

Effects of Intellectual Capital on Profitability of Corporations Listed at Tehran Stock Exchange

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ABSTRACT

According to the perspective of corporation sources, an intellectual capital is a strategic source enabling corporations to establish competitive advantage and achieve profitability. Thus, the present study undertakes to study effects of intellectual capital on profitability of corporations listed at Tehran Stock Exchange. Time span of the study stretches from 1385 to 1389 and the 102 samples are taken by systematic elimination method. Intellectual capital is the independent variable of the study which is calculated by the difference between market and book values of the population corporations and the adjusted inflation ratio. Inflation ratio is derived from total price index and public services in urban areas released by Central Bank. Profitability of corporations listed at Tehran Stock Exchange is the dependent variable of the study and encompasses four parts: profit before subtracting taxes, net profit to sales, ratio of return on common equity and ration of return on assets. Therefore, the study poses four hypotheses and investigates effects of intellectual capital on each part of profitability. Excel and SPSS 16 are used for analyzing data. Statistical methods are based on correlation coefficient tools (R), determination coefficient, and significance level of t and F. Results of testing hypotheses using linear regression method show a positive and significant relationship between intellectual capital and corporate profitability.

KEYWORDS: intellectual capital, human capital, structural capital, communicative capital.

1. INTRODUCTION

The 21st century is known for and defined by the importance of knowledge and its effects on all aspects of an organization. Knowledge is increasingly employed not only in the big scale of economic scene, but also in management processes of corporations. Accordingly, what was previously held by organizations and societies to be the source of wealth and fortune, underwent major changes leading to fundamental ones in economic and business principles. This gradually intensified differences in book value and market value of corporations and made prominent the importance of considering intangible sources casting effects on establishing added value beyond typical calculations (Canez, 2007, 1). Implementation of an effective strategy of knowledge management and conversion into a knowledge-based organization as a basic requirement for success is when corporations enter the historical era of knowledge-based economy. Therefore, managers need to measure effects of knowledge management efforts on corporate performance. Often, practical criteria of knowledge management focus on measuring knowledge asses or intellectual capital. It is assumed that the output of knowledge management affects the intellectual capital of the organization (Kong, 2007, 2). Thus, corporations willing to preserve and expand their financial performance and wish to employ competitive advantage and effects of intellectual capital (an emerging capital) to enter the knowledge-based field, need to gain newer models of organizational assets. Generally, organizational assets are divided into two groups Teresita, 2008, 2):

1. Tangible assets: physical and financial assets those are included in balance sheet. These assets operate under corporate economic principles and are devalued by use.
2. The second group of assets includes two subcategories:
 - Intangible assets that are supported by law and known as intellectual property, including petitions, brands, franchise, etc., some of which are included in the balance sheet.
 - Other intangible assets include intellectual capital and are under macroeconomic principles. In other words, they are not devalued by use and are not included in the balance sheet.

Emergence of knowledge-based economy is attributed to increasing importance of intellectual capital as an intangible source in stable competitive advantage of corporations. Studies indicate that intellectual capital, including

intangible and nonfinancial assets, determine institution value. Thus, it may be the most effective asset of an institute in promoting value and competitive advantage. Intellectual capital, incorporating people and knowledge, prevails the value chain of many corporations. It can be concluded that managing intellectual capital is an essential task of managers (Jarboe, 2010, 1). Intellectual capital is the raw material of economic achievements and a determinant of organization viability. Intellectual capital - as knowledge, experience, technical judgment, and related software assets - is superior to material and financial capital. It may either contain knowledge (which is turned to intellectual property or intellectual asset of the company) or come as a final result of knowledge transformation process. For accounting purposes of evaluation, we can consider copyright, and brand as intellectual capital. Intellectual capital is preservation of knowledge in an organization in a special time. It is the ability to learn developing integration of knowledge behavior and providing means for understanding changes in knowledge preservation over time. Intellectual capital is a imperative and comparative source (Rostami and Ghalibaf, 2008, 3). Along with developments in market value of knowledge-based organizations, a great deal of interest was directed towards the issue of intellectual capital. A brief review of definitions proposed for intellectual capital reveals a great diversity among researchers, although some similarities are present from different aspects. In fact, it can be concluded that almost all researchers classify intellectual capital into human capital, structural capital, and communicative capital.

