EFFECT OF INTELLECTUAL CAPITAL ON FUTURE EFFICIENCY IN CAPITAL MARKET

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Abstract

In this paper, the relationship between organizational capital, communication capital and innovation capital with future efficiency of the company in capital market is investigated. Independent variables of the research include organizational capital, communication capital and innovation capital and dependent variable is the future efficiency of the company. Capital duration, invested capitals, company size and financial leverage are control variables of research. To carry out this research, three hypotheses are considered and tested. Research methodology is applied and statistical method includes regression model of regular least squares. Statistical population includes 50 companies in capital market during 2009 – 2013. Results of research hypotheses tests reveal that company efficiency increases with improvement in subsets of intellectual capitals including organizational, communication and innovation capitals.

Keywords: return on equities, communication capital, innovation capital, organizational capital

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Introduction

Today, using various tools such as computer, email and fax, IT provided personnel with opportunity to be able to do their jobs in parts of engineering, financial, design and other divisions of an administration from home and transfer the outcome of their works to office through available systems.

According to results stating that there is a difference between market value of companies and whatever they register in their bookings, it is generally accepted that one of the reasons for such difference is the presence of intangible assets which are not included in balance sheet of companies. One of the intangible assets is intellectual property. It is the main cause of making value for companies and companies are moving toward making value through intellectual property of companies. In fact, previous viewpoint of mangers about making value by means of physical assets has changed. Intellectual property is one of the appearing topics in companies accounting and is already evolving. In today's competitive economy which is based on modern market accompanying with rapid international changes and revolutions and leading to transition from industrial community to an information one, intellectual property is considered as the driver of economic development which can play a pivotal role in economic growth of companies and consequently countries as well as employment and social welfare. Marr (2004) introduces intellectual property as a set of knowledge properties belonging to company which leads to improvement in value of companies and is classified into three classes: customer capital, organizational capital and innovation capital. Such capitals are form properties which greatly contribute to the success of each company. However, they have no place in balance sheet and financial document of companies and this increases the necessity of managing them.

Therefore, the main question of research is that:

Can intellectual capital be effective for improving future efficiency of companies?

Literature review

- Osana and Gerardo (2008) studied the role of IT as an intellectual property for educational products. Their results reveal that IT can be considered as an opportunity for development of intellectual properties.
- Ting and Lin (2009) evaluated the efficiency of intellectual properties and its relationship with financial efficiency. Results revealed that intellectual property has a positive relationship with efficiency of assets. Another result of the research was that components of intellectual capital have significant relationship with profitability.
- Chang and Hsieh (2011) investigated the relationship between components of intellectual capital and three operational, financial and market performance in Taiwan stock market in electronic industries. To measure intellectual capital, moderated factor of intellectual capital added value model is used. Results reveal that operational performance has a

positive relationship with investment and no relationship with structural and human capital. Furthermore, components of intellectual capital have negative relationship with market performance and financial performance. Costs of research and development have positive relationship with three performances. However, intellectual capital has only positive relationship with operational performance.

- Rey et.al (2012) explored the effect of IT on company efficiency. By assuming normal combination of companies and diversity of equities along with components of intellectual capital, they concluded that IT has a positive and significant relationship with efficiency of studied companies.
- Amadian and Ghorbani (2013) studied the relationship between intellectual capital and organizational efficiency. In this research, to measure the variables, questionnaire was used. Sample includes 118 personnel of the ministry of financial and assets affairs selected using random sampling method. Results of testing research hypotheses using structural equations modeling illustrate the significant relationship between components of intellectual capital (human, structural and communication) and organizational efficiency. Moreover, results reveal the significant relationship between IT and intellectual property.

Research hypotheses

Main hypothesis: there is a significant relationship between intellectual property and future efficiency of company.

1nd hypothesis: there is a significant relationship between communication capital and future efficiency of company.

2rd hypothesis: there is a significant relationship between innovation capital and future efficiency of company.

3th hypothesis: there is a significant relationship between human capital and future efficiency of company.

Research methodology

This is a semi-empirical research in the context of confirmatory works on accounting based on real information in financial bills of companies. Moreover, it is correlative and data collection method is descriptive. Research methodology is after event and since it can be applied for the process of using information, it is an applied research. To carry out the current research and collect data, library method was used. To test research hypothesis and their analysis, SPSS and Eviews ver. 7 and multivariate linear regression was used.

