

## Sources of Intellectual Capital and Investigating the Effects of Intellectual Capital on Economic Growth in Iran

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### ABSTRACT

The theme of Intellectual Capital in economic have received a great amount of attention in terms of theoretical and applied research over the last three decades. Since the seminal work by Edvinsson and Malone (1997), Intellectual Capital: Realising Your Company's True Value by Finding its Hidden Brainpower has become a topic of great concern. This paper reviews the available literature on Intellectual Capital taking into account possible economic growth. Additionally, the paper provides a survey of the empirical studies and an application in order for readers to be able to grasp the underlying problems that Intellectual Capital with economic growth are currently facing. The results showed that there is a significant relationship between intellectual capital and economic growth and there is a non-significant relationship between intellectual capital and market value. It is obvious that in Iranian trade, sources of human development is one of the significant generally factors in successfully economic.

**Key words:** Intellectual Capital, Market Value, Financial Performance, Economic Growth

### Introduction

Scientists and researchers in different courses such as Sociology, Economy and management believe that some basic fundamental movements have occurred in societies and countries. These movements (knowledge and learning) are the bases and axes of changes [1]. Related strategic knowledge and concepts are considered as the main principle and component to survive the organization and to keep its competitive position [2]. Mack Alveri believes that knowledge and knowledge employees are key principles of organization to gain sustainable development, and are the major future competitive sources of organization. The extant literature further affirms that the firm's competitive advantage and performance are largely influenced by its intellectual capital [3]. Moreover, Marr [4] claims that knowledge management is a definite necessity for benefit and flexibility of private and public organizations. The growing interest in knowledge and intellectual capital forms one of the most exciting developments in recent economics and management studies. It builds upon a number of the earlier discussions described above, including the role of R&D knowledge, intellectual property and intangible assets. However, it should be noted that work in this area, particularly empirical testing of the emerging models, is in its infancy and research

seeking to identify various indicators or proxies is somewhat speculative [5].

The growth in the importance of intellectual capital is a result of the shift towards knowledge-based, rather than manufacturing-based production, with the implications that this has for the focus on intangible rather than tangible assets. Lynn [6] has claimed that there has been a metamorphosis from a resource and manufacturing-based economy to one in which knowledge and services are the key drivers of economic growth. Evidence of the importance of the broader range of intangible assets abounds. For example, a number of pharmaceutical companies are sold at many times the book value of their tangible assets. Similarly, the market valuation of many companies is significantly higher than their balance sheet valuations. In addition, it is argued that organizations have restructured in order to cope, increasing their agility, by eliminating hierarchies and decentralizing, in some cases creating 'spider web' or 'fish net' organizations [7].

The term knowledge-based economy stems from a fuller recognition of the role of knowledge and technology in economic growth [8]. Several characteristics define a knowledge-based economy: (1) it is focused on intangible resources rather than tangible resources [9]; (2) it has a very powerful technological driving force; i.e., the rapid growth of information technologies (IT); (3) it is stimulated by