Therefore, intellectual capital includes three parts (Rishikesha, 2004, 6):

1. Human capital: includes education, professional knowledge, professional features, etc.
2. Structural capital: includes organizational capital, production capital and innovation capital, such as information systems, trademarks, petitions, and planning assets.
3. Communicative capital: includes market assets, such as customer loyalty, customer-orientedness, customer satisfaction and repetition of business transactions.

Nowadays, wealth production capacity of corporations relies on knowledge. Intellectual capital is used in knowledge-based economy to create and promote organization value, and success of an organization depends on its capacity in managing these rare and valuable sources. The main problem is that despite increasing importance of intangible assets and intellectual capital in companies, most traditional accounting systems fail to measure intellectual capital and to include it their statements. The present study seeks to investigate effect of intellectual capital on profitability in order to quantify it, since profitability criteria are important factors in evaluating the performance of managers and organization progress.

Theoretical Basics

The growing significance of the role of intellectual capital in determining corporation stance in today's comparative economy raises the question that what is intellectual capital and its constituent elements?

Intellectual capital comprises all processes and assets which are not usually included in the, and also includes those intangible assets such as trademarks, petitions, etc., which are the subjects of modern accounting (Roos, 1997, 2). Intellectual capital, knowledge management, and intangible assets are some key factors in determining organization value and arranging future mechanisms for long-term planning of business and technology. High place and significance of intellectual capital mechanism, and its dynamic and abstract conception, has made it difficult for researchers to provide a clear definition for this notion (Jafarnejad and Ghasemi, 2008, 2). Intellectual capital is derived from the difference between market value of a business unit and the cost of replacing its assets. It can be defined as the difference between market value and book value of a company (Samadi, 2010, 2). Intellectual capital is collective mental ability or key knowledge as a unified set derived from knowledge of organization's members and its application, and is mainly a social construct. Since knowledge is usually present in all social contexts, it is created and sustained through relationships between social groups. Intellectual capital is a artifact of social capital; an important capability and asset of an organization that helps in creation and distribution of knowledge in the organization which, compared to other organizations, brings about stable competitive advantage (Editorial, 2009, 2).

As mentioned earlier, there is no clear-cut definition for intellectual capital and most definitions mainly contain knowledge, skill, know-how, experience, intangible assets, information, processes and value-creation. By and large, the distinction between human capital, structural capital, and communicative capital is widely accepted. In fact, the prevailing general definition, which has gained academic approval, includes three major parts of human capital, structural capital, and communicative capital.

Human Capital

Human capital is an important knowledge or intellectual asset in an organization. These assets comprise the sources of creativity and implicit knowledge of people in an organization, and are of vital factors affecting any

organization. In fact, human capital indicates individual contribution of an organization represented through its member staffs (Teresita, 2008, 3). Human capital implies people's knowledge in an organization. It can be classified into some subcategories like staff competency, communicative values and capabilities (Canez, 2007, 3). Human capital, as the major element of intellectual capital, refers to capabilities, skills and expertise of member staffs of an organization (Malcom, 2002, 3). Human capital is the ability to possess thought and reflection. The primary purpose of human capital is innovation in goods and services and also optimization of business processes (Moritsen, 2006, 2). Main criteria of human capital are professional competence of key staff, education, experience, number of organization members with related prior background, and exact distribution of responsibilities in relation to customers (Radov, 2002, 3). Chen et al. discuss that human capital, as the basis of intellectual capital, refers to factors like knowledge, skill and staff's attitude leading to better performance of the organization (Chen, 2004, 2). Information from human capital yield significant profits. Based on this information, human capital may be assigned in the organization more effectively. In addition, it facilitates a comprehensive collection of information for investors or potential investors. Despite growing importance of human capital, the majority of organizations still follows traditional methods and report the money spent for human resources as expenditure not as investment. Therefore, a major consequence of reporting procedures of traditional management is that companies may be interested in reducing investment in the field of education and development of human resources (Smith, 2007, 4).