Statistical population and sample of research

Statistical population of current research includes all investing companies, banks, post, telecommunication and insurance during 2009-13. To select sample, systematic eliminatory sampling method is used. In this way, among all available companies, those which lack the following specifications will be disregarded and other companies will be selected as sample:

1. Are listed in Tehran stock market before 2009.
2. Their financial year ends to March 20.
3. They have no activity change or change in financial year during study period.
4. Their research data are accessible.

After considering above cases, 50 companies (250 data year – company) which meet al criteria were selected as statistical sample.

Models of hypothesis test

Models which are used to assess the research hypotheses are as follows:

$$= \beta_0 + \beta_1 \text{ Relational Capital}_{it} + \beta_2 Lev_{it} + \beta_3 Age_{it} + \beta_4 Size_{it} + \beta_5 Invest_{it} + \varepsilon_{it}$$

$$= \beta_0 + \beta_1 \text{R\&}D \text{ Capital}_{it} + \beta_2 Lev_{it} + \beta_3 Age_{it} + \beta_4 SIZE_{it} + \beta_5 Invest_{it} + \varepsilon_{it}$$

$$= \beta_0 + \beta_1 \text{Organzation Capital}_{it} + \beta_2 Lev_{it} + \beta_3 Age_{it} + \beta_4 SIZE_{it} + \beta_5 Invest_{it} + \varepsilon_{it}$$

Research variables and their measurement

In this section, all independent, dependent and control variables corresponding to research, method of measurement and operational definition of them will be provided.

Dependent variable

Dependent variable of this model is the future efficiency of the company. Criterion used for the measurement of company's future efficiency is the return on equities.

Actual return on equities in this model is the future efficiency of company. It is the rate of return achieved in a period for stockholders. It can be measured as follows:

1. If the company has no investment increase and equities separation in the period, to measure the return on equities, following relationship will be used:

$$Rit = \frac{Pit - Pio + DPSit}{Pio}$$

Where,

- R_{it} is the Rate of return on equity i at the end of year t
- P_{it} is the price of equity i at the end of year t
- P_{io} is the price of equity i at the beginning of year t
- DPS_{it} is the cash profit of equity i in year t

2. If the company increased its capital through depositions or cash flow, to measure the return on equities, following relationship will be used

$$Rit = \frac{(1+X+Y)Pit - Pio - YPni + DPSit}{Pio + YPni}$$

Where,

- R_{it} is the Rate of return on equity i at the end of year t
- P_{it} is the price of equity i at the end of year t
- P_{io} is the price of equity i at the beginning of year t
- P_{ni} is the nominal value of equity i
- DPS_{it} is the cash profit of equity i in year t
- X is the percent of increase in capital through depositions
- Y is the percent of increase in capital through debts and cash flows

Independent variables

Communication capital

This capital is calculated by the average of advertisement expenditures during last three years:

$$\text{communication capital} = \frac{\text{average advertisement expenditure}}{\text{marketing revenue}}$$

Innovation capital

This capital is calculated as the average of R&D costs during last three years divided by sales:

$$\text{innovation capital} = \frac{\text{average R\&}D\ costs}{\text{marketing revenue}}$$

Organizational capital

Organizational capital is obtained by dividing the market value of shares of stockholders by book value of stockholders:

$$\text{organizational capital} = \frac{\text{market value of shares of stockholders}}{\text{book value of shares of stockholders}}$$

Control variables

In this work, some variables are used as follows to control the effect of variables which can affect the relationship between independent and dpendent variables and are the same in all models (Rey et.al, 2012).

Capital duration

Capital duration is calculated by dividing the gross assets and machineries by depreciation:

$$\text{capital duration} = \frac{\text{gross assets and machineries}}{\text{depreciation}}$$

Investment cash

Invested cash is obtained by dividing company investment by sales:

$$\text{ivnested cash} = \frac{\text{company investment}}{\text{marketing revenue}}$$

Company size

Company size is the natural logarithm of all assets which is included in model to control the size.