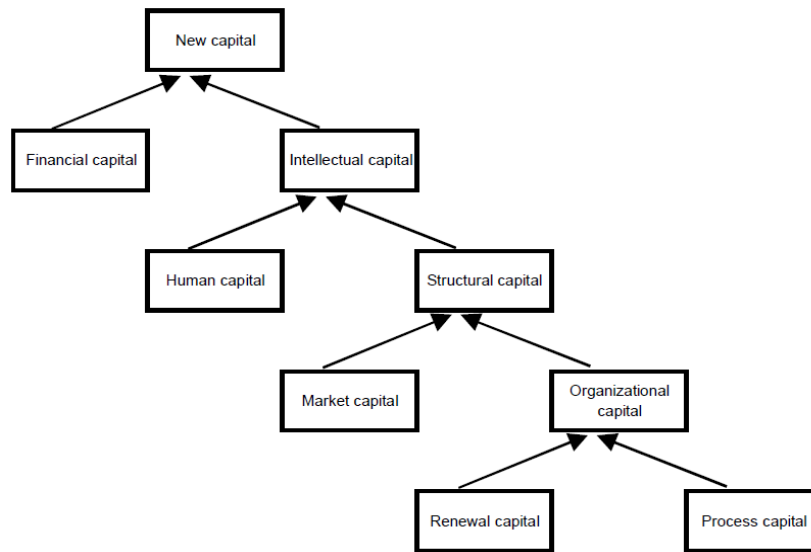
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the rapid growth of ITs with telecommunication and networking, which have penetrated all spheres of human activity, forcing the ITs to work in a new mode and creating new spheres; and (4) knowledge has become an independent force and the most decisive factor in social, economic, technological, and cultural transformation [UNECE, 2002]. In a knowledge-based economy, Intellectual Capital is a core factor, therefore, in the competitiveness of a nation, and its role has been increasing not only from a national perspective, but also in terms of individual firms. Despite the increasingly important role of intellectual capital in national performance, its importance has been recognized in only the last few years. Most countries, therefore, still assess their performance in terms of the traditional factors of production.

The model developed by Edvinsson and Malone [9] presents a clear conceptual and structural base for

Intellectual Capital. It divides it into two main categories, Human Capital and Structural Capital: the latter is further divided into Market capital (or Customer Capital) and Organizational Capital, which again is divided into Process Capital and Renewal Capital (or Innovation Capital). The multi-level hierarchy of the model is the most detailed and it is also the one most frequently used in both conceptual and measurement applications, as explained earlier. The original Intellectual Capital perspectives contained in the taxonomy of three are further refined: Relational Capital is called Market Capital or Customer Capital and is positioned as a subcomponent of Structural Capital; thus the elements are the same but their hierarchical order is different. The measurement problems that both models cause are similar however, and their applications are, in principle, close to each other [10].



**Fig. 1:** The Intellectual Capital model developed by Edvinsson and Malone [9].

Even though the E&M model offers a clear and structured understanding of the elements of Intellectual Capital, it has some serious problems from the measurement perspective. First, conceptual problems arise in choosing the indicators for the sub-categories [11], and secondly, measurement problems arise when attempts are made to form composite indexes for Intellectual Capital. One of the objectives of this study is to show the importance of effects of Intellectual Capital on economic growth in Iran. The most important goals of this study can be summarized as follows:

1. Analysis of the relationship between intellectual capital and economic growth.
2. Determining the relationship between intellectual capital and its main determinants.

3. Information about status (relative and qualitative) of components of intellectual capital in Iran.

**Materials and Methods**

*The model:*

The model proposed here is based on the model adopted of VAIC that has been previously utilized to other similar studies Firer and Williams [12], Chen [13] and Williams [14]. In a much-cited contribution to the literature, firms are divided to four sections (based on dividing traditional sector) including manufacturing and raw materials (15 firms), industrial and services (24 firms), food and beverages (12 firms) and Household goods and

personal (28 firms). In the study of Maditinos [15], this model was explained as following:

*Independent variables:*

The present study includes four independent variables Pulic [16]:

- (1) VACA, indicator of value added efficiency of capital employed
- (2) VAHU, indicator of value added efficiency of human capital
- (3) STVA, indicator of value added efficiency of structural capital
- (4) VAIC, the composite sum of the three separate indicators as value of intellectual capital

The first step towards the calculation of the above variables is to calculate value added (VA). VA is calculated according to the methodology proposed by Maditinos et. al. [15]. Second, capital employed (CE); human capital (HU) and structural capital (SC) are being calculated:

CE = Total assets\* - intangible assets

HU = Total investment on employees (salary, wages, etc)

SC = VA – HU

Finally, VAIC and its three components are being calculated:

VACA = VA / CE

VAHU = VA / HU

STVA = SC / VA

VAIC = VACA + VAHU + STVA

The use of the above measurement methodology is argued to provide certain advantages Bontis [17]:

- 1) It is easy to calculate.
- 2) It is consistent.
- 3) It provides standardized measures, thus, allowing comparison between industries and countries.
- 4) Data are provided by financial statements that are more reliable than questionnaires, since, they are usually audited by professional public accountants.