Structural Capital

Structural capital consists of the philosophy and systems facilitating organization capability. In other words, structural capital is a supporting infrastructure for empowerment of human capital to achieve performance purposes (Hsu, 2008, 4). Some scholars classify structural capital into organizational capital, processing capital and innovation capital containing intellectual assets of an organization such as petition, intellectual property, trademark and performance capabilities (Canez, 2007, 4). Bontis argues that structural capital structural capital contains procedures, mechanisms, typical daily routines, and anything for the organization that is more valuable than its basic material. If an organization has weak procedures and systems for registering goods, intellectual capital will not fully and potentially developed. Thus, structural capital is described by exclusive right of a brand and all capabilities of an organization, supporting staff functionality (Bontis, 2005, 5). Structural capital includes capacities for understanding market needs and issues ranging from petition to institutionalized knowledge in structure, royalty, processes and culture of an organization (Malcom, 2002, 4). Structural capital is knowledge retained in the organization at the end of each working day, which belongs to the whole organization and renewable and can be shared in the organization (Moritsen, 2006, 4). This kind of capital is created by means of competitive advantage of an organization plus capabilities of its members and includes issues like reputation, experience, products and services or their producing methods (Radov, 2002, 4). Youndth defines structural capital (organizational) as institutionalized knowledge of an organization which is saved in databases and instructions and is usually called structural capital. Nevertheless, he prefers to use the term organizational capital because he believes that this word explicitly and clearly states knowledge as belonging to the organization. Structural capital (organizational) includes all nonhuman resources consisting databases, organizational charts, executive instructions of processes, strategies, executive programs, and everything for the organization that is more valuable than its material value (Youndth, 2000, 5).

Communicative Capital

The importance of customer capital lies in its role as a key element of intellectual capital. In general, customer capital, acting as a medium in the process of intellectual capital, is the major determinant in transforming intellectual capital into market value and, consequently, business performance of the organization. Without customer capital, market value or business performance can't be realized. Accordingly, growth of customer capital depends on supporting human capital and structural capital (Chen, 2004, 5). Knowledge inherent in the relationships of an organization in its interactions with the environment includes customers, suppliers, and academic associations. Customer capital is an important element of a communicative capital since it guarantees success of an organization. Customer capital refers to current value of organization's relations with its customers and the potential value of this relationship in the future. Thus, the necessity of customer capital is in knowledge inherent in marketing channels and customer relations, through which an organization grows and develops. Communicative capital represents potential strength of an organization and leads to external assets of the organization (Pablo, 2008, 5).

REVIEW OF LITERATURE

The literature contains numerous articles providing discussions about concept, nature, components, measuring criteria and methods, reporting intellectual capital and its effects on better business performance of companies and

organizations. In 2007, Chang used intellectual value-added coefficient and adjusted intellectual value-added coefficient to study effects of intellectual capital on profitability and market value in IT technology in Taiwan during 2001-2005. He adjusted Pallic intellectual value-added coefficient by inclusion of research and development expenditure, as two separate dependent variables, in multiple linear regression model. His results showed that intellectual capital had a significant relationship with profitability and market value in that industry (Chang, 2007, 1). Also, Tan et al. used Pallic intellectual value-added coefficient, as the criterion for measuring intellectual capital, to study the relationship between intellectual capital and financial return of 150 companies listed at Singapore Stock Exchange from 2000 to 2002. In this study, ratio return on common equity, EPS and annual return of shares were taken as financial return index. Results of the study indicated a significant positive relationship between intellectual capital and current/future performance of the companies (Tan, 2007, 16). Tai and Chen adopted a new method, bilateral phase approach, to investigate intellectual capital. The study evaluates a new model of intellectual capital based on calculating psychological variables. The authors could measure intellectual capital of organizations by means of double phase model (Tai & Chen, 2009, 1). Lu et al. conducted a study on effects of intellectual capital on performance of retailer companies and concluded that intellectual capital not only represents true value of these companies, but also creates competitive advantages among them (Lu & Wang, 2010, 8).

