

*Full Length Research Paper*

# The effect of any relation between intellectual capital based on financial patterns and economic value added for measuring business of accepted companies in Iranian Stock Exchange Organization

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**Value creation and applying of organizational goals are new paradigm in business. For profit continuity and creation of new wealth, all economic agencies may pay special attention to this phenomenon and enter into operational value chain. In this article, we tested the relation between intellectual capital and economic value added as the modern index for measuring the function in the framework of value creation thought. It was based upon management by Ethiner and Larker (2003) for all accepted companies in stock exchange companies for a 5-year period (2004 to 2008). From applicable goal and manner of performance, the research method of this study is explanatory – measuring based upon combination. In order to test any theories, we used T test and to estimate any regression model parameters we used minimum squares. We extracted all research data from financial statements and financial reports available in the archive of Tehran Stock Exchange Organization. The intellectual capital was measured according to four-fold financial patterns. According to the results, it was revealed that there is no meaningful relation between intellectual capital and economic value added. This relation is negative from validity point of view of regression model. Also, the results may reveal that there is no equal severity that means changes of economic value added out of intellectual capital on four-folded patterns.**

**Key words:** Intellectual capital, value creation, economic value added, value based management, business, performance assessment.

## INTRODUCTION

Recent changes in business and ever-increasing needs of managers and economic pioneers in information caused a fundamental change in points of view and managerial methods. One of these changes is a modern paradigm titled "value and value creation". Management thinking based on value and introducing of modern

indexes (economic value added) for measuring of function are the other events of decade of knowledge and a new economic attitude with the title, "Economy based upon knowledge".

Value and value creation, as a new-coming phenomenon, has a direct relation with other phenomena such as intellectual capital. This is because the value of organizations includes intellectual and financial capital. Also, paying attention to different indexes is important for measuring of function necessary for evaluation and inevitable duty of special and effective management of

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economic agencies. The attitude of value added and economic value added model and its relation with intellectual capital in this process is very important.

By specifying integrated scientific bases in relation to the subject of the study (scientific goal), the current article has paid attention to any relation of intellectual capital with value added for measuring the function of the applicable goal in order to find enough proofs for answering all research questions and further problems. Then, it is possible to reveal necessary attention to intellectual capital in any decision making and evaluations. This article includes 4 major parts: scientific bases and history of studies, methodology, analysis of data and testing the theories and conclusion along with submission of proposals.

## LITERATURE REVIEW AND BACKGROUND

### Intellectual capital

Intellectual capital is one of the most important subjects due to its role and effects in decision making, investing, risk analysis and measuring of function by creation of Infra-information decade-the Age of Knowledge.

According to Andriessen (2004), all the organizations may consider intellectual capital for different goals such as: 1) Betterment of internal management, 2) betterment of reporting to the outside of organization and other beneficiaries, 3) transactions of this capital and 4) legal reasons for betterment of accounting.

There are different descriptions of intellectual capital in different context and researches. The following are some samples of the said relation:

Edvinsson et al. (1997) believe that intellectual capital is a set of information and applicable knowledge for value creation in an organization. Marr (2004) considers intellectual capital as a set of knowledge-based assets belonging to an organization which may lead towards organization competition by increasing the value for key beneficiaries of the organization.

Swart (2006) introduces the intellectual capital as knowledge for further values. It may change into wealth and values and further value creation.

According to researches, it was revealed that intellectual capital management in knowledge based agencies would be applied with two different attitudes.

The first one is based upon any increase of knowledge reserves for further development and long-term benefits. The second attitude resulted from economic theories with intellectual capital as an economic asset in its framework. The role of intellectual capital has been highlighted from the point of view of value creation paradigm. Accordingly, it is necessary to pay attention to both dimensions of intellectual capital and financial capital in calculation of organizational value. Intellectual capital includes three basic dimensions such as: 1) Human capital, 2) structural

(organizational) capital and 3) customer capital.

Anvari and Rostami (2003) consider in a research that the financial capital (value) is the central and common point of all three-fold dimensions.

### Intellectual capital measuring models

There are wide ranges of research on measuring intellectual capital. It is possible to classify all presented methods and models in four groups such as direct intellectual capital models (DIC), market capitalization models (MCM), return on assets methods (ROA) and score card methods (SC).