Financial leverage

Financial leverage is calculated by dividing debts by shares of stockholders.

$$\text{financial leverage} = \frac{\text{all debts}}{\text{shares of stockholders}}$$

Results

Table 1 represents the descriptive statistics corresponding to research variables.

Table 1: descriptive statistics of research variables

Skewness	Standard deviation	Mean	Max	Min	No.	Variable
0/351	0/525	0/386	0/998	−0/32	250	Future return on equities
1/953	1/835	3/237	8/268	1/235	250	Organizational capital
1/003	0/325	0/014	0/075	0	250	Communication capital
0/752	0/296	0/023	0/152	0	250	Innovation capital
1/399	0/215	0/157	0/387	0/009	250	Invested cash
0/866	0/315	0/587	1/854	0/037	250	Financial leverage
1/742	1/214	23/124	76/012	6/952	250	Capital duration
1/568	1/425	26/425	29/425	23/161	250	Company size

Inferential statistics

To investigate and understand the role of information asymmetry on evaluation errors made by investors and to test research hypothesis, first model of linear regression which is used for estimation of parameters using regular least squares method was fittedwith tabular data. In what follows, results of the following model will be analyzed.

Test of first secondary hypothesis

This research includes three hypotheses as follows:

1nd hypothesis: there is a significant relationship between organizational capital and future efficiency of company.

This hypothesis tries to investigate the significance of the effect of organizational capital on future efficiency of the company.

Data analysis

First, to be able to use regression analysis and approve research results, it must be determined that essential assumptions of regression including normality of residuals, their independence and colinearity of independent variables apply. Results are summarized in table 5 whose interpretation is explained below:

a) Value of JB test is as much as 0.092 which is higher than 5%. Therefore, hypothesis of normality of residuals is approved with 95% confidence level.
b) The value of DW test is 2.152 and according to being in [1.5-2.5] interval, independence of residuals is approved.
c) Since the value of test is less than 5, there is no problem of collinearity between independent variables.

According to confirmation of above hypotheses, results obtained from fitted model are reliable.

Chow test

First, to determine that whether combined data or tabular ones can be used, Chow test is used. Results of test are provided in table 2.

Table 2: results of Chow test

Significance level	F-test
0/621	1/768

As can be observed, significance level of the test is 0.621 higher than 0.05. Therefore, null hypothesis based on using combined data is approved and it is necessary to estimate the model in this way. As such, there is no need to Haussmann test.

Results of regression analysis

Results of model of research are summarized in table 3.

Table 3: ANOVA results

VIF	P-value	t-test	Standard error	beta	Independent variable
	0/093	-1/685	0/045	-0/076	Intercept
3/412	0/047	1/993	0/04	0/008	Organizational capital
1/451	0/760	0/304	0/013	0/003	Communication capital
1/652	0/624	0/489	0/092	0/045	Innovation capital
1/624	0/249	1/154	0/016	0/018	Invested cash
2/014	0/000	3/486	0/011	0/040	Financial leverage
	0/093	-1/685	0/045	-0/076	Capital duration
2/008	0/004	2/829	0/095	0/274	Company size
2/152	DW		0/075		Determination factor
0/000	F-test		5/229		F–test
0/092	JB-test		4/670		JB test

Value of f-test and its level of significance in ANOVA table illustrates the significance in 95% confidence level. Coefficients of fitted model show that about 7.5% of future efficiency changes in studied sample of the research are explained by independent variables.

Coefficient of independent variable of organizational capital is equal to 0.008 and its significance level is as much as 0.047 which is less than 5%. Therefore, coefficient of independent variable of organizational capital is positive and significant. It means that 2nd secondary hypothesis is approved with 95% confidence level.

Appropriate organizational capital makes a suitable space for sharing knowledge, collective knowledge, reducing waiting time and improving productivity of personnel. In addition to improving operations and working processes, organizational capital helps companies to replace materials and equities by information. For example, increasing the score of patents can represent the ability of company for introducing new products and services. On the other hand, design and implementation of information system can lead to a more effective information distribution.

Results are in agreement with that of King et.al (2009), Ahmadian and Ghorbani (2013) and Setayesh and Kashani Pour (2012).

2rd hypothesis: there is a significant relationship between communication capital and future efficiency of company.