*Dependent variables:*

The present study includes two dependent variables:

- (1) Market-to-book value ratios
- (2) Financial performance

$$y_t = \beta_0 + \sum_{j=1}^p \beta_j y_{t-j} + (\beta_0^* + \sum_{j=1}^p \beta_j^* y_{t-j} F(s_t)) + u_t, \quad t = 1, 2, \dots, T \quad (3)$$

Where:

$y_t$  = The variable of interest,  $b_i$  and  $b^*_i$   $i = 0, 1 \dots p =$  Autoregressive parameters

$F(S_t)$  = A transition function allowing the model to switch smoothly between regimes which is bounded by zero

$u_t$  = A random error component believed to satisfy the assumption  $u_t \sim iid(0, s^2)$

The market-to-book value ratio is simply calculated by dividing the market value (MV) with the book value (BV) of common stocks:

MV = Number of shares \* Stock price at the end of the year

BV\* = Stockholders' equity - Paid in capital of preferred stocks

$$MBV = MV / BV \quad (1)$$

Where, MBV is the market-to-book value ratio as first dependent variable. (\*In all cases, that goodwill was included in the book value of a company of the sample, the required subtraction was conducted). The financial performance is measured with the use of three indicators:

(1) Return on equity (ROE)

ROE = Net Income / Shareholder's Equity

ROE measures organizations profitability by revealing how much profit a company generates with the money shareholders have invested.

(2) Return on assets (ROA)

ROA = Net Income / Total Assets

ROA is an indicator of how profitable a company is in relation to its total assets. It gives an idea as to how efficient the management uses assets to generate earnings.

$$MBV = VACA + VAHU + STVA + VAIC \quad (2)$$

*Methodology:*

The paper adopts the recently developed Smooth Transition Regression (STR) framework to establish the direction of causation between variables. Recent advances in accounting literature dictate that the long run relation in Eq. (5) should incorporate the short-run dynamic adjustment process. It is possible to achieve this aim by expressing Eq. (5). There are three stages for estimation of Smooth Transition Regression (STR) so that Detection model, the model estimation and Assessment Model. Generally a STAR model for a univariate time series  $y_t$  observed in  $t = 1 - p, 1 - (p-1), \dots, -1, 0, 1, \dots, T - 1, T$  is defined as follows:

The model in Eq. 1 can be estimated if the null hypothesis of constancy in parameters is rejected. This estimated model might provide information about where and how the parameters change. It is important to have the STR model in (1) as the alternative hypothesis to the null. Two forms of the transition functions given in Terasvirta are the logistic function:

$$F(0) = \left[ \left\{ 1 + \exp(-\gamma(s_t - c)) \right\}^{-1} - \frac{1}{2} \right] \tag{4}$$

And the exponential function:

$$F(0) = \left\{ 1 - \exp(-\gamma(s_t - c)^2) \right\} \tag{5}$$

A third re-parameterized version of (2) proposed by Liews [18] the Absolute Logistic transition function is:

$$F(0) = (1 + \exp \{-\gamma(|s_t| - c)\})^{-1} - 0.5 \quad \gamma > 0 \tag{6}$$

Our model is:

$$F(0) = \left[ \left\{ 1 + \exp(-\gamma(e_{t(AR(p))} - c)) \right\}^{-1} - \frac{1}{2} \right] \tag{7}$$

The LSTAR model describes an asymmetric realization, that is, this model can generate one type of dynamics for increasing growth rate of inflation and another for reductions of the rate of inflation. The objectives of this study are: First, to evaluate the forecasting performances of LSTAR, ESTAR, ALSTAR models. Second, we shall evaluate our proposed ELSTR model using the AR, LSTAR and the ALSTAR models as benchmark. We shall accomplish this task by investigating the Mean Square Error (MSE) and the robustness of this criterion is subjected to Meese and Rogoff [19] test.