Regarding the considered economic attitude that is economic value added, this article intends to consider all intellectual capital models from the point of view of return of investment group and based upon considered economic patterns. Firstly, it is in compliance with research goals. Secondly, it is the economic patterns of development and completion of financial patterns and related accounting with output rate of investment. It also includes shareholders' equity and capital output rate, which in addition to benefiting from financial patterns for calculation of intellectual capital, may use different measuring models of intellectual capital based on economic patterns. This includes economic value added for its better understanding.

The economic value added model is one of the output models for measuring intellectual capital introduced by Stewart in 1991. At first this model was applied as an index for measuring internal function and evaluating the effectiveness of applying relevant investments in companies.

But by its development and effectiveness, it was used with a more complete form in measuring financial management. Generally, it is possible to consider economic value added as the result of comparing both concepts of "capital output" and "costs of capital output creating factors". According to the concepts of value added the base of any value creation for shareholders means "Maximization of any difference between market value of company and book value of shareholders capital". It is the real meaning of market value added and/or current economic value added in compliance with one of the descriptions of intellectual capital based upon the idea of Q-Tubin; that means the difference between both values.

In addition to the economic value added model for measuring intellectual capital, it is possible to point out to another model with the title, value added intellectual coefficient (VAIC) based upon the value added attitude which was introduced by Ante Pulic in 2000. It is possible to calculate the coefficient of capital value added, human capital value added and structural capital value added by the use of financial/ economic rates.

In his research, Sveiby (1998-2001) has recognized all measuring patterns of intellectual capital as seen in Table 1.

**Table 1.** Measuring methods of intellectual capital.

<b>Pattern</b>	<b>Researcher</b>	<b>Attitude</b>	<b>Description of measuring method</b>
Innovation registration right	Bontis	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 (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.
Value researcher	Andrisen and Tebsen (1998)	DIC	Value calculation is through recognition of five types of intangible assets: 1) Primary assets inventories, 2) skills and additional knowledge, 3- Social values and orders, 4) technology and absolute knowledge, 5) major and managerial processes.
Intellectual assets evaluation	Sullivan (2000)	DIC	It is a method for measuring of intellectual ownership value.
Total evaluation	Anderson and Mack Lin	DIC	It is a plan for benefiting from reduced monetary currencies and for re-evaluation of accidents effects on programmed activities.
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) and 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.
Determined market value by investing	Standfild (1998)	MCM	It is possible to interpret real value as the market value of assets and divide it into tangible capital, real intellectual capital (non-movable) and intellectual capital corrosion and fixed competitive advantage.
Market value against book value	Stewart (1997) and Looiti (1998)	MCM	It may consider the intellectual capital in difference between market value and its registered value. Market value = registered value + intellectual capital.
Accounting and 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 and allowances).

Table 1. Contd.

Evaluating of human capital	Libowitz and 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.
Calculated intangible value	Stewart (1997) and Looiti (1998)	ROA	It may calculate the return of physical assets additions. Then it may consider the result as a base for determining the return rate f intangible assets.
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.
Intellectual value added coefficient	Polik (1997)	ROA	Any measuring the amount and output of intellectual capital and created value due to the intellectual capital is based upon three major elements: 1) Applied capital, 2) human capital and 3) structural capital.
Human capital intelligent	Jack (1994)	SC	Like accounting and pricing of human resources, it may collect and measure human capital indexes.
Board of advantages of value chain	Loo (2002)	SC	It is a matrix of non-financial indexes in three logical processes such as: Innovation and learning, implementation and commercialization.

### Value and value creation and thinking based upon value

With their wide scope of research, Rahnamay et al. (2007, 2008, 2009) believe that "value is a deep, fundamental and wide meaning with a long-term history. But it has been presented in scientific literature with a new attitude, inspiring the meaning of life-making. It may provide a meaning of human greatness as the base of life and inevitable principles of intelligent business and value creation. It may come from social gate and managerial thought of business. Then, it may search its end in finding the special position, group, organization and society. It is legal to have value and value creation base, scientific and practical attention to human beings and satisfying their needs. The value of considered concepts of life is in its all dimensions for which is necessary to be considered. More important is the organizational

acceptance of behavior, speech and works in the framework of life ethics more than before.

The term "competition" has another meaning; and the health, truth and acceptance of the interests of all beneficiaries are different meaning origins of these changes. Value is the accepted reality of life upon which all different aspects of life may grow and complete. Personal, social and economic relations are accepted realities of life based upon value.

