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Original Article

The Impact of Intellectual Capital Efficiency on Market Value: An Empirical Study from Iranian Pharmaceutical Companies

Gholamhossein Mehralian[a,e*], Hamid Reza Rasekh[a,b], Peyman Akhavan[c] and Mohammad Reza Sadeh[d]

[a]*Department of Pharmacoeconomics and Pharmaceutical Management, School of Pharmacy, Shaheed Beheshti University of Medical Sciences, Tehran, Iran.* [b]*Pharmaceutical Sciences Research Center, Shaheed Beheshti University of Medical Sciences, Tehran, Iran.* [c]*Malaek Ashtar University of Technology, Teheran, Iran.* [d]*Allameh Tabatabaie University, Tehran, Iran.* [e]*Student Research committee, School of Pharmacy, Shahid Beheshti University of Medical Sciences, Tehran, Iran.*

Abstract

The increasing gap observed between market value and book value of many companies has taken into account towards investigating the impact of intellectual capital (IC) on business performance. IC has been widely considered as a critical tool to deliver the business successfully in an intensive competitive environment. Various models have been suggested to measure the numerous aspects of IC, *i.e*. the Skandia navigator, Tobin's Q, and value added intellectual coefficient (VAIC). The aim of this study is to examine the relationship between intellectual capital and market value of pharmaceutical companies, using the VAIC developed by Ante Pulic (2000). Six-year data was obtained from audited financial reports in Iranian Exchange Stock, and used to calculate human capital, structural capital, and capital-employed efficiency of pharmaceutical companies. The results obtained using correlation and multiple regression analysis failed to support the impact of IC on market value. Practically, IC efficiency can be applied as a benchmark and strategic indicator to assess firm value. This study is a pioneering attempt in Iran to measure the impact of IC efficiency on market value using cross sectional time series data.

Keywords: Intellectual capital; Pharmaceuticals industry; Iran; Intangible assets; market value.

Introduction

In the current century, the industrial development model has turned knowledge-based and innovation intensive. In this model, as result, company valuation is not achievable by the capability of traditional accounting techniques. The intangible assets of knowledge and intellectual capital (IC) are exceedingly overwhelming conventional valuating means, such as land, property and capital assets, and are turning into the determinants and credible sources of company success (1).

Pharmaceutical companies have all the characteristics of knowledge-based organizations. Knowledge is expanded mainly in own research centers or is purchased from other companies and also Knowledge is essentially protected by patents.

Knowledge is sold to other companies and-most notably-there exists perpetual and urgent need to extend novel knowledge so as to have successful products in time to the market. This

* Corresponding author:
E-mail: gmehralian@gmail.com

indicates that the procedure pharmaceutical firms develop and deal with knowledge will have a large impact on their economic success. Pharmaceutical firms are also highly capital-intensive. Large deals of money have to be invested, while the returns will only be acquired following years of research and development. Thus, it is meaningful that investors are seeking for indicators of "good-knowledge-handling" in order to assess whether their investment will be an appropriate decision.

The concept of hidden value was innovated and developed by Roos (1998) regarding valuation of companies, as symbolized by Microsoft and Intel, where intangible assets constituted 94% and 85% respectively of their market value (2). Furthermore, a cross- sectional study manifested that the contrast between market value and book value became 30-fold in pharmaceutical firms, in which intellectual capital has a significant role in company valuation (3).

Although intellectual capital might serve as a cause of competitive advantage, generally speaking, organizations mainly do not comprehend its nature and value (4). Due to unique characteristics of pharmaceutical sector such as a highly regulatory environment, long development cycles, high level of risks and costs in the R&D process, long time from discovery to marketing of new drug (5) and facing intensive globalized competition,, there is a widespread perception that intellectual capital management is a critical force that drives economic growth (6).

Ultimately, the objective of this research is to study the impact of intellectual capital efficiency on market value of Iranian pharmaceutical industry.

To present the paper, this article is divided into two major sections, the first section depicts the summarized outline of the pharmaceutical industry particularly in Iran, it also incorporates literature review, hypotheses, and research methodology of this study and the second section deals with analysis of the collected data accompanied with conclusions and implications of the study.