Since intellectual capital is not well known in Iran, it has not received due consideration and is not studied carefully in the country. In 2003, Ali-Asghar Anvari Rostami and Mohammadreza Rostami investigated models and methods for valuation of intellectual capital in corporations. In this study, they defined intellectual capital, determined its components in companies, and examined different models and methods for valuation (Anvari Rostami & Rostami, 2003, 21). In 2005, Hassan Seraji and Anvari Rostami examined the relationship between intellectual capital and market value of corporate listed at Tehran Stock Exchange and found a high correlation between them (Seraji & Anvari Rostami, 2005, 8). In 2006, Behrouz Ghelichly and Asghar Moshabbaki conducted a study on two car-manufacturing companies in Iran. They asserted the role of social capital in establishing intellectual capital, and concluded that social capital, as a major capability and asset of an organization, may help companies create and distribute knowledge in their intellectual capital and bring about competitive advantage, as against other companies (Ghelichly & Moshabbaki, 2006, 17). In 2008, Behrouz Dorri Nokourani, Bahram Salavati Sarcheshmeh and Masoume Maddah employed localized model of ARC to manage and report intellectual capital of Jahad Daneshgahi Research Centers. They used a questionnaire to collect field information and used library sources to collect theoretical sources (Nokourani, Sarcheshmeh and Maddah, 2008, 1). Based on case studies of companies at Science and Technology Park of Tehran University in terms of intellectual capital mechanism, Jafarnejad and Ghasemi proposed a model for achieving technology. The study aimed at recognizing and determining the role of intellectual capital mechanism in determining the mechanism of achieving technology. Results of their study indicate a relationship between intellectual capital and technology achievement mechanism, a significant distance between current and optimal mechanism for achieving technology, and lack of comprehensive approach from managers of these companies towards communicative and human capital (Jafarnejad and Ghasemi, 2008, 15). Rostami and Ghalibaf arrived at final value of intellectual capital through the process of allocating facilities to economic institutes. In addition to revising valuation methods of intellectual capital and examining credit risk management, they proposed the pattern for evaluating intellectual capital of economic institutes in allocating credit facilities (Rostami and Ghalibaf, 2009, 14). In 2010, Abbas Samadi and Shobeir Motiei examined the relationship between intellectual capital and performance criteria of companies listed at Tehran Stock Exchange. Results of their study showed a significant relationship between intellectual capital and operative cash flow (Samadi, 2010, 11). Mohammad Namazi and Shahla Ebrahimi examined effects of intellectual capital on current and future performance of 120 sample companies listed at Tehran Stock Exchange from 2004 to 2006. They found a significant positive relationship between intellectual capital and current and future performance, disregarding firm size, debt structure and past financial performance (Namazi & Ebrahimi, 2010, 19).

Hypotheses

Based on the literature and theoretical basics proposed for determining effects of intellectual capital on profitability of companies listed at Tehran Stock Exchange, the following hypotheses are devised and tested in the present study.

Main hypothesis: intellectual capital affects profitability of companies.

Subsidiary hypothesis 1: intellectual capital affects

Subsidiary hypothesis 2: intellectual capital affects net profit to sales of the company.

Subsidiary hypothesis 3: intellectual capital affects ratio of return on common equity.

Subsidiary hypothesis 4: intellectual capital affects ratio of return on total assets.

Time Span and Population

The study is conducted in five years stretching from 2006 to 2010. Sample population is selected, by systematic elimination method, from companies listed at Tehran Stock Exchange. Due to large number of population and their heterogeneity, companies satisfying the following criteria are selected:

1. Companies whose financial year ends in Esfand.
2. Companies with stable financial period between 2006 to 2010.
3. Companies that are not considered as financial and credit investing institutes.
4. Their equity is not negative.
5. Companies that did not face detriment during the period under study.

Considering the above limitations, only 102 companies satisfied the requirements. Therefore, all these companies were taken as sample population to be evaluated.

Methodology and Definition of Operating Variables

The present study falls in the category of correlative studies since it seeks to determine effects of intergroup information in a population, i.e. intellectual capital and profitability. On the other hand, it is a post-event study and relies on analyzing past information (companies' statements). In this study, intellectual capital is taken as independent variable which is derived from the difference between market value and book value of the company. A review of quantitative valuation methods revealed that the following method is the most appropriate one for the present study since it has intellectual capital as its independent variable which is calculated from the difference between market value and book value of population samples adjusted by inflation ratio.

$$IC_t = \frac{MV_t - BV_t}{1 + I_{nft}}$$

MV, BV= market value and book value

I_{nft}= inflation ratio in the period t

Market value is derived from stock number multiplied at final price.