This hypothesis attempts to investigate the significance of the effect of communication capital on future efficiency of the company.

Data analysis

First, to be able to use regression analysis and approve research results, it must be determined that essential assumptions of regression including normality of residuals, their independence and collinearity of independent variables apply. Results are summarized in table 8 whose interpretation is explained below:

a) Value of JB test is as much as 0.133 which is higher than 5%. Therefore, hypothesis of normality of residuals is approved with 95% confidence level.
b) The value of DW test is 1.740 and according to being in [1.5-2.5] interval, independence of residuals is approved.
c) Since the value of test is less than 5, there is no problem of collinearity between independent variables.

According to confirmation of above hypotheses, results obtained from fitted model are reliable.

Chow test

First, to determine that whether combined data or tabular ones can be used, Chow test is used. Results of test are provided in table 4.

Table 4: results of Chow test

Significance level	F-test
0/549	2/111

As can be observed, significance level of the test is 0.549 higher than 0.05. Therefore, null hypothesis based on using combined data is approved and it is necessary to estimate the model in this way. As such, there is no need to Haussmann test.

Results of regression analysis

Results of the 3rd model of research are summarized in table 5.

Table 5: ANOVA results

VIF	P-value	t-test	Standard error	beta	Independent variable
	0/085	−1/724	0/044	−0/077	Intercept
1/756	0/019	2/341	0/018	0/042	Communication capital
1/820	0/166	1/385	0/004	0/006	Communication capital
1/145	0/498	0/678	0/054	0/037	Innovation capital
2/123	0/857	0/179	0/091	0/016	Invested cash
2/685	0/043	2/056	0/010	0/021	Financial leverage

	0/085	-1/724	0/044	-0/077	Capital duration
1/540	0/004	2/861	0/037	0/108	Company size
1/740	DW		0/191		Determination factor
0/000	F-test		7/874		F–test
0/133	JB-test		4/030		JB test

Value of f-test and its level of significance in ANOVA table represents the significance in 95% confidence level. Coefficients of fitted model show that about 44.6% of future efficiency changes in studied sample of the research are explained by independent variables.

Coefficient of independent variable of communication capital is equal to 0.042 and its significance level is as much as 0.019 which is less than 5%. Therefore, coefficient of independent variable of communication capital is positive and significant. It means that 3rd secondary hypothesis is approved with 95% confidence level.

Loyal personnel are of great importance in determination of long-term profit of company and hence, duration of loyalty of customers can be regarded to as an intangible and value making asset for companies. if customers sign long-term contracts with companies, it means that they have trust on companies and tend to maintain their corporation with company and in this way, it is hoped that minimum efficiency of company can be improved or at least remains unchanged.

Results are in compatible with that of King and Lin (2009), Young and Gunk (2008) and Ahmadian and Ghorbani Pour (2013) and Setayesh and Kashani Pour (2012).

3th hypothesis: there is a significant relationship between innovation capital and future efficiency of company.

This hypothesis intends to investigate the significance of the effect of innovation capital on future efficiency of the company.

Data analysis

First, to be able to use regression analysis and approve research results, it must be determined that essential assumptions of regression including normality of residuals, their independence and collinearity of independent variables apply. Results are summarized in table 10 and interpretation is explained below:

a) Value of JB test is as much as 0.096 which is higher than 5%. Therefore, hypothesis of normality of residuals is approved with 95% confidence level.
b) The value of DW test is 2.085 and according to being in [1.5-2.5] interval, independence of residuals is approved.
c) Since the value of test is less than 5, there is no problem of collinearity between independent variables.

According to confirmation of above hypotheses, results obtained from fitted model are reliable.

Chow test

First, to determine that whether combined data or tabular ones can be used, Chow test is used. Results of test are provided in table 6.

Table 6: results of Chow test

Significance level	F-test
0/740	1/252

As can be seen, significance level of the test is 0.740 higher than 0.05. Therefore, null hypothesis based on using combined data is approved and it is necessary to estimate the model in this way. As such, there is no need to Haussmann test.

Results of regression analysis

Results of the 3rd model of research are summarized in table 7.