Iranian pharmaceutical history

Medicine and pharmacy are among the oldest sciences and disciplines in Iranian civilization. After Islam was introduced to Iran, it had a great impact on both sciences. The influence was so great that it drew a line in the history of pharmaceutics in Iran. There are two different but continuous eras of medicine and pharmacy of Iran; before Islam and after Islam. The sciences of medicine and pharmacy were greatly improved during the reign of Islamic civilization. The Islamic pharmacists and physicians followed methods of Hippocrates and Galen. Among the most famous Persian physicians and chemists are Mohammad-ebn-e Zakaria Razi and Avicenna who both were living during Medieval era. The most popular book of Avicenna in medicine is "Ghanoon" written in five volumes. Two volumes of the book are devoted to pharmacology (7).

Pharmaceutical companies in iran

On the eve of the 1979 revolution, numerous domestic, foreign, and domestic-foreign private companies were active in Iran's pharmaceutical sector. By that time, the country's pharmaceutical sector had been transformed into a market that boasted a $300 million annual cash flow. There were nearly 4,000 kinds of pharmaceutical products available in Iran, 70% of which was provided by imports and the remaining 30% was produced domestically. More than half of the latter market served the sales of products under the concession of foreign companies (8). At present more than 95% of the drug consumption is produced by domestic pharmaceutical companies (9).

Generic system in iran

The year 1981 witnessed the beginning of a roundup of actions aimed at adopting and implementing policies to modernize the Iranian pharmaceutical sector, which influenced this industry all the way up to 1994. These programs, entitled Generic Scheme, sometimes also called the Generic Concept, formed the foundation of the new pharmaceutical system in the country. In recent years, national pharmaceutical system was directed to the brand-generic and brand systems and, as a result, there is some competition in the industry. This provides good opportunities for future development of domestic pharmaceutical

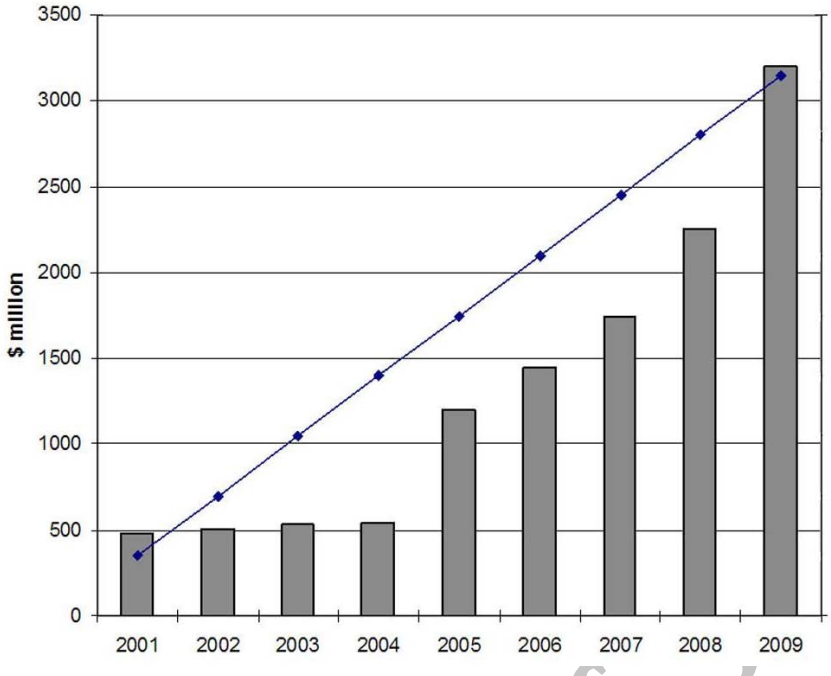

Figure 1. Iranian pharmaceutical industry: market value (11).

industry. The fact is that the domestic industry has not yet adequately developed to its full capacity and there are much potential capabilities for further growth and development. Domestic pharmaceutical industry is experiencing a substantial double digit growth in the recent years. Furthermore, in house production of hi-tech biological products is an emerging know- how in Iran's pharmaceutical sector. In recent years some private firms have focused to produce biological pharmaceuticals, using novel biotechnology methods (10). The annual growth of Iranian pharma market value (2001-2009) is shown in Figure 1. The share of domestic pharmaceutical sale to total pharmaceutical sale in the year 2009 was around 60 percent (11).

Literature review (IC and knowledge management)

This section briefly describes IC concept and pharmaceutical industry revolution and then integrates them regarding the creation of value in these companies.

