

Intellectual capital & Return on investment: Case study: Iranian Stock Exchange

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All organizations are alive in accordance with knowledge in any economies based upon it as well. In such cases, the most successful organizations are able to have better and quicker benefits from knowledge as a real investment. Roos et. al discuss that Intellectual capital from the strategic point of view may be used for creation and application of knowledge in order to increase organization value. Boom & Silverman (2004) considered the relation between IC parts and decisions & financial risks and operation of companies. This article intends to study any relation between Intellectual capitals measured by financial patterns with output rate of investment of accepted companies at Tehran Stock Exchange Organization. The real meaning of Intellectual capital is any intends for effective usage of current knowledge and intangible assets. From the point of view of applicable goal & implementation method, the research system of this study is explanatory-measuring based upon combination of theories test from Test t and for estimation of parameters in which the regression model has been used for minimum squares. Research data are current audited financial statements in Tehran Stock Exchange Archive for 2005-2009 periods. The findings of theories tests through 2004 to 2008 show that there is a meaningful relation between Intellectual capital and investment output rate. This relation is positive in first, second and three methods and negative in fourth one. Furthermore the relation between studying variants are not equal in accordance with measured financial pattern.

Key words: Intellectual capital, Human Capital, Structural Capital, Return of Investment

Field of research: Finance & Intellectual capital

1. Introduction

Human being has experienced different periods in the past. The said historical periods had considerable effects on the life style and activity of human being. It is possible to see its effects on the operation of economic agencies. The other effects are IT & appearance of different tools such as internet, intranet and web wide network. The effect of these innovations is a new decade under the title of "Age of Knowledge" and to say good bye to industrial age which has been appeared in the past along with information decades which has been introduced in third millennium. In knowledge age, what makes more success in trade and industry is knowledge of human being which was successful in creation of economy based upon knowledge. The knowledge of human being is an intangible asset and recognized as an

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intellectual capital. Any development of intellectual capital makes a wide field for more wealth and values.

In fact, in most countries of the world, any business environment based upon knowledge needs to understand and accept a new paradigm including intangible organizational factors which would be named today as intellectual capital. This may cause to add a new knowledge under the title of intellectual capital with a daily increase of its importance. The present article is in fact a research about any relation between intellectual capital and return of investment in Tehran Stock Exchange Organization. Then after determining its updated scientific bases as the major scientific goals, intends to assist all investors and pioneers of capital market in any further decision making and to answer to this major research question that "What is the relation between intellectual capital and return of investment?" In addition, we have considered the effect of different calculation methods of intellectual capital based upon financial pattern in company's value. This paper design to 4 parts as literature, methodology, discussion of findings & conclusion.

2. Literature Review

2.1 The Meaning of Intellectual Capital

Intellectual capital is one of the new subjects in scientific literature. It was presented for the first time in an applicable description format in 1993 by Organization for Economic Cooperation & Development (OECD). It means the economic value of two groups of intangible assets of company including 1-Organizational capital and 2-Human being capital including of inter-organizational human resources that means the relevant personnel of the organization and outer-organizational resources that means the customers and suppliers.

Various researches revised it for providing a better meaning for intellectual capital including Roos, (1997) who may consider intellectual capital as a collection of knowledge of all members of an organization and its practical application. Bontis (1996, 1999, 1998, 2000, 2004) considered intellectual capital as a search and following up and effective usage of knowledge (made product) in comparison with information (raw material). Mouritsen (1998) explains intellectual capital as a wide organizational knowledge which is exclusive for each company and enables it to comply itself continuously with under change conditions.

Gupta et. al (2001) considers intellectual capital as an exclusive set of tangible /intangible resources of company. Swart (2006) introduces the intellectual capital as knowledge for further values. It may change into wealth and values as a knowledge, profession and abilities. Dzinkowski (2000) considers intellectual capital as a total capital and/or ownership right based upon knowledge of company. Khavandkar et. al (2008) provides a complete meaning of intellectual capital.

