The Effect of Intellectual Capital on Cost of Finance and Firm Value

Mohsen IRANMAHD[1]
Mahmoud MOEINADDIN[2]
Nasim SHAHMORADI[3]
Forough HEYRANI[4]

[1,2,3,4]*Islamic Azad University, Yazd,* [1]*E-mail:* M.Iranmahd@yahoo.com
(Corresponding author)

Abstract	*In today's knowledge-based industry, the role of intellectual capitals in creating value for the business units is more effective than financial capitals. The accounting system plays a crucial role in finding appropriate strategies for achieving suitable methods of evaluating intellectual capitals. One of the most significant shortcomings of traditional accounting systems is that it doesn't reflect the intellectual capital value in financial reports of business units. Collecting the data from 84 firms, this study examines the relationship between intellectual capital and financing costs, and the value of manufacturing companies listed in Tehran Stock Exchange for an eight-year period. In order to measure intellectual capital, the value-added of intellectual capital coefficient, value-added of intellectual capital and value added of capital applied were used the calculation of which were performed through Palic's method which is one of the most practical methods of calculating intellectual capital. In order to analyze the data, Pearson correlation, univariate and multivariate regressions, and Z Wang test were also performed. Results showed that the value added of capital applied, value added of intellectual capital, and the value added of intellectual capital coefficient negatively influenced weighted average cost of capital, yet they had no effect on enterprise value.*
Key words	Value added of intellectual capital, value added of intellectual capital coefficient, value added of capital applied, weighted average cost of capital, firm value, financing costs

1. Introduction

Intellectual capital that has been theoretically raised in the last few years throughout the world is regarded as one of the most value-creating resources in entrepreneurial growth of firms. Hence, today, the need to develop and manage intellectual capital has become a serious obligation in the national level and in the business arena in such a way that the emergence of knowledge-based economy can be observed.

Measuring intellectual capital is important in two respects: first, intra-organizational aspect which seeks to allocate better resources that are in line with the organization's efficiency and cost minimalization. Second, extra-organizational aspect that aims at making available the organization's existing and potential investment information in order to predict future growth of and plan long term perspectives. One of the biggest problems of traditional accounting systems is their inability to measure the firms' intellectual capital. Therefore, the tendency to consider the real value of intangible and intellectual assets in the financial statements of companies has increased more than ever before. Since the investors' intent to sell and buy the firms' securities, the market value of them must be determined in order to specify the firm's financial value. Companies should also seek to maximize shareholders' wealth; this way the securities of shareholders can attract investors. Thus, they should set their goals in a way that increase investors demand to buy shares and other securities of the company. This demand will increase in the market price of its securities. One way of increasing shareholders' wealth is to raise the value of company's common stock. It is therefore important that managers be able to consider those variables or factors that are taken into account by investors when

determining the value of the securities[1]. Capital expenditure is treated as costs of corporate financing. To maximize shareholders' wealth and develop business activities, companies need funds that are costly. The impact of financing costs on financial structure is clear though. This capital cost is estimated through calculation of the cost of various sources of financing and the weight of each of them in the capital structure. Meanwhile, the cost of each component of the capital structure is determined by assessing the corresponding resources. Considering the importance of the mentioned issues in decision making of users as well as the importance of intellectual capital, it is aimed at examining the relationship between these two. The purpose of this study is to check whether or not a relationship exists between intellectual capitals, cost of capital and firm value; and in case such a relationship exists, and how strong the correlation is.

2. Theoretical foundations of the research

2.1. Definitions of intellectual capital

• The intellectual capital literature implies the intangible value and nature of this resource; the following is the outline of some definitions of various perspectives.

• Intellectual capital is composed of four main components: market assets, human assets and intellectual property assets and infrastructure assets (Brooking, 1996).

• Intellectual capital is a combination of an intellectual component, such as human capital, and a non-intellectual component, such as structural capital (*Roos et al.,* 1997).

• Any intellectual element – such as knowledge, information, intellectual property and experience - that could be used to create wealth (Stewart, 1997).

• It is a concept that can be used for classifying all intangible resources of organization and understanding the relationship among them (Bentis *et al.*, 1999).