Intellectual capital concept

It is hard to present a generally accepted definition of IC, and even more difficult it is to propose a commonly adopted typology for it, because this concept still is at an emerging phase of development. Generally, in some of these definitions, IC comprises the stocks or funds of knowledge, intangible assets, and lastly intangible resources and capabilities, which enable the development of fundamental business processes of organizations, facilitating the achievement of competitive advantages.

Therefore, a couple of researchers have dissected and conceptualized intellectual capital aimed at obtaining a better description of it. The general categories of intellectual capital seem to be human, relational, and structural capital (12). Under this framework, human capital is associated with the individual knowledge stock of an organization delegated by its staffs; relational capital signifies the relation between internal and external stakeholders, while structural capital represents the knowledge entailed within the regular processes of an organization (12, 13).

To further enlighten the different relationship of components of intellectual capital, the work of Nazari *et al.* (2007) provided a more extensive outlook of what constructs the variety of components in layers or sub-categories (14). The value differentiation tree provides

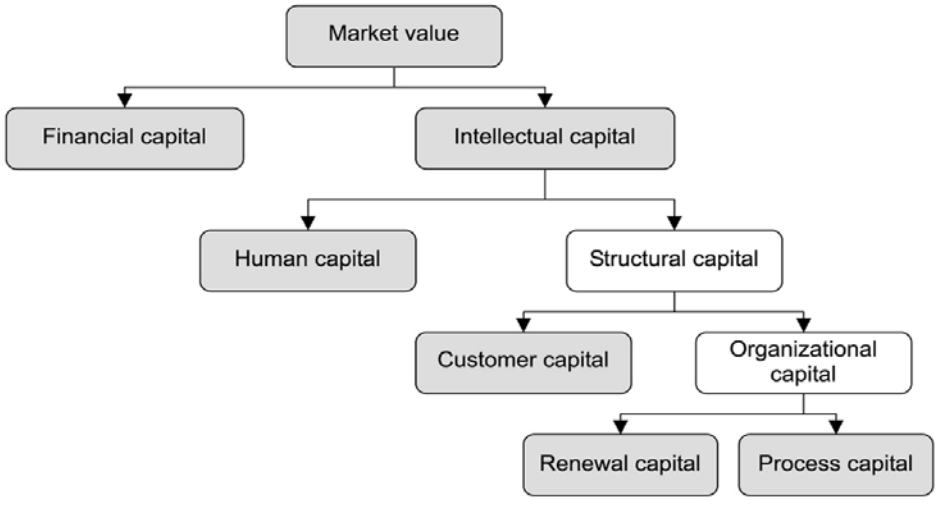

Figure 2. Taxanomy of Intellectual Capital (14).

a hierarchical perception of the relevant relationships between the components that constitute intellectual capital. As illustrated in Figure 2, it is important to note that value is composed of two categories of capital; one being the conventional or financial capital and the another is the intellectual capital.

The pharmaceutical industry revolution

In the late 90's revolutionary scientific discoveries, majorly in the field of biology, have led the pharmaceutical sector to flourishing, exceeding the expectations for the future (15). Large pharmaceutical industries rely extensively on scientific discovery and innovation in order to maintain profitability. Nonetheless, and despite swiftly growing investments in R&D, at present there is a remarkable decline in productivity, which is reflected in the diminishing number of approved medicines annually (16). There is also a trend towards consolidation due to pharmaceutical firms hold the opinion that synergies, often manifested in the form of mergers and acquisitions, can improve profitability and productivity (17).

The industry currently encounters challenges in its central competency and particularly its business model. The challenges arise from numerous diverse aspects as a more complicated drug lifecycle in the pre-marketing steps and an incrementing encouragement for more innovative drugs that can promote more effectively today's substantial diseases. At the same time, there is an exceeding demand for personalized medication (18), which is expected to improve both the efficiency and safety of medicines, but concurrently will reduce the scale of economy and generate an even more segmented market.

In the current state of globalization, competitions among pharmaceutical companies would be rapid. When facing threats from multinational pharmaceutical firms, the local pharmaceutical ones should realize the niche market in order to obtain more market share. Consequently, pharmaceutical firms have been expanding their strategic evaluations to enhance their organizational performance and competitive advantage and also the efficient indices can be utilized to assess the impact of performance improvement on pharmaceutical companies. A measure of efficiency implies good indicators of the success for pharmaceutical firm in a competitive market (19).