Value, as a form, is a key word with its practical wideness in social and economic life and the relevance of its effects. This may describe different aspects such as social, economic, financial, accounting values etc.

Such a word shows a wide scope of meaning with relevant relations to different fields and specialties. Value is the inevitable necessity of a person thinking of success. It is the real aspect of life especially in economic business. This is

because of its effects on survival and business life continuation. Then we have wealth creation, a suitable field of fixed development.

Lends (2005) points out a phrase of an Arabian bank clerk for providing a clearer meaning of value and wealth creation and says: "We have money but we are not rich. Richness means knowledge, skill, specialty, knowhow and work creation (value creation). We are like a baby who has inherited a lot of money but nobody teaches him how to expend his money. If you do not know how to use you money, you are not a rich person".

The above statement is true of most counties and the owners of raw material and natural wealth. Most important is a clear specification of wealth in job creation and creating of necessary values. This is because job creators are the real wealth creators with required innovation for accepting any risks. They know how to use money and resources with their own knowledge, skills and

specialty. They consider required management as the necessary provision for business which will lead to wealth creation.

Lends (2005) says: "The values are really our obligations for reflection of what is good and what is bad. These are criteria with which persons may compare and judge their actions with the reactions of others".

Therefore, it is the criterion of judgment. Then it could be considered the criterion of evaluation for revealing the results of value creation. As a result, it is possible to name it a goal. This is because of the reality that values are different criteria informing us which goals are important for people. For this purpose, Brian (2006: 45) says: "Life is a subject of the interior. As a result, your personality is based upon your values. Your values make you as they are. Every work you do would be organized in accordance with your values. More information about your internal self-conscious values may lead to more effectiveness of your external functions. Your external functions specify your goals". He continues: "Aristotle believed that the final goal of and the ideal human life is finding luck. It is reaching the highest level of luck where you have parallel internal values with all in your external position. It is necessary to have harmonized goals in compliance with your values. Then it is possible to say that any specification of our own values is the starting point of valuable goals".

Value creation means creating of value out of humanistic and managerial works along with wealth. This is in compliance with the logic and researches made by Ardebili (2001) with the title: "Value means a special meaning for different conditions and phenomena; accordingly economic values are those values created by different tools and through time. Then the relevant results are measurable and reported in the form of accounting values".

There is a close and multi-purpose relation between value creation and business success. In this paper, the researcher intends to specify the value and value creation from economic business point of view. As a result, the base and criteria of value creation are meeting the customers' expectations in the form of luck of all beneficiaries.

All changes in this field mean value creation and value chain and its concepts were the subject of different researches made by Ethiner and Larker (2002) with the title of management based upon value (I). This item and economic value added model may attract the interest of organizations in years to come.

Ethiner and Larker (2003) have considered different criteria based on economic value as one of the major three subjects for further researching. They found long-term benefits in different criteria based upon economic value. They may carry out a research on any success of companies which may accept managerial thinking based on value in comparison with the companies in contrast.

Teemu et al. (2003) started to apply management

based on value and any researches made by other thinkers. For example Valaei (2003) noticed that success rate is more in the companies that benefit from economic value added model and is a criterion for compensating motivation against other companies.

Klayman (2003) focused on "economic value added" and found out they have better market share than other industrial competitors."

Management based upon value, introduced by Ethiner and Larker (2003), has different principles for introducing its framework and it shows different applications of this thought as follows:

- (1) The general goal is to increase value of shareholders.
- (2) Strategy selection and organizational plans are in compliance with selected subjects (Determining the special organizational goals)
- (3) Strategy development and selection of organizational plan for value creation
- (4) Determining the value of motivations
- (5) Evaluation and successful work programming and management of organizational evaluation means management of activity plan, selecting the results and regulation of the goals.
- (6) Evaluation of function

In addition to all the aforementioned principles which are assumed in the format of executive steps, Ethiner and Larker (2003) have also proposed firstly the practical and executive guideline of integrated index of operation measurement (balanced score card), which is the same as managerial thought based upon value.

Secondly, they presented different accounting systems of strategic management and believe in their combination. It means to combine balanced score card with strategic management accounting. Furthermore, it is possible firstly to evaluate the value of shareholders and secondly present managerial applications based upon value in the following fields:

- 1) Goal making
- 2) Evaluating and measuring the function
- 3) The base of payment of allowance and compensation of services
- 4) Decision making and its betterment
- 5) Selecting the strategies and strategic decisions
- 6) Work programming and executives' decisions

Table 2 shows the obtained results of applying mentioned six-fold applications and any management solution based upon value.