• Intangible assets include human capital (such as skills, talents, and knowledge), information capital (such as databases, information systems, and technology infrastructure), and organizational capital (such as culture, leadership style, and ability to share knowledge) (Kaplan & Norton, 2004).

2.2. Components of intellectual capital

Reviewing the Intellectual capital literature suggests that in most models three cases are the key factors: human capital, structural capital, and customer capital (Chen et al., 2004).

a) Human capital

This includes individual capabilities, competencies, talents, communications, knowledge and experience of staff and managers (Ja'fari, 2006). Human capital is established and used when the employee devote much of their time and talent to the activities that lead to innovation. Human capital can grow in two ways: when the organization mostly uses the knowledge of individuals or when individuals are useful for the organization beyond the level of their knowledge (Stewart, 1997).

b) Structural capital

It is the knowledge that exists in the organization. This asset belongs to the whole company and it can be reproduced and traded with others. Capital structure includes technologies, inventions, innovations, publications and business processes. (Stewart 1997).

Establishing a knowledge bank enables the reuse of knowledge. Capital structure of an organization should make some plans for creating intellectual capital assets; for instance, it should help staff understand where they should look for knowledge or who has the best skills. What that should be used as the only guide is the knowledge that is directly related to the organization's core strategies. This knowledge should lead to better performance results (Brown, 2002).

c) Customer capital (relational capital)

This capital represents the value of current and ongoing relationships with individuals or organizations that provide them with services. Customer capital indicators include market share, customers' maintenance,

---

[1] Raymond P. Neveu (2000)

and profit gained from each client. The worst-managed capital among all intangible assets is the customer capital. Many businesses have no idea who their customers are (Stewart 1997).

In general customer capital, which plays the role of intervening bridge in the process of intellectual capital, is the main determinant in the transformation of intellectual capital to market value and the organization's business performance (Qelichlee, 2005).

3. Research background

In his study, Qelichlee (2006) examined the role of social capital in creating intellectual capital in Iranian automobile companies and concluded that there is a significant positive relationship between social capital and intellectual capital. Pew tan *et al.* (2007) investigated the relationship between intellectual capital and companies' performance and stated that there is a positive correlation between intellectual capital and companies' efficiency. They also found the positive relationship between the increase in intellectual capital and firms' future returns. Chi-Wang (2008) investigated the relationship between intellectual capital and market value in the electronics industry of United States and concluded that there is a positive relationship between intellectual capital and market value. In a study entitled "intellectual capital performance" which was carried out in Pakistan, Makki et al. (2008) found that chemical, oil, gas, and cement sectors enjoy high intellectual capital performance, the banking sector has average intellectual capital performance, and the public sectors have low performance. Nazari *et al.* (2009) conducted a study entitled "investigating organizational characteristics and intellectual capital in Canada and the Middle East" to examine the relationship between organizational characteristics (culture, climate, and other features) and intellectual capital management in Canada, Iran, and Lebanon. Results indicated the differences in the relationship between intellectual capital and organizational characteristics of the three countries. Nik Mohammad (2009) examined the relationship between intellectual capital and financial performance of companies in Malaysia analyzed and concluded that intellectual capital has the greatest impact on the performance of banking institutions when compared with the4 performance of credit and insurance institutions. In his study entitled "disclosure of intellectual capital and financial costs", Orens (2009) studied the role of intellectual capital in the disclosure of economic interest in four countries Belgium, France, Germany, and the Netherlands and concluded that intellectual capital better reveals economic interest. Ting and Lean (2009) studied about the performance of intellectual capital in financial institutions to evaluate intellectual capital performance and its relationship with financial performance; they came to the conclusion that a positive relationship (71.6%) exists between the added value of intellectual capital and equity returns. Sayyadian (2009) investigated the intellectual capital of one of Iran's banks and proposed a specific method reporting the results; she concluded that structural capital gaining 39% was taken into account by administrators more than the other components of intellectual capital; human capital with 32% and relational capital with 29% were respectively rated in the next rows. Shahriari (2009) examined the impact of the components of intellectual capital and organizational performance in banks exports did conclude that there are significant relationships between the components of intellectual capital on organizational performance in Saderat Banks and stated that there is a significant relationship between the components of intellectual capital and organizational performance. Sharabati *et al.* (2010) studied the relationship between intellectual capital and business performance in the pharmaceutical sector in Jordan and suggested that measuring intellectual capital is the primary focus of senior executives of pharmaceutical companies. In an investigation, Kamukama *et al.* (2010) examined the interplay between intellectual capital elements and how they are combined and concluded that there is no interplay between intellectual capital elements and also found that the effect of human capital on performance is dependent upon any of structural or relational capital. In a study about the effect of intellectual capital on the performance of pharmaceutical companies in Jordan, Azizi (2010) found a direct relationship between the components of intellectual capital and company's performance. Joshi *et al.* (2010) assessed the intellectual capital performance and the relationship between its components in the Australian banking sector. They concluded that labor costs and value added of labor are significantly correlated with the value added of intellectual capital and that productivity of human capital is higher than productivity of structural capital. The effect of bank size in terms of total assets, number of employees, and shareholders' equity on the performance of intellectual capital was non or poor. In an investigation by Esmaeel Zade *et al.* (2010), the relationship between intellectual capital and some indicators of assessing the performance of the listed