Ulrich (1998) suggests that intellectual capital represents the most likely of a firm's assets to generating value in the future and IC also would be the leading factor to gain company's profit, specifically in knowledge-base industries and also knowledge can be a target for trading by licensing and sharing to create

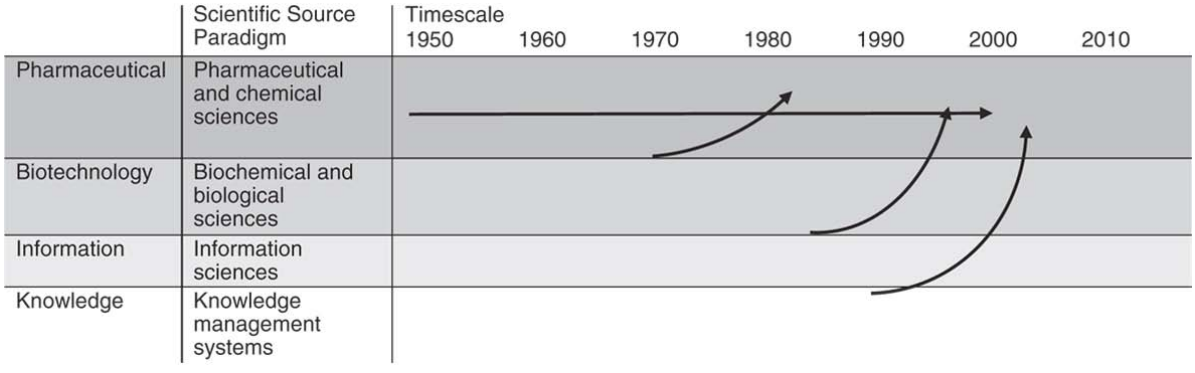

Figure 3. New scientific regimes in the pharmaceutical industry (22).

value (20). With the development of measures for intellectual capital, intangible assets can be more accurately assessed in R&D environment like pharmaceutical industry; in addition, Osborne (1998) showed that the contribution of intangible assets to firm value is approximately 80% (21). This is particularly right in the pharmaceutical industry during the exploratory phases. The initial resources of such companies appear as research publications, licensable technologies, and intellectual properties or know-how. However, these intangible assets are not simply evaluated by conventional accounting approaches. Consequently, there is a necessity for an effective and usable technique of intellectual capital valuation for R&D-based industry such as the pharmaceutical industry.

As depicted in Figure 3, the development of this industry can be explained as a series of accretions or rings: The figure suggests that knowledge management systems have become important tools for pharmaceutical industry growth in the global intensive competition (22).

The important role of intellectual capital and knowledge management in the pharmaceutical industry

Daum (2005) concluded that pharma industry is a great source of intellectual capital, since this industry is research-intensive, highly innovative (23), and well-balanced in its use of human capital and technological knowledge (24, 25). Pharma industry is extensively dependent on its intellectual capital as a key source for innovation (19). Pharmaceutical industry, therefore, can be considered as an ideal candidate for analyzing IC component (26). Intellectual capital was proposed to measure future value and tacit value of a firm (13), particularly important for firms in knowledge-based environment such as the pharmaceutical industry.

Prior studies in pharmaceutical industry

The IC in pharmaceutical industry can be followed in three important perspectives (27):

Human resources' experts involved in R&D activities of the firms will guide the firm's resource through training and development plans. These resources are related to human capital.

The firms will invest so much in the R&D activities. This is extensively associated with the structural capital.

The constant efforts of the firm in generation of new molecules result in a fundamental patent ownership in such firms. This intellectual property constitutes a major portion of the organizational capital.

Since these firms invest so much on their resources to develop new molecules, it is necessary to evaluate relative importance each resource and also their role in the overall performance of such firms. Several studies discussed about significant role of IC and KM in business performance of pharmaceutical industry. These researches have been conducted in both developed and developing countries from innovator and generic companies' perspective, as follows:

Hess *et al*. (2011) analyzed 108 global

pharmaceutical companies over three decades (1974-2003) to answer the question of when are assets complementary. They concluded that recruitment and retention of star scientists as human capital and their engagement in strategic alliances would be necessary assets for innovative performance (17). The empirical study to investigate the effect of intangible asset on innovation in Taiwanese biopharmaceutical industry showed that intangible assets positively influence innovation process, and the organization capital mediates the relationship between intangible assets and innovative capability in this industry (19).