There are various researches on applying value creation and business success. They include the researches made by Winther and Tobia (2002) on value creation and optimization of profit; by IT Government Institute (2005) on value creation and function management in developed companies; by Weissernrieder (1997) on application

**Table 2.** A summary of management solution based upon value for decision making and management control

<b>Different dimensions used for management based upon value</b>	<b>The solution of management based upon value</b>
Strategies and management control goals	Maximization of shareholders wealth, economic value added (or value motivation) as the organizational goal. Value creation strategy through possible solutions, designing of considered strategy that means reliability against commercial units of strategic programming.
Measuring of function	Benefiting from economic profit index and value motivations from up to down for measuring the function.
Goal making	Betterment of current level of economic value added. In this situation, the minimum acceptable level of economic value added is zero along with compliance goals with relevant value motivations.
Compensation o services (allowance)	Paid advantages in accordance with any change in economic value added, delivery of shares to master managers with increasing the level of considered goal based upon financial financing.
Effectiveness on decision making and strategic decisions	Calculation based upon economic value added. Obtaining of strategic investing and re-invest in commercial units.
Operational decisions	Considering the balance sheet and profit and loss statement. Betterment of investing and efficiency of capital flow management.

of value creation and value in pricing of product.

### **Economic value added**

According to the idea of financial economists, the economic value added is named as economic profit and/or remaining interest. It is described as the net operation profit after deduction of tax and financial costs. In order to calculate the financial costs it is possible to use average coefficient of Capital costs rate (WACC) in applied capital; that means the total capital in book value. Economic value added is an index based upon management and value for controlling total created value in a business. It is a common language in an organization when the growth of sale and market share is considered for any strategy writing. With it, it is possible to determine the current net value and internal output rate in any investment. Economic value added has various applications including internal and external usages.

The most important internal applications of economic value added are:

1) Managerial tools for operation measurement (Chow, 1997), 2) Integrated criteria of output measurement (Piter, 2003), 3) Ownership specifying tools with company's management (Rojerson 2003), 4) Compliance tools of costs with income (Rojerson and Lefkotis, 1999) and the most important external applications of it are: 1) A tool for investment (Tool, 1998; Lefkotis, 1999), 2) A

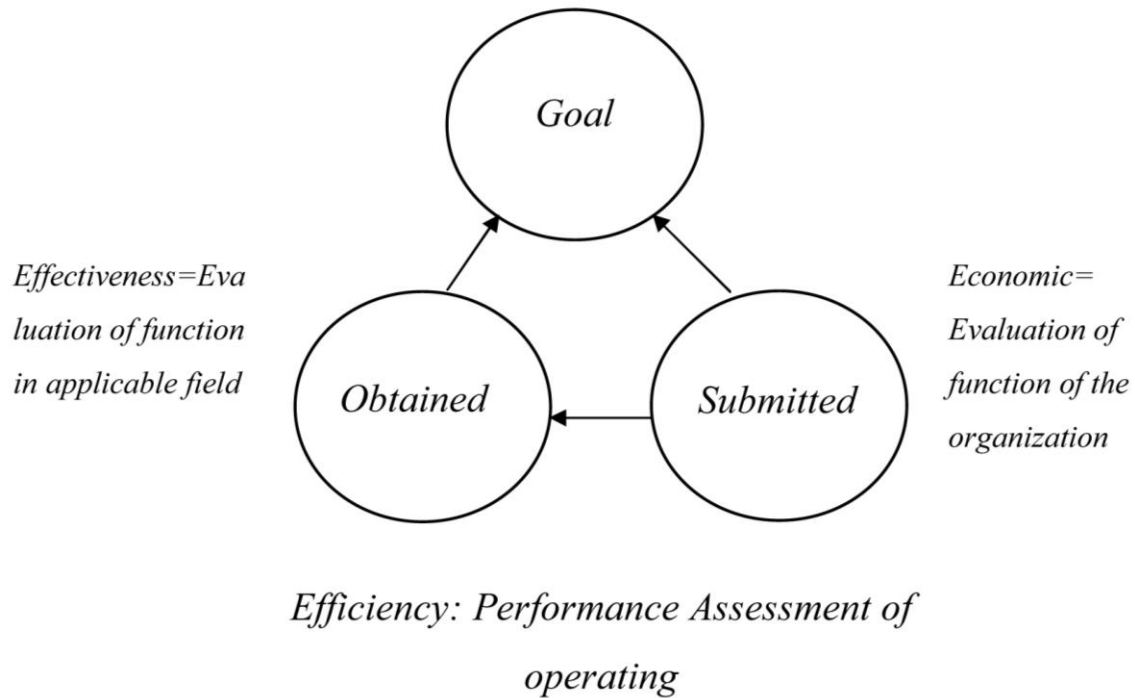
criteria for estimation of share price (Titel, 1997), 3) Measuring tools of value creation (Stern, 2001), 4) A framework for financial management (Mors, 2001) and 5) An effective framework on organizational culture and upgrading the work quality of occupants (Moris, 2001).