Table 7: ANOVA results

VIF	P-value	t-test	Standard error	Beta	Independent variable
	0/129	-1/524	0/045	-0/068	Intercept
1/356	0/000	5/663	0/004	0/023	Innovation capital
2/003	0/655	0/446	0/003	0/001	Innovation capital
1/198	0/051	1/935	0/022	0/043	Innovation capital
2/532	0/491	0/688	0/017	0/012	Invested cash
2/603	0/043	2/029	0/009	0/020	Financial leverage
	0/129	-1/524	0/045	-0/068	Capital duration
1/657	0/029	2/182	0/081	0/178	Company size
2/085	DW		0/101		Determination factor
0/000	F-test		3/053		F–test
0/096	JB-test		4/672		JB test

Value of f-test and its level of significance in ANOVA table represents the significance in 95% confidence level. Coefficients of fitted model show that about 10.1% of future efficiency changes in studied sample of the research are explained by independent variables.

Coefficient of independent variable of innovation capital is equal to 0.023 and its significance level is as much as 0.000 which is less than 5%. Therefore, coefficient of independent variable of innovation capital is positive and significant. It means that 4th secondary hypothesis is approved with 95% confidence level.

Institutions with higher monopoly power make it possible to achieve lower risk by increasing innovation capital (R&D costs) through making innovation; that is, by maintaining more

monopoly power, profitability is affected by research and development and can be increased. Of course, it must be noted that profitability resulted from R&D is not sole reason for monopoly power; but, profit of most of the institutions can be improved by means of supplying new products. Further, costs of research and development have lower risk compared to other costs due to increase in long-term return.

Results are in accordance with that of Chang and Hsieh (2011), Ting and Lin (2009), Young and Gunk (2008). However, they are not consistent with that of Khani et.al (2013) and Setayesh and Kashani Pour (2012).

In general, according to results of secondary hypotheses, main hypothesis of research based on the significant relationship between IT and intellectual capital and future efficiency of company is approved.

Conclusion

In summary, results of tests for assessing the research hypotheses confirm the fact that more investment on intelligence and subsets of intellectual capitals including organizational, communication and innovation, future efficiency of companies increases. Investigation of the results of research suggests that IT capitals have the most contribution to the future efficiency of companies. Further, among intellectual subsets, communication capital has the highest effect on future efficiency which shows that trust and loyalty of customers can play a key role in future profitability of companies.

Regarding results of the remaining hypotheses, it can be suggested that managers and investors pay more attention to the highlighted role of intellectual capital and its components in improving physical capitals and by means of strengthening such investments, they can pave the way for future progress of their companies.

In addition, recommendations for future research include: study of the relationship between IT and intellectual capital and non-financial performances such as customer and personnel satisfaction, relationship between IT and intellectual capital and performance using efficiency criteria, relationship between IT and intellectual capital and performance using measurement criteria for IT and intellectual capital, prediction of the future efficiency by means of IT and intellectual capital through intelligent networks (neural network and fuzzy method and so on).

References

Khani, A., Ghajavand, Z., (2012), "effect of market competition range on the relationship between information asymmetry and costs of equities", financial accounting rsearch magazine, 4th year, pp. 67-88

Rahimian, N., Hemmati, H., SoleimaniFard, M., (2012), "investigation of the relationship between profit quality and information asymmetry in companies listed in Tehran stock market", accounting knowledge, 3rd year, vol. 10, pp. 157-181

MousaviShiri, M., Khalatbari, H., Vaghfi, H., (2012), "effect of evaluation of equities on profit management", accounting knowledge, 3rd year, vol. 9, pp. 143-163

Nourvash, I., Hoseini, A., (2009), "investigation of the relationship between disclosure quality (reliability and being on-time) and profit management", accounting and survey studies, vol. 55, pp. 117-134

Badertscher, Brad A., D. W. Collins, and T. Z.Lys., (2012), "Earning Management and the Predictive Ability of Accruals With Respect to Future Cash Flows", Journal of Accounting and Economics.Vol.53 (1-2), PP 1-488.

Bhattacharya, N., H. Desai, and K. Venkataraman., (2010), "EarningsQuality and Information Asymmetry: Evidence from Trading Costs",Under Review in Second Round at ContemporaryAccounting Review.