In another study, Sharabati *et al.* (2010) conducted an empirical study to determine the relationship between IC and business performance of pharmaceutical sector in Jordan. They concluded that there is strong and positive evidence so that pharmaceutical firms in Jordan are managing intellectual capital effectively and that, in turn, is influencing business performance positively (28).

In Indian pharma sector, Kamath (2008) examined the relationship between IC and corporate performance by VAIC methodology in an empirical study and found a positive relationship between the profitability and productivity of the firms and human capital (17).

Considereing intellectual property perspective in pharmaceutical industry, Bollen *et al*. (2005) conducted an empirical study to investigate the linkage between intellectual capital and intellectual property (IP) to company performance. They concluded that there is a link between company performance and IP in pharmaceutical industry, and IC as a whole, including IP. They also suggested that IP does not solely have a positive impact on company performance (26). To determine the critical success factors involved in implementing a knowledge management system for pharmaceutical industry, Hung *et al.* (2005) concluded that the following seven factors were addressed to be critical; a benchmarking strategy and knowledge structure, the organizational culture, information technology, employee involvement and training, the leadership and the commitment of senior management, a learning environment and resource control and finally, evaluation of professional training and teamwork (29).

There is no globaly accepted IC measurement method among the 34 methods recognized in the relevant literature (30, 31). There has been an attempt by Sveiby (2010) to categorize these various methods into four approaches, then this categorization has been expanded by Chan (2009) to five approaches through adding new model which developed by Pulic (32).

These approaches are addressed as follows: market capitalisation approach; direct IC measurement approach; scorecard approach; economic value-added approach and VAIC approach.

The VAIC model is unique because it uses the data from the conventional financial report, and discussed by Andriessen (2004) to be a better tool for analyzing intellectual capital because the data is available online (30). Firer and Williams (2003) explained that unlike other approaches to measure intellectual capital, which have been criticized for the extent of subjectivity connected with their basic indicators, this model uses the data from a readily identifiable source derived from audited information (33).

Several studies in the field of intellectual capital have utilized the VAIC model to analyze value creation efficiency of intellectual capital (33, 27, 32, 34).

Overall, the VAIC model addresses the following advantages (32): It uses relatively simple and explicit procedures in the calculation of the necessary items, might be easily understandable for all people (managers, employees, stakeholders, investors, government, and suppliers) besides traditional accounting report; It alleviates any subjective bias and provides objective and quantitative indicators; It covers a form of standardized indicators which can be used for internal and external comparison; It uses audited financial data so that it may increase the validity of the measurement; It has been used in IC research of listed companies in many countries, especially in the Asian region that makes a potential for comparison with other countries.

Research hypotheses

As earlier discussed, prior studies of IC and

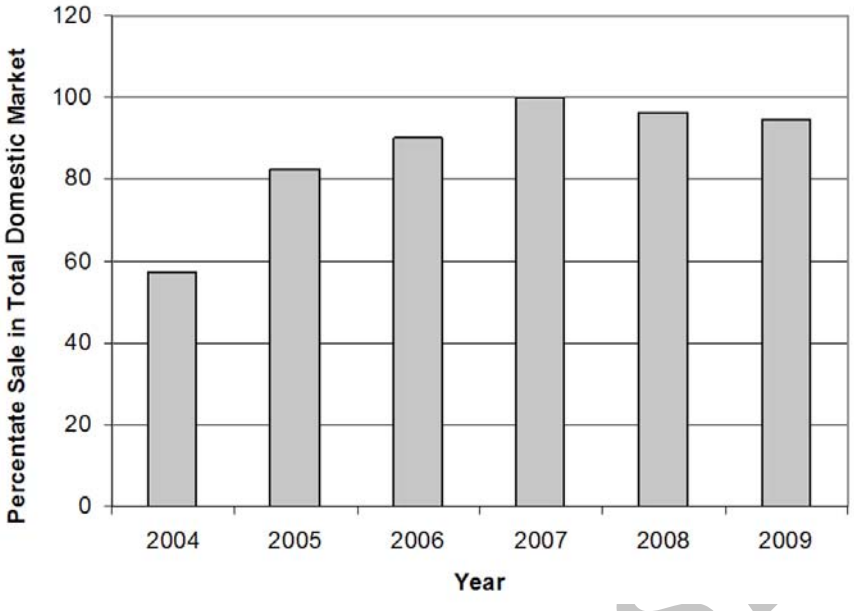

Figure 4. Percentage sale of 19 firms in total domestic market (11).

financial performance using the VAIC model have been investigated in companies in major stock exchanges (27, 32, 34-36). These studies examined the impact of IC and its components on financial performance, as calculated by the company's market valuation, profitability, productivity, return on equity. Different results between IC and financial performance have been reported. Some of these studies have indicated that IC and its components have a significant effect on market value of sample firms (36, 37).