companies in Iran Stock Exchange was tested and it was concluded that a direct relationship exists between intellectual capital and profit before tax, and also between operating cash flows and value added; the correlation between these indices and intellectual capital was strong. In another study, Mojtahed Zade *et al.* (2010) examined the relationship between intellectual capital and performance of insurance companies tested. Results indicated that human capital, customer capital, and structural capital, when independently tested, were positively correlated with firm performance. But when the effects of these three variables were simultaneously investigated, only human capital and structural capital significantly affected the performance. Hemmati *et al.* (2010) investigated the relationship among intellectual capital, market value, and financial performance of the companies in non-financial firms listed in Tehran Stock Exchange. Using value added coefficient of intellectual capital, Maditinos *et al.* (2011) examined the impact of intellectual capital on market value and financial performance of companies in Greece and concluded that a positive significant relationship exists among intellectual capital, financial returns of intellectual capital, future financial returns. Zamani (2011) examined the relationship between intellectual capital, financial performance, and the value of listed companies in Tehran Stock Exchange and stated that added value coefficient of intellectual capital, intellectual capital, and added value of capital employed significantly correlated with financial performance, economic performance, and stock market performance. Hemmati and Zamani (2011) examined the relationship between intellectual capital, value added, and cumulative abnormal returns in the listed companies in Tehran Stock Exchange and came to the conclusion that as firms' intellectual capital increases, value added of the capital also increases, while their cumulative abnormal returns decreases. Sinaee *et al.* (2011) examined to find out whether innovation capital and customer capital are correlated with financial performance as well as the interactive relationship of the two with financial performance in manufacturing companies. They suggested that there is a significant relationship between innovation capital and customer capital, and there is no difference between high-tech and low-tech companies regarding the intensity of the relationship between their innovation capital and firm performance. Martin *et al.* (2012) studied the internal complexity of companies and concluded, after analyzing the relationship between human capital and the innovation of developed product innovation, that innovation culture plays a role in a knowledge-based model of product innovation and that the capability of a company to be innovative is closely related to institutional knowledge or intellectual assets of the company and its ability to expand these assets.

4. Methodology of research

This applied research used a descriptive design to examine the correlation between variables. Since the dependent variables are continuous, regression method was used to investigate the effect of independent variables on them. Besides testing primary hypotheses, some secondary hypotheses were also proposed tested using multiple regressions.

4.1. Research hypotheses
The two hypotheses and six sub-hypotheses of the study are as follows:
H_1: Intellectual capital affects firm's cost of capital.
H_{1a}: Value added of capital applied (VACA) affects weighted average cost capital (WACC).
H_{1b}: Value Added Intellectual capital coefficient (VAIN) affects weighted average cost of capital (WACC).
H_{1c}: Value added intellectual coefficient (VAIC) affects weighted average cost of capital (WACC).
H_2: Intellectual capital affects firm's value.
H_{2a}: Value added of capital applied (VACA) affects firm value.
H_{2b}: Value added intellectual capital coefficient (VAIN) affects firm value.
H_{2c}: Value added intellectual coefficient (VAIC)) affects firm value.