### **Measurement of operation**

The real meaning of operation evaluation in operational field includes the applicable field and/or relevance of effectiveness. Alirezaei et al. (2003) presented the relation of applicable concepts and economic situation with operation measurement meaning in Figure 1.

In order to evaluate the function we should consider various goals; the most important of them in accordance to the researches of Mehrgan (2004) are: 1) Continuous control of affairs in organization and establishment of utilization management, 2) recognition of weak/power points of the organization, 3) optimization of decisions, 4) optimization of allocation and consumption of resources, 5) Upgrading the reliability of programs, 6) upgrading the facilities of organization.

Any consideration of measuring models of intellectual capital shows that operation measurement includes different classifications out of 4 common classifications such as "score card methods" including balance score card (BSC) of Kaplan and Norton (1992), Holistic accounts model (HA) of Romtoll Group (1995), Skandia Navigator Model of Edvinson and Malone (1997),



**Figure 1.** Efficiency: Performance Assessment of Operating.

intangible assets' monitor (IAM) of Sveiby (1997) and intellectual capital index (ICI) of Roos et al. (1997), value creation index (VCI) of Beum et al. (2000), knowledge audit cycle (KAC) of Marr and Schiuma (2001), value chain scoreboard (VCS) of Baruch (2001), measurement model for knowledge assets and intellectual capital (MMIKAIC) of OECD (2001), Intellectual Capital Rating Model of Edvinsson (2002), intellectual capital dynamic value (IC-dval) of Bounfour (2003), measuring and accounting IC (MAGIC) of European commission (2004) and business intelligent model.

#### **Determining the relation of intellectual capital and business function measurement**

Optimization of function level in companies will be performed by developing and creating special resources, which is the same as different sets of knowledge in it and as sign of intellectual capital. Any application of it needs high dependency in investment and developing of special resources which may apply innovations and use knowledge in their business activities. Any consideration of scientific basis shows that business function measuring index, evaluation of intellectual capital with assets output process are in the framework of similar value model of economic value added with a close and inseparable relation. It is possible to use intellectual capital index as a replacing criteria for economic value added and for evaluation of the function.

#### **Background**

Most researches in this field are focusing on relevant reports based on knowledge and the other group may consider public sections which are related to intangible assets. Chen (2005) benefits from Games theory for evaluation of intellectual capital and Ketisa has considered the relation between intangible assets and intellectual capital. Hunt and Sivoni endeavor to measure knowledge and assets based on knowledge. Betiss et al. (2005) tried to investigate the real meaning of output rate of intellectual capital.

In a research under the title of Intellectual capital in Hotel Industry in Slovenia, Rudz and Mihalik (2007) considered the effect of intellectual capital on the operation. The results show a positive meaningful relation between the dimensions of intellectual capital and financial function. Also the most relation was related to customer (communicative) capital.

According to the researches made by Chang (2007) a history was presented including all other researches.

Yang et al. (2006) made different researches on any relation of intellectual capital parts with value/operation of special advanced industries of Industrial Technology Researches Institute of South Korea. The results show a positive and meaningful relation between different parts in intellectual capital and function of companies. Furthermore any increase of intellectual capital depends upon the value creation process and their strategic restoration in the organizations.

Johansson et al. (2005) presented an analytical model of intellectual capital based upon value creation process and considered the role of intellectual capital in any value creation process at organizations.