In the present study, to determine the relation between market value and IC in 19 firms of pharmaceutical industry in Iran for the period 2004 to 2009, the following hypotheses are proposed:

H_1. Companies with higher VAIC have higher market valuation.

H_2. Human capital efficiency is positively associated with market valuation.

H_3. Structural capital efficiency is positively associated with market valuation.

H_4. Capital employed efficiency is positively associated with market valuation.

Research methodology

An extensive literature survey was done to perceive a methodology for carrying out this study. Finally, the VAIC approach was assigned for present study adopted from Pulic (2000) (38).

Variable definition

Dependent variable

The present study includes the MB as important dependent variable in business performance as follows definition: The MB, which reflects the market valuation, is the ratio of market capitalization to book value of the total assets of the firm for the given year.

Independent variable

This study comprises four independent variables (38): I) The Value added intellectual capital (VAIC) is used as a measure to reflect the intangible assets of the firm .The VAIC is measured by using three important components; II) Value added capital coefficient (VACA), indicator of value added efficiency of capital employed; III) Human capital coefficient (VAHU), indicator of value added efficiency of human capital; IV) Structural capital value added (SCVA), indicator of value added efficiency of structural capital. The detailed analysis of the concept is given below.

The statistical methods used in the research are descriptive tools (mean, median and standard

Table 1. Descriptive analysis.

Variable	Year					
	2004	**2005**	**2006**	**2007**	**2008**	**2009**
VACA Average	0.31	0.32	0.35	0.37	0.41	0.44
SD	0.22	0.21	0.19	0.13	0.19	0.16
VAHC Average	2.32	2.7	2.39	2.47	2.6	2.78
SD	1.49	3.04	1.45	1.02	1.21	1.14
SCVA Average	0.45	0.42	0.46	0.51	0.54	0.57
SD	0.33	0.28	0.26	0.26	0.23	0.2
VAIC Average	2.93	3.26	3.2	3.18	3.38	3.81
SD	1.85	3.33	1.71	1.34	1.58	1.41
MB Average	1.38	1.05	1.21	1.32	0.94	0.89
SD	1.37	0.71	0.51	0.8	0.77	0.49

deviation), simple correlation analysis and multiple linear regression analysis.

At first, the correlation analysis was applied to determine whether there is any correlation between the MB of the firm and the VAIC or not.

Then, the multiple linear regression analysis was used to find out the strength of relationship between the variables and also to discover the factor among the various elements of IC which has significant impact on the MB of the firm.

Data collection

The data were collected through secondary sources. The main data were collected from the published annual reports of the firms in the Iranian Stock Exchange Organization. The 19 firms (mostly affiliated to governmental organizations) were selected for this study. As shown in Figure 4, these sample firms account for around 90 percent of the total domestic pharmaceutical industry sales in 2009.

The six-year period of study was taken from the annual years 2004-2009, the reason for choosing this period was that the data required for the study were available for these years (11).

VAIC methodology

Using the VAIC model, three items were measured as IC components in this study. At first, capital employed efficiency coefficient (CEE) was obtained. This is calculated as follows:

$$CEE_i = VA_i \div CA_i,$$

Where; CEE_i is the capital employed efficiency coefficient for firm i; VAi is value added for the firm i; CAi is book value of the net assets for firm i. The VA is calculated using the following equation:

$$VA_i = I_i + DP_i + D_i + T_i + M_i + R_i,$$

Where; VA_i is value added for firm i computed as sum of; Ii is interest expense; Dpi is depreciation expenses; Di is dividends; Ti is corporate taxes; Mi is equity of minority shareholders in net income of subsidiaries and Ri is profits retained for the year.