4.2 Population and sample size

All firms listed in Tehran stock exchange between the years 2005 and 2012 having the following features make up the study population:

1. They shall not belong to companies in financial intermediation, banks, and insurance and investment companies.

2. Their financial year shall be ended up on March 20th of the year, and their fiscal year shall not be changed during the investigated years.

3. The comprehensive and detailed information about the annual financial statements of these companies must be available in the Tehran Stock Exchange during the investigated period.

4. The investigated companies must continue being a member of stock exchange until the end of the year 2012.

4.3. Research variables & calculation

The independent variables in this study consisted of value added intellectual capital, value added intellectual capital coefficient, and value added intellectual coefficient; the dependent variables also consisted of the weighted average cost of capital and firm value; finally, control variables consisted of firm size and financial leverage.

Calculation of added value:

$$VA = OP + W \tag{1}$$

Where:
W = staff wages;
OP = operational profit;
VA = value added.

Calculation of value added of capital applied (VACA):

$$VACA = VA/CA \tag{2}$$

CA = total assets - intangible assets
Calculation of value added intellectual capital coefficient (VAIN):

$$VAIN = STVA + VAHU \tag{3}$$

$$VAHU = VA/HC \tag{4}$$

$$HC = W - R\&D \tag{5}$$

$$STVA = SC/VA \tag{6}$$

$$SC = VA - HC \tag{7}$$

Where:
VAHU = value added coefficient of human capital;
R & D = research and development costs;
STVA = value added coefficient of structural capital.

Calculation of value added of intellectual capital coefficient (VAIC).

$$VAIC = VAIN + VACA \tag{8}$$

Calculation of weighted average cost of capital (WACC): in this study, the cost of capital is the weighted average cost of the securities used to finance the company's investment.

$$WACC = P1K1 + P2K2 + \dots PnKn \tag{9}$$

Where:
P = proportion of financing method;
K = interest rate of financing.

Market value (MV): the value of stock market is considered as market value.
Calculation of firm size: logarithm of firm's total assets is regarded as firm size.
Calculation of firm leverage: it is obtained through the dividing the sum of shareholders' equity by total assets.

Table 1. Summary of research variables

Variable	Situation in model	Symbol	Resource
Value added of capital applied	independent	VACA	Pulice (2000)
Value Added Intellectual capital coefficient	independent	VAIN	Skandia (1994)
Value added intellectual coefficient	independent	VAIC	Firer and Wiliams (2003)
Weighted average cost of capital	dependent	WACC	Taghavi (2011)
Markt value	dependent	MV	Hampton, Hirt, Block et al

5. Analysis of hypotheses

Results of performing regression model for the hypotheses are presented in Tables (2) and (3).

Table 2. Regression models test

Model Assumptions				
1	WACC = α0 + α1VACA + α2SIZE + α3LEV		5	MV = α0 + α1VACA + α2SIZE
2	WACC = α0 + α1VAIN + α2SIZE + α3LEV		6	MV = α0 + α1VAIN + α2SIZE
3	WACC = α0 + α1VAIC + α2SIZE + α3LEV		7	MV = α0 + α1VAIC + α2SIZE

Assumptions						
Explain	First	Second	Third	Fourth	Fifth	Sixth
Adjusted R-Squared	.176	.160	.176	-.005	-.002	-.005
R- Squared	.186	.169	.186	.002	.004	.002
Durbin Watson	1.907	1.9	1.907	1.801	1.803	1.802
F- Statistic	19.100	18.416	19.100	0.290	0.604	0.291
Sig.	.000	.000	.000	.748	.547	.748

The coefficient of adjusted determination shows the changes in the dependent variable given the independent variables. Durbin-Watson statistic also confirms the relative independence of data or lack of serial correlation between model errors. F-statistic is also used to determine the significance of the regression equation; results are presented in the tables.