2.2 Major Elements of Value & Intellectual capital

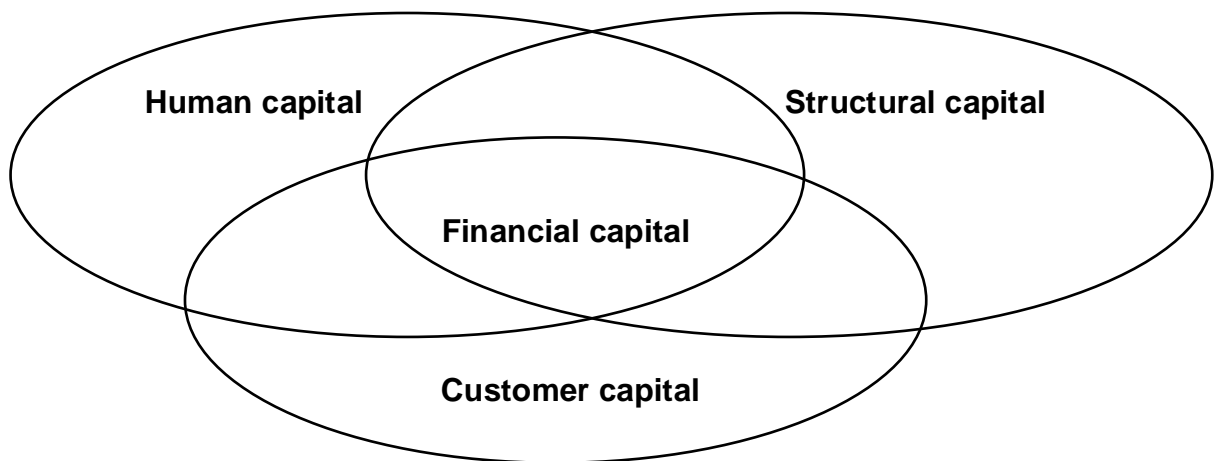
In scientific literature value includes of intellectual capital and financial capital of the organization. This finding is the result of intellectual capital index introduced by Johan Roos et. al in 1997.

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This classification is in compliance with different descriptions of intellectual capital based upon customer in any process of organizational value including the provided description by Hananes et. al (1997) as "Intellectual capital is a set of knowledge based assets through increasing the value of key beneficiaries of organization including customers" and Macwatters (2008) who may consider effective factors on creating strategy value for customers including technological changes, globalization and competing and customers' need.

Upon considering the researches of this field and for determining of model and measuring methods and evaluation of intellectual capital, Anvari Rostami & Rostami (2003) believe in structural, humanistic and customer dimensions of financial capital. Diagram 1 shows these items.

Diagram 1



Although there are not equal descriptions and concepts about intellectual capital, but intellectual capital is going towards a way as a witness of combination of meaning. (Nikoo Maram, Yari 2008).

2.3 Measuring of intellectual Capital

It is a need to accept measuring principle in financial & accounting literature and in evaluation process of all accidents and phenomena including intellectual capital. This may increase the information effectiveness. Generally there are two major reasons for measuring of intellectual capital in Organization. The first is from financial reporting point of view and for various subjects and the second is ensuring about intellectual capital management for better & effective usage and increasing the competitive advantage of most central organizational competences.

Any consideration of scientific literature of subject shows that it is possible to classify most proposed measuring models of intellectual capital into four models such as Direct Intellectual Capital models (DIC), Market Capitalization Models (MCM), Return on Assets Methods (ROA) AND Scorecard Methods (SC). This may cover all models with regard to the real meaning related to intellectual capital.

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We have considered Assets output models through the meaning of intellectual capital from the point of view of return of investment that is based upon financial patterns.