Many economic and financial time series exhibit trending behavior or nonstationarity in the mean. Leading examples are asset prices, exchange rates and the levels of macroeconomic aggregates like real GDP. An important econometric task is determining the most appropriate form of the trend in the data. For example, in ARMA modeling the data must be transformed to stationary form prior to analysis. If the data are trending, then some form of trend removal is required. Strong negative numbers of unit root reject the null hypothesis of unit root at some level of confidence. The results of ADF test is displayed in Table 1.

**Results and Discussion**

**Table 1:** Results of unit root by Philips Perron test.

Variables	Level Constant	Level Constant & Trend
MBV	-13.16[000]	-14.92[000]
VACA	-16.84[000]	-15.32[000]
VAHU	-2.41[010]	-15.02[000]
STVA	-1.21[015]	-9.54[000]
VAIC	-3.02[005]	-2.88[009]

The first step in estimating STR models is determining the optimal intervals for model variables.

**Table 2:** Results of final estimation by STR model in form of Nonlinear.

Part of Nonlinear	Coefficient of $\Theta$	Quantity of t statistic	Value of probably t statistic
Constant	-0.27*	-4.14	0.015
VACA(t-1)	-0.34**	-7.11	0.000
VACA(t-2)	-0.26*	-4.39	0.012
VAHU(t-1)	0.36**	-3.21	0.021
VAHU(t)	-0.51*	-5.13	0.008
STVA(t)	0.19*	-6.26	0.001
VAIC(t-1)	-0.17***	2.51	0.031
VAIC(t-2)	-0.33*	-5.81	0.004
VAIC(t-4)	-0.22*	-5.19	0.005

\*Significant of 1 percent, \*\*Significant of 5 percent, \*\*\*Significant of 10 percent

In the first regime  $G=0$  and in the second regime  $G=1$  therefore, for first regime we have:  
 $MBV(t) = -0.27 - 0.34 VACA(t-1) - 0.26 VACA(t-2) - 0.36 VAHU(t-1) - 0.51 VAHU(t) + 0.19 STVA(t) - 0.17 VAIC(t-1) - 0.33 VAIC(t-2) - 0.22 VAIC(t-4)$

Regarding the obtained results, it was determined that variable coefficients in the estimation model for the dependent variables, i.e. economic value added, cash value added, market value added and refined economic value added are not zero (0) and significance of all coefficients in the model was confirmed. Also, firm size as the control

variable is effective in estimating the dependant variables and wastes are not self-correlated. Moreover, normality of each of the research variables has been verified in the Descriptive statistics. Therefore, there is significant linear relationship at the 95% significant level between intellectual capital variable and economic value added, cash value added, market value added, and refined economic value added, considering firm size as the control variable, during 1384 to 1388 years. The following table shows a brief of intellectual capital estimations on the economic value added, cash value added, market value added variables and refined economic value added (dependant variable) in the research hypotheses.

#### Conclusion:

Intellectual capital is considered as one of the main drivers of the organization value and an important and effective element of gaining companies' competitive advantage and superior financial performance. Nowadays, intangible aspect of economy is based on intellectual capital and the essential need of intellectual capital is knowledge and information. This paper shows the empirical evidence indicating the existence of positive and significant correlation between intellectual capital and economic growth. The result therefore indicates that Iranian companies have not succeeded in retaining its high level of utilizing Intellectual capital. From a managerial point of view, this study is important for identifying the problems or strengths of different industries for using components of Intellectual capital. Despite efforts towards improving its intellectual capital base, the Iran business environment appears to place greater weight on corporate performance based on physical capital assets. Policy makers should intensify their initiatives in order to encourage greater acceptance and understanding of the concept of intellectual capital and the development of its related assets. Only by such actions would the country be able to improve in vital indexes as the ones mentioned above. Moreover, on a microeconomic level, organizations should understand that only by nurturing their intellectual assets they will be able to remain competitive, fight against the severe competition (domestic and foreign) and create sustainable competitive advantages.

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