Profitability is the dependent variable of companies listed at Tehran Stock Exchange and includes profitability before tax, net profitability to sales, rate of equity, and rate of returns, all of which are equally important in evaluating performance of management as regards profitability. Profitability before tax is available and doesn't need to be calculated, but the other three factors should be calculated. Net profit to sales is derived from net profit divided by net sales. Rate of equity (ROE) and rate of returns (ROA) are calculated as:

$$ROE = \frac{\text{operating net profit}}{\text{average equity}} \qquad ROA = \frac{\text{operating net profit}}{\text{average assets}}$$

ROE explains effective use of typical equity and represents profit per Rial of equity.

ROA explains effective use of assets and represents profitability per Rial of invested money in the company.

Data Analysis Method

Data analysis method is cross-sectional and is done annually. In this study, a linear regression method is used for testing hypotheses. Descriptive statistics methods such as mean, median, variance, standard deviation, along with Excel and SPSS 16, are used for data analysis and test through the following tools:

- Correlation coefficient (R)
- Determination correlation (R²)
- Significance level at t and F

Results of Testing Hypotheses

Hypothesis 1 states that intellectual capital affects profit before tax subtraction of companies listed at Tehran Stock Exchange. The null hypothesis and the opposite hypothesis are:

H₀= intellectual capital has no effect on profit before tax.

H₁= intellectual capital affects profit before tax.

Based on hypothesis 1, effects of intellectual capital on profit before tax were studied using intellectual capital valuation method. Results are given in Table 1.

Table 1.

variables	coefficients	t	Sig.	F	Sig.	Adjusted R ²	D-W
Fixed value	-5/455	-6/225	0/000	462/542	0/000	0/477	1/870
IC	0/821	21/507	0/000	EBIT= -5/455+(0/821)IC			

The adjusted R² coefficient indicates that the independent variable (intellectual capital) explains 47.7% of changes in the dependent variable (profit before tax). Considering significant level of each variable's coefficient and comparing them with error level (5%), significance with 95% reliability was affirmed. F statistics and the related significance level and its comparison with error level (5%) indicate significance of regression model in 95% reliability. Durbin-Watson statistics calculated for 1/5 and 2/5 showed no correlation in error components of regression model. Therefore, H₀ is rejected while H₁ is accepted.

Hypothesis 2 states that intellectual capital affects net profit to sales in companies listed at Tehran Stock Exchange. The null hypothesis and the opposite hypothesis are:

H₀= intellectual capital has no effect on net profit to sales.

H₁= intellectual capital affects net profit to sales.

Based on hypothesis 2, effects of intellectual capital on net profit to sales were studied using intellectual capital valuation method. Results are given in Table 2.

Table 2.

Variables	coefficients	t	Sig.	F	Sig.	Adjusted R ²	D-W
Fixed value	-27/340	-73/246	0/000	93/019	0/000	0/153	1/760
IC	0/833	9/6546	0/000	E/S= -27/340+(0/833)IC			

The adjusted R² coefficient indicates that the independent variable (intellectual capital) explains 15.3% of changes in the dependent variable (net profit to sales). Considering significant level of each variable's coefficient and comparing them with error level (5%), significance with 95% reliability was affirmed. F statistics and the related significance level and its comparison with error level (5%) indicate significance of regression model in 95% reliability. Durbin-Watson statistics calculated for 1/5 and 2/5 showed no correlation in error components of regression model. Therefore, H₀ is rejected while H₁ is accepted.

Hypothesis 3 states that intellectual capital affects ratio of return on common equity of companies listed at Tehran Stock Exchange. The null hypothesis and the opposite hypothesis are:

H₀= intellectual capital has no effect on ratio of return on common equity.

H₁= intellectual capital affects ratio of return on common equity.

Based on hypothesis 3, effects of intellectual capital on ratio of return on common equity were studied using intellectual capital valuation method. Results are given in Table3.