In assets output model we have considered the average income of organization before tax as the base of any calculations. In fact the average of profit before tax in a special period of time will be divided on average of organizational intellectual capital. The obtained result as the output rate of assets would be divided to industry average and in next step it will be multiple in average organizational intellectual capital for further calculation of annual average profit through intellectual capital. The result will be divided on average of capital costs and/or profit rate. The obtained amount would be considered as the value of intellectual capital. Furthermore, the Return of Investment and Return Of Equity (ROE) of introduced models in this classification will be developed in financial literature and based upon this concept.

Then it is possible to introduce modern models based upon of value added and creation of similar value of Economic Value Added (EVA) and calculated intangible value model, Knowledge Capital Earning (KCE), Value Added Intellectual Coefficient (VAIC) introduced respectively by Bentnett Stewart (1991), Tomas Stewart (1997), Ante Pulic 2000 and Lev Baruch 2001. Table 1 shows a summary of theoretical studies in relation with subject and according to the researches of Sveiby (1998, 2001).

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Table 1: Measuring methods of intellectual capital

Pattern	Researcher	Attitude	Description of measuring method
Innovation Registration right	Bontis (1996)	DIC	Technology factor would be calculated in accordance with number of made innovations in organization. The intellectual capital operation would be calculated in accordance with any effects of index sets including number and costs of registration the innovations.
Integrated Evaluation Method	Mack Ferson (1998)	DIC	It may use classification of combined weighted indexes in which the focus is on estimated not absolute values. Value= Monetary value added + combined intangible value added
Intellectual assets evaluation	Sullivan (2000)	DIC	It is a method for measuring of intellectual ownership value
Accounting for future	Nesh (1998)	DIC	It is a method for reduced monetary currencies. In this method it is assumed the difference between accounting value (for future) at the end and beginning of a value added course.
Q Tobin	Stewart (1997) & Bontis (1999)	MCM	Q Tobin is the rate of value against a registered (book) value of assets. Stewart puts the replacement costs of tangible assets instead of registered value of tangible assets. Any changes in q Tobin may provide an index for measuring of function. It is expected to have this rate in long-term towards 1. Q Tobin=Market value / book value
Market value against book value	Stewart (1997) & Loo (1998)	MCM	It may consider the intellectual capital in difference between market value and its registered value. Market value= Registered value + intellectual capital
Accounting & pricing of human resources	Johansson (1996)	ROA	It may calculate the effect of non-fixed related costs with human resources on reducing of economic unit profit. It is possible to measure intellectual capital by calculation of the shares of human assets, dividing on investing costs on Human Force (Salary & allowances)
Evaluating of human capital	Libowitz & Right (1999)	ROA	It is based upon pricing functions and benefits from real costs accounting convention. It is able to have an integrated evaluating of human capital by traditional accounting patterns.
Knowledge Capital allowances	Loo (1999)	ROA	It may estimate the results of knowledge capital as the normalized receipts more than attributable receipts of registered assets.

2.4 Background

Ross (1997) presented the basic theme of intellectual capital as a framework for further analysis of intangible assets in an organization. Then Chatkel (2001) and Payik et. al (2001) submitted the relevant details of this theory. Bonits (1999), Chen et. al (2000), Stewart (1997), Solivan and Harrison (2000), Bartsh (2005) and Bollen, Vergduwen and Schnieders (2005) continued this research as well.

Swedish Association performed the first experimental study for measuring of intellectual capital in middle of 1980s.

Riahi Bolkoui (2003) has considered the effect of intellectual capital on operation of multi-national American companies within 1992-96.

In their research under the title of "Intellectual capital & Human capital, as the effective factors on risk & financial function in bio-technology industry", Boom & Silverman (2004) considered the relation between intellectual capital parts and decisions of financial risks and operation of companies and the effect of these parts on further functions. According to the results, there is a meaningful effect of intellectual capital on the operation and financial risks of considered companies.