In a research titled, measuring and sampling of intellectual capital, Nerbardemar (2004) concluded that any organizational recognition of abilities and value creation process of organization are so much important before any sampling of intellectual capital is done.

Herman et al. (2003) compared intellectual capital measuring models in accordance with system active time data.

Roodposhti and Hemmati (2009) determined the relation of intellectual capital with modern variants in a research titled "measuring any relation between intellectual capital and modern variants based upon value creation". The findings show a relation between intellectual capital and market value added. But it is impossible to obtain any results about its relation with economic value added and value added of the shareholder.

## RESEARCH METHODOLOGY

The current research method is based on explanatory –measuring for performance. Data were collected from the library. Fisher test was used for measuring the validity of models, T test for examining the meaningful relation between variants (theories test) and  $R^2$  Durbin-Watson tests for estimation 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 in this research. The followings are the different specifications:

1) Continuous activity within 7 years of study, 2) they should not experience any losses and with no negative shareholders equity, 3) there should not have a fiscal year change, 4) Their fiscal year should be ending on 20th March, 5) All required data for calculation of intellectual capital should be provided in accordance with specified financial methods in research, 6) They should not be included in investing industrial companies.

### Research variants and calculation method

Intellectual capital: It means any efforts for effective benefit from current knowledge and intangible assets for creating a value.

Financial pattern: It means economic activity that may show the company's function.

Value (financial capital): It means economic value added (EVA).

The followings are the used methods and formulations for calculating the intellectual capital:

1- $I_{c1}$ : In this method it is possible to calculate intellectual capital from the following relation:

$$I_{c1} = \frac{R_C - R_1}{WACC}$$

Where:

IC: Intellectual capital, RC: company's income in T,  $R_1$ : average income of current companies in similar industry through T, WACC: weighted average of capital costs which was about 15.5% in this

research and as WACC.

2- $I_{c2}$ : In this method it is possible to calculate intellectual capital from the following relation:

$$I_{c2} = (\mu_c - \mu_1) \times T_A$$

IC: Intellectual capital, RC: Company's income in T,  $\mu_1$ : Average output of current companies in similar industry through T,  $T_A$ : The average of company's assets through T (Total value of assets)

3- $I_{c3}$ : In this method it is possible to calculate intellectual capital from the 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 output addition of company against the average output of industry through T

$T_A$  = It is the average of company's assets through T,  $WACC_\mu$  = It is the weighted average of company's capital through T,  $I_{nfi}$ : The average inflation rate through T (Within first to third three years, 14.5% and in fourth and fifth years equal to 16.5% according to the Central Bank of Iran rate.

4- $I_{c4}$ : In this method, the value of intellectual capital is as follows:

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

$MV_\mu$ : Company's average market value within T,  $BV_\mu$ : Company's average book value within T,

$I_{nfi}$ : Average inflation rate within T for years 2004 up to 2006 with a rate of 14.5% and for 2007 up to 2008 it is 16.5% according to the report of Central Bank.

### RQI calculation method in this research

In order to calculate EVA, we benefit from the following formulation: Economic Value Added = Total capital with book value of the beginning x weighted average of capital rate – net operational profit after tax deduction.

### Research hypothesis

The following hypotheses have been presented in theoretical framework used for answering any research questions and tests:

#### Major hypothesis

- 1) There is a meaningful relation between intellectual capital and Economic Value Added.
- 2) There is a meaningful difference between different calculation methods of intellectual capital based upon financial patterns with ROI.

#### Indirect hypothesis

- (1) There is a meaningful relation between calculated



**Table 3.** Model summary<sup>a</sup>.

Model	R	R Square	Adjusted R Square	Std. error of the estimate	Change statistics					Durbin-Watson
					R Square change	F Change	DF 1	Df 2	Sig. F change	
1	0.335 <sup>a</sup>	0.113	0.076	9.68172	0.113	3.042	1	24	0.094	1.671
Coefficients <sup>c</sup>										
Un-standardized coefficients			Standardized coefficients			T		Sig.		
B			Beta			T		Sig.		
1 (Constant)			13.769	1.964	0.335	7.011	0.000			
Q1			0.000	0.000		1.744	0.094			

<sup>a</sup>predictors: (Constant), Q1, <sup>b</sup>Dependent variable: Q6. <sup>c</sup> Dependent variable: Q6

intellectual capital with  $I_{c1}$  method and EVA.

