except sugar.

3. Research Methodology

This research, in terms of the classification based on how the research information has been gathered, is a comparative study. In terms of the purpose and also according to this fact that this research is in search of achieving a practical goal in order to use it in the decision making process by financial decision makers, therefore, this research is a type of applied research. ANOVA analysis was used to test the research hypotheses.

4. Findings

Initially, the normality of the research variables were examine using the Kolmogorov-Smirnov test and as you can see the results of the test is presented in Table 2, which confirm the normality of variables.

Table 2. The result of the Kolmogorov-Smirnov test for three research variables

	Physical capital	Human Capital	Structural capital
Number	473	473	473
Average	6.38	-12.66	11.61
Standard deviation	1.27	2.42	2.56
Maximum deviation Absolute Value	0.07	0.07	0.11
Positive	0.07	0.07	0.08
Negative	-0.07	-0.04	-0.11
Kolmogorov-Smirnov Z	0.85	1.17	1.19
The significance level	0.45	0.07	0.06

The variance analysis method has been used to answer the research hypotheses. You can see the results in the following.

Table 3. The results of analysis of variance

Variables	Resources	Total second power	Degrees of freedom	Average second power	Test statistic	The significance level
Physical capital	Inter-group	0.34	2	.17	4.05	0.01
	In-group	56.15	1329	0.04	-	-
	Total	56.50	1331	-	-	-
Human Capital	Inter-group	23491.26	2	11745.63	13.09	0.00
	In-group	1192130.24	1329	897.01	-	-
	Total	1215621.5	1331	-	-	-
Structural capital	Inter-group	9.62	2	4.81	3.74	0.02
	In-group	1707.62	1329	1.28	-	-
	Total	1717.25	1331	-	-	-

As you can see the significance level of the analysis of variance test for all variables is obtained less than the critical value of 0.05 which reflects the point that physical, human and structural capital is different for typical companies. We used the Post hoc test to respond more accurately to the above hypothesis. You can see the result of the analysis below.

Table 4. Results of the Post hoc test for the research variables

	I group	J group	The significance level	Standard deviation	Average difference
Physical capital	Cement	Pharmaceutical drugs	0.26	0.10	0.00
	Cement	Foodstuffs	0.16	0.12	0.17
	pharmaceutical drugs	Foodstuffs	-0.09	0.08	0.24
Human Capital	Cement	Pharmaceutical drugs	-0.19	0.018	0.29
	Cement	Foodstuffs	0.023	0.021	0.28
	pharmaceutical drugs	Foodstuffs	0.042	0.015	0.00
Structural capital	Cement	Pharmaceutical drugs	12.94	2.65	0.00
	Cement	Foodstuffs	1.74	0.20	0.38
	pharmaceutical drugs	Foodstuffs	1.79	2.24	0.42

According to the above chart, it is concluded that there is a significant difference between the structural capital of cement and pharmaceutical companies. Due to the difference in average, structural capital for the cement industry is higher than the pharmaceutical industry. There is a significant difference between pharmaceutical and food industries in terms of their physical capital. According to the average difference it can be concluded that physical capital in the pharmaceutical industry is

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more than food industry and ultimately, there is a significant difference between the cement industry and the pharmaceutical industry in terms of their human capital. In accordance with the average difference it can be concluded that human capital in the cement industry is greater than the pharmaceutical industry.

5. Discussion and Conclusion

In today's world, the industrial economy has been left behind and a new, knowledge-based economy has been highlighted, an economy that production and utilization of knowledge plays a main role in the process of creating wealth (Chengwe, 2005). Massive investments in human capital and information and communication technology are the features of a knowledge-based economy and since the human's capacity for knowledge production is unlimited, unlimited resources are provided in a knowledge-based economy. The advent of a knowledge-based economy can result in an increase in the importance of intellectual capitals as an intangible asset and is an important source for creating a competitive advantage for a company (Roseworth, 1997). Intellectual capital is an attempt to effectively use knowledge versus information. From the viewpoint of Rouse and colleagues, the intellectual capital includes all processes and assets that are not usually shown on the balance sheet. And also includes all the intangible assets that are considered in modern methods.

In other words, intellectual capital is the total knowledge of the members of the organization and their application of knowledge (Huang & Yang, 2008). The result of the analysis showed that for structural capital, cement and pharmaceutical companies have a significant difference and the structural capital for the cement industry is greater than the pharmaceutical industry. Pharmaceuticals and food industries are significantly different from each other in terms of their physical capital and physical capital in the pharmaceutical industry is more than foodstuff and ultimately, for the human capital, the cement industry and pharmaceuticals industry are significantly different from each other and human capital in cement industry is more than the pharmaceutical industry. Minoi and Bahrevar (2015) investigated the relationship between intellectual capital and company value based on the theory of corporate life cycle. Research findings indicate that the intellectual capital of companies has a reverse and significant relationship with their value and with an increase in the intellectual capital of companies, their value decreases. In addition, the results confirm that the effect of intellectual capital on the value of companies is significantly different from each other in different life cycle stages and this difference appears in the periods of growth and maturity of the corporate life cycle as well as the periods of growth and decline of companies. The result of this study is consistent with this research. Fallahi, Abbaszadeh (2013) investigated the changes in intellectual capital throughout the life cycle of companies accepted in Tehran Stock Exchange. Palic method was used to measure intellectual capital and the

Anthony and Ramesh (1992) and Black (1998) classification methods were used to classify companies in different stages of the life cycle. The results of this research indicate that the amount of intellectual capital in different periods of life cycle is significantly different from each other; their relationship during this period is consistent with the theory of organizational life cycle. So that the level of intellectual capital increases in the growth period and reaches its peak at maturity and gradually decreases as the company declines. The result of this study is consistent with this research. Kousinidis (2005) has examined the relationship between stock returns and accounting profitability in the life cycle for a sample of companies in Greece. The results of the research show that the size of the company is an important factor in explaining the relationship between profitability and returns. Although the obtained results did not support the hypothesis of the existence of difference among the information content of profitability to explain stock returns according to the stages of the company's lifecycle. The result was not consistent with this study. According to the obtained results, it is recommended that those who invest, financial analysts and other users should pay full attention to different Stock Industries and start investing by taking all the information into account. Considering the investors "goals of investing in companies" stocks, that is acquiring a stable, continuous and ultimately an acceptable return, therefore, it is suggested that actual and potential investors who are aware (ie, investors who invest through Financial analysis), consider the factor of industry in their investment decisions to get the desired return on their investment. Finally, since intellectual capital variables can be measured through different models, it is suggested that these variables be measured by other models than the models used in this study in future research are compare the results with the results of this study.

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