Garcia & Matiner (2007) in their theory under the title of "Benefiting from intellectual capital information in investing decision making" will show that all investors benefit from this information. Rodof & Lelyart (2002) confirmed in their article under the title of "Monetary methods for measuring of intellectual capital" that it is possible to qualify intellectual capital in accordance with financial patterns. In their research under the title of "Accounting of Experimental Measuring of intellectual capital with accounting attitude", Mack Pierson & Paik (2001) considered the operation of companies. According to the findings, there is a positive meaningful relation between the operation and intellectual capital. Jafari (2009) has tested and confirmed the effective relation of risk with company's operation level based upon intellectual capital. Anvari Rostami (2005) tests the relation of intellectual capital and market value of shares at Tehran Stock Exchange Organization between years 1997 to 2003 in accordance with financial patterns. Then it was possible to confirm a positive & meaningful relation between both mentioned items. Asghar Nejad Miri (2006) has tested the intellectual capital and its relation with financial output in accordance with Polik method for years 2001 up to 2006. Then it was possible to confirm a positive & meaningful relation between intellectual capital and financial output.

Nikoo Maram & Yari (2008) tested the relation between intellectual capital with investment output and economic value added at Tehran Stock Exchange Organization for a financial period of 2002 up to 2006 based upon a special pattern. Then it was possible to confirm a positive relation between intellectual capital and return investment and economic value added.

3. Methodology

The current research method is applicable for the aim and explanatory –measuring for performance. Data collection is on library basis along with benefiting from Fisher test for measuring the validity of models and T test for examining the meaningful relation between variants (theories test) and R2 Durbin-Watson tests for estimation

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of relation of variants in regression model. Research statistical population is all accepted companies at Tehran Stock Exchange Organization selected from different industries with some determined specifications and assumed in better group companies with considered indexes. Study period is 2005-2009.

Research Process Design

- 1- subject define
- 2- variable Identify & define
- 3- Hypothesis & problem define
- 4- Data gathering
- 5- Hypothesis test
- 6- Finding model called regression for prediction

Research variables & calculation method such as:

1-Ic1: In this method it is possible to calculate intellectual capital from following relation

$$IC1 = \frac{RC - R_1}{WACC}$$

Where:

IC: Intellectual capital

RC: Company's income in T

R1 :Average income of current companies in similar industry through T

WACC: Weighted average cost of capital which was about %15.5 in this research and as WACC.

2-Ic2: In this method it is possible to calculate intellectual capital from following relation

$$IC2 = (\mu_c - \mu_1) \times T_A$$

IC: Intellectual capital

μ_c = the average of return in T

μ_1 :The average of return companies in similar industry through T

T_A : The average of company's assets through T (Total value of assets)

3-Ic3: In this method it is possible to calculate intellectual capital from following relation

$$I_{c3} = \frac{(Q) \times T_A}{WACC_\mu} \left[\frac{1}{1 + I_{nfi}} \right]$$

$(\mu_c - \mu_1)$ Q is the return addition of company against the average output of industry through T

TA= It is the average of company's assets through T

WACC μ =It is the weighted average cost of capital through T

I_{nfi} :The average inflation rate through T (Within first to third three years, %14.5 and in fourth & fifth years equal to %16.5 according to the Central Bank of Iran rate.

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Ic4: In this method, the value of intellectual capital is as follows:

$$I_{c4} = \frac{(MV_{\mu} - BV_{\mu})}{(1 + I_{nfi})}$$

MV μ : Company's average market value within T

BV μ : Company's average book value within T

I_{nfi}: Average inflation rate within T

$$ROI = \frac{\text{netIncome}}{\text{Total investment}}$$

4. Discussion

4.1 Hypothesis

1-There is a meaningful relation between intellectual capital & ROI

2-There is a meaningful difference between different calculation methods of intellectual capital based upon financial patterns with ROI.