(2) There is a meaningful relation between calculated intellectual capital with  $I_{c2}$  method and EVA.

(3) There is a meaningful relation between calculated intellectual capital with  $I_{c3}$  method and EVA.

(5) There is a meaningful relation between calculated intellectual capital with  $I_{c4}$  method and EVA.

## TESTS AND RESULTS ANALYSIS

In order to further analysis of theories, we use regression model in this research. We used Durbin-Watson for testing auto-regression, for testing meaningful relation of regression we used Fischer test and in order to test meaningful relation of considered variants we used T test.

According to the results of D-W test, it was revealed that there is no more relation between the remaining amounts of auto-regression. In other words, there is no auto-regression in estimation model of auto-regression. The results of meaningful test of regression model, and by the use of F statistics at ensured level of 95% in which the meaningful level is lower than 0.05, it shows that there is a meaningful relation.

### Testing of indirect hypothesis

The following tables are a summary of major results of testing the relation of variants (Testing of indirect theories) separately for indirect theories.

#### *The results of 1st indirect hypothesis*

According to the results, it was revealed that firstly  $R^2$  is equal to 0.113. This may show that about 11% of changes in economic value added would be specified by changes of intellectual capital and in accordance with first pattern (Table 3).

Secondly the results of t test provide proofs that meaningful level is more than 0.01 and at 99% level, there is not a meaningful relation between intellectual capital by 1st method and economic value added rate. Therefore it is impossible to confirm first indirect hypothesis.

#### *The results of second indirect hypothesis test*

According to the results, it was revealed that firstly

$R^2$  is equal to 0.050. This may show that about 5% of changes in economic value added would be specified by changes of intellectual capital and in accordance with second pattern (Table 4).

Secondly the results of t test provide proofs that meaningful level is more than 0.01 and at 99% level, it is impossible to confirm 2nd method for all considered companies. It means that there is not a meaningful relation between intellectual capital in 2nd method and economic value added.

#### *The results of third indirect hypothesis test*

According to the results, it was revealed that firstly  $R^2$  is equal to 0.05. This may show that about 5% of changes in economic value added would be specified by changes of intellectual capital and in accordance with third pattern (Table 5).

Secondly the results of t test provide proofs that meaningful level is more than 0.01 and at 99% level. As a result it is impossible to confirm third indirect theory, which means there is not a meaningful relation in accordance with third pattern with economic value added.

**Table 4.** Model summary<sup>b</sup>.

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	0.225 (a)	0.050	0.011	10.014	0.050	1.276	1	24	0.270	1.581
<b>Coefficients (c)</b>										
<b>Un-standardized coefficients</b>										
<b>Standardized coefficients</b>										
	<b>B</b>	<b>Std. Error</b>	<b>Beta</b>	<b>T</b>	<b>Sig.</b>					
1 (Constant)	13.953	2.057	0.225	2.785	0.000					
Q2	0.000	0.000		1.130	0.270					

<sup>a</sup>Predictors: (Constant), Q2, <sup>b</sup>Dependent variable: Q6. <sup>c</sup>Dependent variable: Q6.

**Table 5.** Model summary<sup>b</sup>.

Model	R	R Square	Adjusted R Square	Std. Error of the estimate	Change statistics					Durbin-Watson
					R Square change	F Change	DF 1	Df 2	Sig. F change	
1	0.224 <sup>a</sup>	0.050	0.011	10.0157	0.050	1.269	1	24	0.271	1.581
<b>Coefficients<sup>c</sup></b>										
<b>Un-standardized coefficients</b>										
<b>Standardized coefficients</b>										
	<b>B</b>	<b>Std. Error</b>	<b>Beta</b>	<b>T</b>	<b>Sig.</b>					
1 (Constant)	13.952	2.058	0.224	6.779	0.000					
Q3	0.000	0.000		1.126	0.271					

<sup>a</sup>Predictors: (Constant), Q3, <sup>b</sup>Dependent variable: Q6. <sup>c</sup>Dependent variable: Q6.

**The results of fourth indirect hypothesis test**

According to the results, it was revealed that firstly R<sup>2</sup> is equal to 0.051. This may show that about 5% of changes in economic value added would be specified by changes of intellectual capital and in accordance with fourth pattern. The remaining are related to other factors which we did not consider anymore (Table 6).