Table 3. Analysis of testing hypotheses

	Assumptions														
	First		Second				Third			Fourth		Fifth		Sixth	
	VAIC	SIZE	VAIN	SIZE	VACA	LEV	SIZE	VAIC	LEV	SIZE	VAIN	LEV	SIZE	VACA	SIZE
T.Statistic	-7.154	7.557	7.012	-6.987	7.427	7.058	-6.987	7.557	7.698	-0.322	-0.698	-0.807	-.573	-.698	-.323
B	-.324	.431	0.321	-.261	.416	.365	-.126	.431	.531	-0.019	-.04	-.046	-.032	-.04	-.019
Prob	.000	.000	.026	.024	.000	.03	.000	.000	.024	.748	.485	.42	.567	.485	.747
impact	Revers	Direct	Direct	Revers	Direct	Direct	Revers	Direct	Direct	Not effect	Not effect	Not effect	Not effect	Not effect	Not effect
result	Confirm		Confirm				Confirm			Reject		Reject		Reject	

6. Discussion and conclusion

Intellectual capital is derived out of knowledge. The role of human factor is essential in knowledge management and knowledge-based organizations; it is the main competitive advantage and the rarest resource in today's knowledge-based economy. The purpose of this study is to investigate the relationship between intellectual capital (as well as its components) and the cost of debt and firm value. The results of testing hypotheses suggested that there is a significant reverse relationship among mechanisms of value added of capital applied, value added of intellectual coefficient, value added intellectual capital and the weighted average cost of capital. There also exists a direct significant relationship between sales and leverage with weighted average cost of capital. The findings are consistent with those of Qelichlee, Pitan, Chi Wan, Makki, Nazari, Nik Mohammad, Orens, and Oskra. There is no significant relationship among mechanisms of value added of capital applied, intellectual capital value added ratio, value added intellectual capital and firm value, value added of intellectual coefficient, value added of intellectual capital, and firm value. Sales and leverage are not significantly correlated with firm value; this is consistent with the result of the findings of Mojtahed Zade while in contrast with those of Maditinos, Hemmati, and Zamani. Among the reasons for rejecting hypotheses 4 to 6 could be the inability of companies in using intellectual capital properly. Due to the economy's changing conditions, companies may not be very flexible to adapt themselves to the rapid changes of intellectual capital commensurate with changes in the environment or arrangement. It is recommended to firms' managers to pay attention to the strengthening of intellectual capital. Making structural and process reforms, observing the regulatories, implementing operational plans, strengthening the strategies, reforming infra-structures, improving the organization and methods used, and taking advantage of trademarks and innovations are all effective in strengthening intellectual capital and can consequently lead to the reduction of cost of capital; they can create value for the firm and finally, they can help to achieve the ultimate goal which is maximizing shareholders' wealth. Companies can also assess their immaterial intangible assets including intellectual capital (human, structural, and customer) and report it to the capital market. Giving reports of balance sheet and assets of over- balance sheet assets will help analysts to make actual valuation of the shares. Therefore, companies are recommended to try their best in order to optimally use intellectual capital and pay more attention to the intellectual capital structure; this way they can improve their performance. Part of the board's remuneration can be dependent upon the added value obtained by reinforcing the firm's intellectual capital. It is also recommended to stakeholders and other decision-makers to specially take into account the mentioned criteria when evaluating the performance of a company. It is required for Stock Exchange Organization, firms' experts, and other market analysts to measure firm value based on intellectual capital. In general it can be said that intellectual capital has some effects on firms' capital costs, yet no effect on firm value. As a result, compared to the other companies those taking intellectual capital into account will have the opportunity dramatically improve their performance by constantly enhancing intellectual capital.

References

1. Ja'fari, M. Enb Rasul., A., Rezaee Nour, J., and Akhavan, P. (2006). A comparative study of approaches to knowledge assets measurement. Paper presented at Fifth International Conference on Industrial Engineering, Tehran.

2. Sayadian, S. (2009). Intellectual capital and providing a method for Iran reporting. MS Thesis, Islamic Azad University of Yazd.