The second step was to measure the efficiency of the human capital on the value creation of the firm. It is evaluated through calculating the ratio HCE as follows:

$$HCE = VA_i \div HC_i,$$

Where; HCEi is the human capital efficiency

Table 3. Correlation analysis of the selected variables.

		MB
SCVA	Pearson Correlation	-0.041
	Sig.	0.724
VACA	Pearson Correlation	-0.132
	Sig.	0.187
VAHC	Pearson Correlation	0.099
	Sig.	0.340
VAIC	Pearson Correlation	*-0.223
	Sig.	0.024

coefficient for the firm i; VAi, is value added for the firm i; and HCi is the total salaries and wages for the firm i. The Third component of IC is computed as follows:

$$SC_i = VA_i - HC_i,$$

Where; SC_i is the structural capital for the firm i; VAi, is the value added for the firm i; and HC_i represents total salary and wage costs for the firm i. Then structural capital efficiency (SCE) was determined as follows:

$$SCE_i = SC_i \div VA_{i,}$$

Where; SCEi is structural capital efficiency for the company i; SCi is the structural capital for the firm i; and VAi is value added for the firmi.

Intellectual capital efficiency (ICE) was measured as the sum of the two coefficients of human and structural capitals:

$$ICE = HCE + SCE,$$

Where; ICE is the intellectual capital efficiency coefficient, HCE is the human capital efficiency coefficient; SCE is the structural capital efficiency coefficient.

Overall value added intellectual coefficient is simply the sum of all value creation efficiency indicators:

$$VAIC_i = HCE_i + SCE_i + CEE_{i,}$$

Where; VAICi is the value added intellectual coefficient for the firm i; CEE is the capital employed efficiency coefficient for firm i; HCE_i is the human capital efficiency coefficient for the firm i and SCE_i is the structural capital efficiency coefficient for firm i.

Ante (2001) discussed that among several methods to calculate and report IC, the VAIC is an accepted, comprehensive and standardized model to evaluate and compare the IC performance of the firm and also it enables firms to compare themselves both internally and externally. This method would be an acceptable model to measure IC index of the Iranian pharmaceutical firms for present study.

Descriptive statistics and correlation analysis

Table 2 represents the descriptive statistics for all studied variables, including dependent and independent ones. As seen in the Table 1, the VACA, SCVA and VAIC increased over the period of study, but VAHC remained relatively constant. The major contribution to the VAIC is mainly from physical capital compared to human and structural capitals, indicating the efficiency of physical assets. The market valuation (MB) of these firms is observed to decline over the same period.

To find a primary analysis of whether there exists any relation between the independent and dependent variable, the correlation coefficient was estimated as indicated in Table 3. SCVA and

Table 4. Pearson correlation for the explanatory variables.

	SCVA	VAHC	VACA	VAIC
SCVA	1	-0.032	0.017	0.131
VAHC		1	0.122	0.08
VACA			1	0.374**
VAIC				1

Significant at *0.05 and **0.01 level.

Table 5. Regression results-Model 1: MB and VAIC components.

Independent Variable	Dependent Variable	
	MB	
	Coefficient	t-statistic
Constant	0.204	3.043
VACA	-0.744	0.459
VAHA	0.122	1.058
SCVA	-0.035	-0.307
Adjusted R^2	0.017	
F- Value	0.563	

Significant at *0.05 and **0.01 level.

Table 6. Regression results-Model 2: MB and VAIC.

Independent Variable	Dependent Variable	
	MB	
	Coefficient	t-statistic
Constant	0.272	8.478*
VAIC	0.223	-2.287
Adjusted R^2	0.017	
F- Value	0.563	

Significant at *0.05 and **0.01 level.

VACA show negative correlation with MB; and also there is no significant correlation between VAHC and MB.

Overall, VAIC also shows a significant negative correlation with MB. Firms created high level of IC efficiency are significantly undervalued in the market as shown by a significant negative relation between the VAIC and MB.

To determine the absence of multicollinearity problems, the Pearson's correlation coefficients between explanatory variables were tested. Suggested that multicollinearity shall be considered as a serious problem only if the correlation coefficient between explanatory variables be more than 0.8 (39). As shown in Table 4 the correlation coefficients between explanatory variables are not high (from -0.032 to 0.374). As a result, we can ignore from any multicollinearity problems.

