

## **Evaluating the relationship between intellectual capital and financial performance in Iranian biotechnological production companies**

**Arezou Sayad<sup>1</sup> and Reza Pourmohammadi<sup>2\*</sup>**

<sup>1</sup>*Department of Medical Genetics, Shahid Beheshti University of Medical Sciences, Tehran, Iran*

<sup>2</sup>*Department of Management, Islamic Kar University, Ghazvin, Iran*

---

### **ABSTRACT**

*Biotechnology is secret human survival. There is no doubt that the prospect of unlimited and the technology is amazing. Intellectual capital is a set of knowledge-based assets that are assigned to an organization and are among the features. The aim of the present study was to investigate the relationship of intellectual capital and financial performance of companies in the biotechnological production of Iran. The study population consisted of all the companies that produce biotech products. A random sampling of 80 companies was selected based on Cochran's sampling formula. The instrument is a questionnaire. , And methods of using structural equation are causal. The results indicate that aspects of intellectual capital (human capital, relational capital, structural capital) have an impact on the financial performance of companies, biotech products.*

**Keywords:** intellectual capital, financial performance, biotechnological products

---

### **INTRODUCTION**

Intellectual capital is a set of knowledge-based assets that are assigned to an organization and among its features are Through adding value to the organization's key stakeholders, to significantly improve the competitive position of the leads. Dimensions of intellectual capital are:

#### **1 – Human capital:**

Human capital as individual knowledge, skills, abilities and experience in solving problems and creating value for employees of an organization is defined as [12]. Higher human capital theorists who have targeted their research it on the individual level are considered and it's a combination of knowledge, skill, and talent has ever seen. Regardless of what the context is. Pong ET example, an organization's human capital of the organization's experts have the knowledge and skills to provide professional services they use [13].

#### **2-Structural capital:**

Capital structure refers to the structures and processes within an organization in which employees use them and thus are employing knowledge and skills [15].

The funding mechanisms and structures, including the major role in supporting staff to achieve optimal performance and intellectual side of the business is functioning optimally. In fact, the non-human capital in an organization includes all repositories such as databases, processes, strategies and organizational charts are to give the value beyond the physical assets.

3-relational capital (customer):

Bounfr(2003) the origin of the capital relationship between persons or groups in a certain class knows. While communications between individuals have been identified as a key factor but the level of communication is widely different with other studies. Pong broad vision and its communication with the various economic stakeholders, particularly potential customers is known. This form is in several directions, such as capital, intellectual capital, and is part of the basic values embedded in the marketing and communications channels through which organizations conduct their business [4].

Shankar (2005), the U.S. intellectual capital and organizational performance variables studied, the results show that there is a relationship between variables moderate to low.

Wisiniowski(2009) study entitled: Between 2009-2007 global economic crisis and its effect on the development of intellectual capital has done, which shows what must be determined is the extent of this effect:

Identify cases that are affected in particular classification rule and casual observations and associated political turmoil due to the negative control over the creation and dissemination of intellectual capital. Researches in case of global economic crisis in The first evidence of cycle and 2009-2007 the creation of intellectual capital represents the stringencies of both groups reporting on intellectual capital based on an evaluation of the stock is very fleeting .Use of this intellectual capital in anticipation rather than questions of economic shocks and includes the conceptual and practical reasons.[16]

Hong (2010)studied to examine the effects of social structural capital, human resource, knowledge production and its effects on the diversity of technical knowledge. The results are as follows: Firstly, it is proved that the intellectual capital is a phenomenon resulting from the relationship, and secondly, it is proved that knowledge diversity is a phenomenon of moderation. Finally, all aspects of intellectual capital have a positive and significant impacts on knowledge production are. Vera (2005) says that in the light of knowledge management and organizational learning in knowledge- based companies to raise their performance. Kong (2005 ) writes : Both researchers and managers to track how the mutual learning organizations are more interested in means to simultaneously explore new areas of knowledge and areas of current . To create a context for mutual learning methods of human resources should be considered, based on the composition of human capital, organizational and social impacts.[17],[1],[10],[6]

George Claudio (2006), in which research: challenges facing organizations in a dynamic economy requires intangible assets to achieve competitive position in the market. The growing importance of intellectual capital has thrown a challenge to the traditional financial reporting system and other systems have shown that this is not information needs. Another study concluded that AyHardeman (2008) have been suggested: a new concept based on dynamic knowledge and an approach to the development of intellectual capital in an organization that has provided the knowledge to change the concept of intellectual capital will up. The model of intellectual capital through changes in attitude by the general areas of knowledge and its related parties acquired parts of their knowledge of changes in beneficial amended. Achieve the goal of knowledge and a new concept that dynamic is introduced. The concept of knowledge is presented as a cube,i.e., a three dimensional model of knowledge with types and quality varies. Further indication is of the internal aspects - external view of human knowledge. Following types of knowledge, including knowledge of the subject is demonstrated.