4.1.1 The Results of 1st Sub Hypothesis:

Model Summary (b)

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	DF1	Df2	Sig.F Change	
1	.683 (a)	.467	.445	607219.6312	.467	21.016	1	24	.000	1.648

a predictors: (Constant), Q1

b Dependent Variable: Q5

Coefficients (a)

Model	Un-standardized Coefficients		Standardized Coefficients	T	Sig
	B	Std. Error	Beta		
1 (Constant)	318455.315	123173.147		2.585	.016
Q1	.024	.005	.683	4.584	.000

a Dependent Variable: Q5

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According to the results, it was revealed that firstly R² is equal to 0.467. This may show that about 47% of changes in return of investment would be specified by changes of intellectual capital and in accordance with first pattern.

Secondly the sig. results of t test provide proofs that meaningful level is lower than 0.01 and at 99% level, there is a meaningful relation between intellectual capital by 1st method and return of investment rate. Therefore it is possible to confirm first indirect Hypothesis.

4.1.2 The Results of Second Sub Hypothesis Test:

Model Summary (b)

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	DF1	DF2	Sig. F Change	
1	.723(a)	.523	.504	574107.80976	.523	26.358	1	24	.000	1.317

a predictors: (Constant), Q2

b Dependent Variable: Q5

Coefficients (a)

Model	Un-standardized Coefficients		Standardized Coefficients	T	Sig
	B	Std. Error	Beta		
1 (Constant)	282704.909	117924.878		2.397	.025
Q2	.005	.001	.723	5.134	.000

a Dependent Variable: Q5

According to the results, it was revealed that firstly R² is equal to 0.523. This may show that about 52% of changes in return of investment would be specified by changes of intellectual capital and in accordance with second pattern.

Secondly the sig. results of t test provide proofs that meaningful level is lower than 0.01 and at 99% level, it is possible to confirm 2nd method for all considered companies. It means that there is a meaningful relation between intellectual capital in 2nd method and return of investment.

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4.1.3 The Results of Third Sub Hypothesis Test:

Model Summary (b)

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	DF1	Df2	Sig.F Change	
1	.723(a)	.523	.503	574378.21521	.523	26.311	1	24	.000	1.319

a predictors: (Constant), Q3

b Dependent Variable: Q5

Coefficients (a)

Model	Un-standardized Coefficients		Standardized Coefficients		T	Sig
	B	Std. Error	Beta			
1 (Constant)	282042.318	118023.385			2.390	.025
Q3	.013	.003	.723		5.129	.000

a Dependent Variable: Q5

According to the results, it was revealed that firstly R² is equal to 0.523. This may show that about %52 of changes in return of investment would be specified by changes of intellectual capital and in accordance with third pattern.

Secondly the sig. results of t test provide proofs that meaningful level is lower than 0.01 and at %99 level, the level of meaningful is lower than 0.01. As a result it is possible to apply third indirect theory means there is a meaningful relation in accordance with third pattern with return of investment.

4.1.4 The Results of Fourth Sub Hypothesis Test:

Model Summary (b)

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	DF1	Df2	Sig.F Change	
1	.139(a)	.019	-.022	823589.34242	.019	.470	1	24	.499	1.822

a predictors: (Constant), Q4

b Dependent Variable: Q5

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Coefficients (a)

Model	Un-standardized Coefficients		Standardized Coefficients	T	Sig
	B	Std. Error	Beta		
1 (Constant)	495198.420	168322.523		2.942	.007
Q4	.000	.000	-.139	-.686	.499

a Dependent Variable: Q5

According to the results, it was revealed that firstly R² is equal to 0.019. This may show that about %19 of changes in return of investment would be specified by changes of intellectual capital and in accordance with fourth pattern. The remained are related to other factors which we did not consider anymore.

Secondly the sig. results of t test provide proofs at %99level the sig level was more than 0.01. As a result the statistical zero theory is confirmed and fourth indirect theory would be rejected. This means that there is not a meaningful relation between intellectual capital in 4th method and return of investment.

Generally it is possible to say that although we can confirm any meaningful relation for first, second and third indirect theories and lack of relation for fourth theory, but the severity of variants are not equal. That means determining of return of investment by intellectual capital is in accordance with financial patterns.