Multiple linear regression analysis

Through taking a further in-depth view on the relation between the dependent and independent variables, a multiple linear regression analysis was applied. Table 5 represents the results taking into account H2-H4 (Model 1) and in Table 6 the results considering H1 (Model 2). Results depicted in Table 5, prove that there is no statistically significant relationships between IC components and MB. Thus, H2, H3 and H4 were not confirmed by the empirical data.

In addition, results in Table 6 demonstrate that there is no statistically significant relationship MB and VAIC. Therefore, H1 is not supported by the empirical data**.**

Results and Discussion

Despite the fact that IC is drastically known as a significant strategic resource for sustainable competitive advantage, the results of this research did not confirm the hypotheses.

Generally, the empirical studies which have deployed VAIC model to assess the influence of IC on market value have revealed paradoxical outcomes. For instance, the European studies implemented by Pulic (2000) with samples taken from the London and Vienna Stock Exchanges exhibited a positive relationship, further, Chen *et al*. (2005) succeed to detect a relationship between IC, market value and financial performance in the Taiwanese economy (37, 38). In contrast, Gan and Saleh (2008) concluded that VAIC in Malaysia can justify profitability and productivity, but is not able to explain market valuation, and also Kamath (2008) discovered no significant positive relationship between the firm's performance in terms of market valuation with any of the independent variables in Indian pharmaceutical industry (40, 27). Furthermore, studies carried out in Canada, Taiwan could support research hypotheses to demonstrate positive relationship between IC and market value (36, 41).

It must be also noted that market valuation might be regarded as the investment decision of investors or investor's agents in choosing and valuing firms (42). Consequently, different capital markets or agents may place emphases on diverse dimensions of corporate output that may or may not incorporate IC. Conventional

accounting scales of corporate performance such as profitability and return on equity might just be some of the conventional tools of assessment and valuation of companies (42). There might be an imbalance among investors in their degree of awareness of the significance of IC in value creation in companies, which might exist in different geographical realms where the capital markets are situated. As a result, the impact of IC on market valuation might be different from country to country (32).

The empirical results of the current research may be taken into account to further support the above analysis, because the influence of IC on market valuation may not be global. Arguably, it is also associated with the level of maturity of IC insight, existing in the investors in a specific market. Furthermore, Malhotra (2003) showed that valuation specifically in emergent and developing countries like Iran is mainly founded on tangible assets and tend to disregard the intangible ones (43). Therefore, it seems definitely reasonable for VAIC studies to fail to hold a positive relationship between IC and company value in those counties.

The current research also implies that an insignificant relation exists between human capital and the company's market value in Iran. This could be attributed to lack of employees' training, since Katsanis (2006) pointed out that continual training program is an essential factor for employees and managers outcome (44). The alternative explanation might be associated with a poor relationship between industry and academic centers in Iranian pharma sector, while Fontana *et al*. (2006) held the opinion that this relationship is highly important for pharmaceutical companies (45).

Finally, as the direct relationship between corporate intellectual efficiency and market valuation has not been supported in the sample companies listed in Iran, the effectiveness of using IC in determining the market-to-book value difference is also somewhat restricted.

Implications for researchers and practitioners and further researches

The concept of IC is a newly emerging subject, and until now, it has not been completely understood by most organizations especially pharmaceutical firms in Iran. This study provides major contributions in promoting this concept within the Iranian business community.

In conclusion, there is an urgent and immediate need for corporate managers to start taking up the voluntary disclosure of IC indices. Without proper IC evaluation, having a healthy financial report is arguably impossible. The present study is a useful eye-opener especially for scholars, practitioners and policy makers to enquire for the logical factors that can show reasons of nonexistence perfect relationship between the performances of Iranian pharmaceutical firms with their IC components.

To better evaluating the impact of IC and its components on business performance, further studies should be conducted to evaluate IC through other approaches as an economic value added (EVA) and balance scorecard (BSC) in IC measurement, and it is important to determine the key factors that are fundamental in establishing KM process in this environment.

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Hamid Reza Rasekh is an associate professor working in the Dept of Pharmacoeconomics and Pharma Management of School of Pharmacy, Shahid Beheshti University, Iran. Peyman Akhavan is an associate professor in Industrial engineering department of Malek Ashtar University of Technology in Tehran, Iran.

Mohammad Reza Sadeh is a financial consultant and is a Ph.D. candidate in Accounting in Allameh University, in Tehran, Iran.

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