3. Qelichlee, B. (2005). The model of measuring and reporting organizations' intellectual capital. Paper presented at Third International Conference on Management, Tehran.

4. Mojtahedzade, V., Alavi Tabari, S.H., and Mahdizade, M. (2010). The relationship between intellectual capital (human, customer and structural) and the insurance industry performance. Journal of the studies of accounting and auditing, 17(60).

5. Hemmati, H., Moein addin, M. and Mozaffari Shamsi, M. (2010). Investigating the relationship among intellectual capital, market value, and financial performance. Journal of Financial Accounting, 2(7).

6. Hemmati, H. and Zamani Amouqin, R. (2011), Examining the relationship among intellectual capital, value added, and cumulative abnormal returns. Journal of Management, 2 (24).

7. Khavandkar, J., Khavandkar, E. and Motaqi, A. (2009). Intellectual capital, management, development and measurement models. Industrial Training and Research Center of Iran.

8. Zamani, F. (2011), Investigating the relationship between intellectual capital and economic performance, financial performance and stock market performance. MS Thesis, Islamic Azad University of Yazd.

9. Bontis N. (1998). Intellectual capital: an exploratory study that develops measures and models. Management Decision, 36(2): 63-76.

10. Bontis, N. Crossman, M and Hulland, J. (2002). Managing an Organizational Learning System by Alligning Stocks and Flows. Journal of Management Studies, 39 (4).

11. Bontis, N., Dragonetti, N.C. Jacobsen, K. and Roos, G. (1999). "The knowledge Toolbox: A review of the Tools Available to Measure and Manage Intangible.

12. Brooking, A. (1996), Intellectual Capital: Core Assets for the Third Millenium Enterprise, London, Thomson Business Press.

13. Brown, Ch.J. (2002). Factors That Affect the Successful Commercialization of

14. Celemi (1999). Uncovering Hidden Assets, Celemi Annual Report, available: www.celemi.com

15. Chen J, Zhu Z. and Xie H.Y. (2004). Measuring Intellectual Capital: a New Model and Empirical Study. Journal of Intellectual Capital; 5(1)

16. Edvinsson, L. (2002). Corporate Longitude, Bookhouse, Available on line: www.corporatelongitude.com

17. Kaplan R.S., Norton D.P. (1996). Using the balanced scorecard as strategic management system. Harvard Business Review. January-February.

18. Kamukama, N. Ahiauzu, A & M. Ntayi, J. (2010). Intellectual capital and performance: testing interaction effects. Journal of Intellectual Capital, Vol.11Iss: (4).

19. Lev, B. (1999). Seeing is Believening - A Better Approach to Estimating Knowledge Capital in CFO magazine April 2000, Available on line: http://207.87.9.12/html/charts/99FEseei-2.html.

20. Nazari, J. Herrmans, I. (2007). Extended VAIC Model: Measuring Intellectual Capital Components, Journal of Intellectual Capital, Vol.8, No (4).

21. Pulic, A. (2004). "Intellectual Capital–Does It Create or Destroy Value?, Measuring Business Excellence, Vol. 8, No (1).

22. Roos, G., Roos, J. (1997). "Measuring Your Company's Intellectual Performance", Long Range Planning, Vol.30, No (3) June.

23. Stewart, Thomas, (1997). Intellectual Capital: New Wealth of Organizations.

24. Sharabati, A., Jawad, Sh & Bontis, N. (2010). Intellectual capital and business performance in the pharmaceutical sector of Jordan , Management Decision , Vol. 48 Iss: 1.

25. Sharbati, A., Jawad, S. (2010). Intellectual capital and business performance in the pharmaceutical sector of Jordan, Journal of management decision, 48,(7).

26. Nazari, J., Herremans, I., Manassian, A. & Isaac, R. (2009). National intellectual capital stocks and organizational cultures: a comparison of Lebanon and Iran"in O., Sullivan, K.J. (Ed.), Strategic intellectual capital management in Multinational Organizations: Sustainability and Successful Implications, Idea Group Publishing, Hershey, PA.