Table 3.

variables	coefficients	t	Sig.	F	Sig.	Adjusted R ²	D-W
Fixed value	-25/294	-98/594	0/000	38/827	0/000	0/069	1/792
IC	0/566	6/231	0/000	ROE= -25/294+(0/566)IC			

The adjusted R² coefficient indicates that the independent variable (intellectual capital) explains 7% of changes in the dependent variable (ratio of return on common equity). Considering significant level of each variable's coefficient and comparing them with error level (5%), significance with 95% reliability was affirmed. F statistics and the related significance level and its comparison with error level (5%) indicate significance of regression model in 95% reliability. Durbin-Watson statistics calculated for 1/5 and 2/5 showed no correlation in error components of regression model. Therefore, H₀ is rejected while H₁ is accepted.

Hypothesis 4 states that intellectual capital affects ratio of return on assets of companies listed at Tehran Stock Exchange. The null hypothesis and the opposite hypothesis are:

H₀= intellectual capital has no effect on ratio of return on assets.

H₁= intellectual capital affects ratio of return on assets.

Based on hypothesis 3, effects of intellectual capital on ratio of return on assets were studied using intellectual capital valuation method. Results are given in Table4.

variables	coefficients	t	Sig.	F	Sig.	Adjusted R ²	D-W
Fixed value	-24/980	-81/012	0/000	12/014	0/001	0/021	1/670
IC	0/252	3/466	0/000	ROA= -24/980+(0/252)IC			

The adjusted R² coefficient indicates that the independent variable (intellectual capital) explains 2.1% of changes in the dependent variable (ratio of return on assets). Considering significant level of each variable's coefficient and comparing them with error level (5%), significance with 95% reliability was affirmed. F statistics and the related significance level and its comparison with error level (5%) indicate insignificance of regression

model in 95% reliability. Durbin-Watson statistics calculated for 1/5 and 2/5 showed no correlation in error components of regression model. Therefore, H_0 is rejected while H_1 is accepted.

Conclusion

Hypothesis 1, examining effects of intellectual capital on profit before tax, signifies a strong bond between them. In other words, there is a significant and positive relationship between intellectual capital and profit before tax and any increase in intellectual capital leads to increase profit before tax. In fact, intellectual capital positively affects profit before tax. Hypothesis 2, examining effects of intellectual capital on net profit to sales, signifies a strong bond between them. In other words, there is a significant and positive relationship between intellectual capital and net profit to sales and any increase in intellectual capital leads to increase net profit to sales. In fact, intellectual capital positively affects net profit to sales. Results of testing hypothesis 3, which examines effects of intellectual capital on ratio return on common equity, indicate a weak relationship between the two. In other words, there is a direct relationship between them and increasing intellectual capital increases ratio of return on common equity. In fact, intellectual capital has positive effects on the ration of return on common equity. Results of testing hypothesis 4, which examines effects of intellectual capital on ratio return on assets, indicate a weak relationship between the two. In other words, there is a direct relationship between them and increasing intellectual capital increases ratio of return on common equity. In fact, intellectual capital has positive effects on the ration of return on common equity. A review of domestic studies and those conducted abroad shows that results of our study are in accordance with their findings. In a study on intellectual capital and business performance of service and production industries in Malaysia, Bontis et al. found that intellectual capital is up to 20-30% effective on the performance of institutions observed. Tan et al (2007) also found that intellectual capital affects financial performance of companies. Samadi and Motiei showed in their study, evaluating relationship between intellectual capital and performance criteria of companies listed at Tehran Stock Exchange, that there is a significant relationship between the two. Namazi and Ebrahimi affirm these results. It was expected to achieve these in today's knowledge-based economy which is rapidly moving towards integration and globalization.

Suggestion for further studies

It is suggested to researchers to:

1. Use intangible calculated methods and the statement of human resources to measure intellectual capital.
2. Evaluate effects of intellectual capital on financial performance, using human resources accounting and finding costs of human resources.
3. Evaluate the relationship between intellectual capital and nonfinancial performance, such as consents of customers and the staff.
4. Use intellectual value-added coefficient to examine effects of intellectual capital on economic value added.

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