While the most specification degree is for intellectual capital in accordance with 2nd and 3rd patterns and the lowest is for 4th one. Also the findings reveal that the validity of mentioned relation among first, second and third patterns is positive and it is negative for 4th pattern.

4.2 Testing of Major Hypothesis

4.2.1 The Results of First Major Theory Test:

Following tables show the obtained results of testing the first major Hypothesis:

Model Summary (b)

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	DF1	DF2	Sig.F Change	
1	.733(a)	.537	.475	5904703193003	.538	8.535	3	22	.001	1.388

a predictors: (Constant), Q4,Q1,Q3

b Dependent Variable: Q5

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Coefficients (a)

Model	Un-standardized Coefficients		Standardized Coefficients	T	Sig
	B	Std. Error	Beta		
1 (Constant)	304936.848	126836.024		2.404	.025
Q1	.007	.011	.194	.616	.544
Q3	.010	.006	.545	1.735	.097
Q4	.000	.000	-.082	-.566	.577

a Dependent Variable: Q5

The results of testing the major first theory show that any intellectual capital variant based upon 2nd pattern is depending upon Partial Correlation test due to the meaningful of Collinerarity statistic and would be extracted from the model and the remained will stay in it. Secondly R2 is equal to 0.538. It means that about %54 of changes are explained in return of investment and by intellectual capital changes.

Thirdly the sig. results of t test of indirect theories and the results of t test of major one show that there is a meaningful relation between intellectual capital and return of investment. As a result it is possible for confirm major theory about considered companies. Also the results of this paper is adapt with finding Garcia & matiner (2007), Anvari Rostami (2005) and Nikoomaram & Yari (2008).

4.2.2 The Results of 2nd Major Hypothesis:

Upon consideration of the results of indirect theories, there are different proofs that there is a meaningful relation between the calculated intellectual capital in four-fold pattern with ROI. The results of R2 may confirm this matter.

4.2.3 Main results:

The results show that we can use intellectual capital as a proxy ROI for performance assess ment. Because it is elements of value creation in financial capital also measuring financial risks and operation of comparies.

5. Conclusion

Intellectual capital includes in organizational intangible assets in knowledge time. It is a phenomenon based upon decision making, evaluation of function and analysis of investment in an applicable & economic form. All discussed theoretical aspects which have been discussed in the article are necessary & enough proofs for introducing of intellectual capital in knowledge-base economy. All discussed and presented models in measuring of intellectual capital are some important subjects in the field of intellectual capital. Any good understanding of the relation of intellectual capital and its three-fold dimensions and its dealing with financial capital makes a great organizational value for it. Pursuant to the scientific goal of this article for determining of theoretical discussion and further application this article intends to find a relation of intellectual capital based upon financial pattern and return of investment. According to the results, firstly there is a meaningful relation between intellectual capital and return of investment according to the first, second and third

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financial pattern. Secondly, the validity results of model for indirect first, second and third theories is positive and for the 4th theory is negative and generally is positive for major theory. Thirdly, the results show that there is a difference between the value of calculated intellectual capital and in accordance with four-fold patterns.

Therefore, it is necessary to pay attention to this matter and to use a pattern in all discussion with the most meaningful relation with ROI. This is because of its usefulness in further measuring of function and evaluation of shares. These results show that all active pioneers of capital market and users of financial information may consider intellectual capital as an important variant in any decision making for purchase of shares and evaluation of function. Also the results of research records show that all findings of this research are in compliance with the results of research made by "Tan, Plowman and Hankok" in Singapore and " Boom, Silverman" and the research of Garicia Martines at Spain and the research of Mack Pierson and Paik about function & research by Anvari Rostami and Asghar Nejad and Nikoo Maram and Yari in Iranian Capital market. This is a sign of paying attention to it for any decision making and evaluation of business function. Also we propose to all future researches to test any relation between intellectual capital based upon other measuring models rather than this article with different subjects including economic value added and other indexes based upon the value, type of company either from growth and/or value and type of shares and accounting, financial, economic, human and business points of view.

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