Secondly, the results of t test provide proofs at 99% level that the significant 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 a meaningful relation between intellectual capital in 4<sup>th</sup> method and economic value added.

Generally, the results of indirect theories show any lack of meaningful relation for first, second and third indirect theories and fourth theories, but the severity of variants are not equal. That means the highest rate of intellectual capital is in accordance with first pattern and the lowest is

related to second, third and fourth patterns with equal amounts. Furthermore the obtained results show a positive relation from validity of all four patterns.

**Testing of major hypothesis**

**The results of first major hypothesis test**

Table 7 shows the obtained results of testing the

Table 6. Model summary<sup>b</sup>.

Model	R	R Square	Adjusted R Square	Std. error of the estimate	Change statistics					Durbin-Watson
					R Square change	F change	DF1	Df 2	Sig. F change	
1	0.227(a)	0.051	0.012	10.0093	0.051	1.301	1	24	0.265	1.587
Coefficients <sup>c</sup>										
Un-standardized coefficients				Standardized coefficients			T	Sig		
B		Std. Error		Beta						
1 (Constant)		13.987	2.046		0.227	6.837	0.000			
Q4		0.000	0.000			1.141	0.265			

<sup>a</sup>Predictors: (Constant), Q4, <sup>b</sup>Dependent variable: Q6. <sup>c</sup>Dependent variable: Q6.

first major theory. The results of testing the major first hypothesis show that any intellectual capital variant based on the 2nd pattern depends on partial correlation test due to the meaningful collinearity statistic; and it would be extracted from the model and the remaining will stay in it. Secondly,  $R^2$  is equal to 0.200. It means that about 20% of changes are explained in economic value added and by intellectual capital changes. Thirdly the results of t test of indirect theories and the results of t test of major one show that there is not a meaningful relation between intellectual capital and economic value added. As a result it is impossible to confirm major theory about considered companies.

### ***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  $R^2$  may confirm this matter.

## **DISCUSSION**

Value creation is a new-coming phenomenon of economy knowledge of the third millennium. Value creation is one of the major strategies of agencies. There is a different position for intellectual capital in this age. Intellectual capital is one of the intangible organizational assets in this age of knowledge.

It is a phenomenon in which it is possible to have decision making, operation evaluation and analysis of investment in an applicable and economic form. All discussed theoretical principles in this essay provide enough and necessary proofs for introducing intellectual capital in economy knowledge and basics of value creation, which is necessary to be considered. All discussed and presented models in measuring of intellectual capital are important subjects in the field of intellectual capital. It is important and necessary to have a good understanding of the relation of intellectual capital and all its three-fold dimensions and also its dealing with financial capital in organizational value creation. Management based

upon value is included in thoughts of this age of knowledge. This is the major paradigm of business in the third millennium. Applying VBM thinking is directly related to the role and effect of different phenomenon. Intellectual capital is one of the most important of these variants which may be calculated in accordance with the results of the company's value and applied in operation measurement agencies. With a scientific goal, this article intends to determine theoretically all discussions and any relation of intellectual capital based on financial pattern and economic value added. According to the results, it is obvious that firstly there is no meaningful relation between intellectual capital with economic value added in accordance to the four-fold financial pattern. Secondly, there are positive results of validity model for indirect, first, second, third and fourth theories. Generally it is positive for major theory. The obtained results show that all pioneers of capital market and users of financial information may consider intellectual capital as an important variant in their decision making for purchasing of shares and evaluating the operation of considered

Table 7. Model summary<sup>b</sup>.

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	0.447 <sup>a</sup>	0.200	0.091	9.6027	0.200	1.830	3	22	0.171	1.786
Coefficients <sup>c</sup>										
Un-standardized coefficients				Standardized coefficients				T	Sig.	
	B	Std. Error		Beta						
1 (Constant)	13.255	2.063				6.426	0.000			
Q1	0.000	0.000		0.648		1.569	0.151			
Q3	0.010	0.000		-0.332		-0.803	0.430			
Q4	0.000	0.000		0.249		1.304	0.206			

<sup>a</sup>Predictors: (Constant), Q4,Q1,Q3, <sup>b</sup>Dependent variable: Q6. <sup>c</sup>Dependent variable: Q6.

companies. Also, we propose to all future researchers to test any relation between intellectual capital based upon other measuring models, unlike this article that has different subjects including return of investment, return of shareholders' equity 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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