Martinez (2009) in his study that deals with this topic in the knowledge-based economy changes the current assets have a deep pool of non- tangible assets in revitalizing the economy full of success, and requires an to achieve organization can and to enhance its durability .Intangible assets and intellectual capital in organizations relate to the element of non- tangible assets and is one of the types of capital: capital structure, and human society. The role of organizational assets, this research is a critically reflective analysis of intellectual capital on organizational performance and its reflection in the agent's community provides. [12]

### **Biotechnologies**

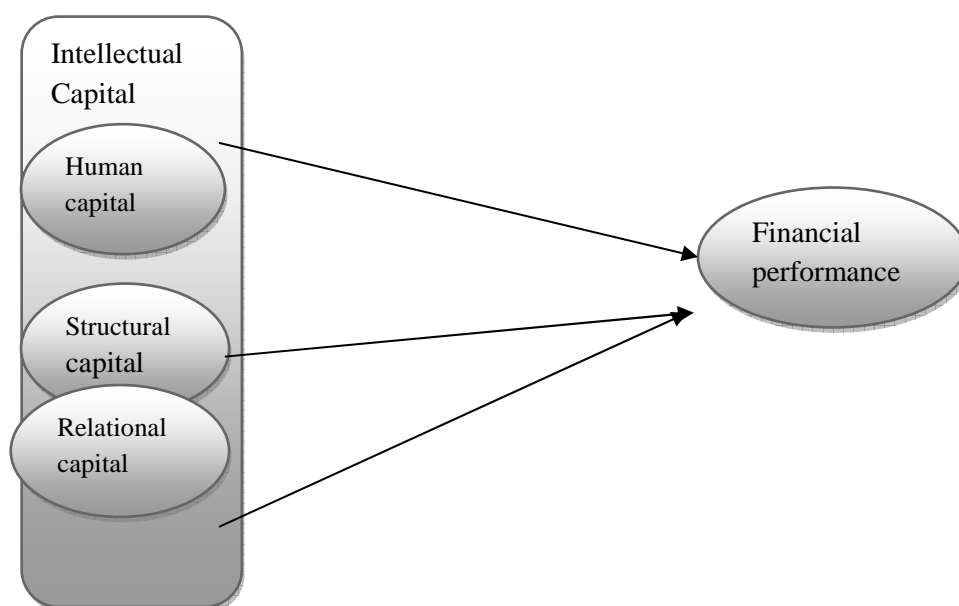
Terms of biotechnology, the first time in 1919 by Karl Erik to the application of biology and their interactions in the human-made technologies were used. In general, any human activity smarter, better and different products using living organisms, particularly through genetic manipulation at the molecular level, is in the area of biotechnology. Biotechnology (Biotechnology and Genetic Engineering) is a relatively new knowledge of the consequences, the fears and hopes of the community were. The simple definition of a new phenomenon is as follows: Integrated use of biochemistry, Microbiology knowledge and product technologies in biological systems due to the use of the interdisciplinary nature of science are studied. Another definition of biotechnology (biotech) has been described: Technique of living organisms to make or modify products, improving the quality and characteristics of microorganisms, plants or animals used for special applications. Biotechnology is an interdisciplinary science due to

its inherent features. Application of such knowledge in cases where the combination of ideas within a multidisciplinary collaboration leading to a new system. Background and methodology of its own and finally, there are interaction between the different departments of biology and engineering. Biotech is in the central core and has two components: A component in achieving the best catalyst for a particular process or function and other system components or catalysts or reagents that act on it.

- 1- Genesis Biotechnology
- 2- Traditional applications of biotechnology
- 3- Biotech Products
- 4- Education in Iran
- 5- References

The use of microorganisms to produce foods such as vinegar, yogurt, and cheese dates back over eight thousand years ago. The role of microorganisms in the production of alcohol, vinegar was discovered centuries ago that A group of French businessmen in search of a way to prevent ferment wine and beer with them when they move around with ship. Those from Louis Pasteur, ask for help. Louis Pasteur discovered that yeast in a vacuum can sugars converted to alcohol. This process is called anaerobic fermentation. And also found that, rancidity and contamination of those activities acetic acid bacteria that converts alcohol into vinegar. Industrial applications of biotechnology are including plant and animal breeding; provide bread, yogurt and cheese and production of antibiotics (antibiotics), Human insulin and interferon Laboratory Science, And now with the advent of recombinant DNA technology, Genetic manipulation and transferring genes from one organism to another or in other words, genetic engineering, Capacity utilization of this technology has grown so increasingly. Currently, with respect the population growth and need to provide food for this population is increasing and there is special attention to agricultural biotechnology and high yielding resistant variety of transgenic crops such as, corn, rice, soybeans, tomatoes, wheat will produced and application of modern biotechnology techniques have been effective in increasing production of milk and meat. Provide hygiene and health of the population of more than six billion inhabitants of the planet, through the production of recombinant drugs and vaccines, access to low-cost treatment of diseases, and find treatments of non cure diseases, faster and more effective detection of various diseases, including genetic diseases are duties of medical biotechnology. The new approach to the environment in this century and consider it as a part of the national capital countries and need to preserve it with using biotechnology techniques are human concern of the present century. Effective removal of harmful environmental contaminants with use of microorganism’s refinery pollution and using the techniques of genetic resources is including biotechnology applications in the field of environment. Biotechnology applications in field of industry cause the cost of production and less energy and Leads to less waste and most importantly, it leaves little adverse effect on the environment cause these technologies will be remembered as one of the cleanest parts of the industry. Biotechnology also with other ways to produce products that previously did not exist or it has been extremely difficult has made possible.

**Theoretical framework of the research**



**Hypotheses**

- 1 - Human capital in the biotech companies has an impact on the financial performance of this company.
- 2 – Structural capital in the biotech companies has an impact on the financial performance of this company.
- 3 -Relational capital in the biotech companies has an impact on the financial performance of this company.

**MATERIALS AND METHODS**

The method of this study is a causative one and in this way, the relationship between variables based on the target of this study was analyzed. Also this study based on the studies classification in terms of how to collect the data or in the other words, the design of this research, is a descriptive study which describes the properties of a sample and then generalizes these properties to the statistical society. These studies were classified into many groups but in this study, the measuring one is used. Through this study, the relationship between variables were described, predicted and analyzed. Therefore it can be said that the method of this study is descriptive – measuring and causative one and based on the defined target, it is a functional. The study population consisted of all the companies that produce biotech products. A random sampling of 80 companies was selected based on Cochran's sampling formula. The data collected in this survey questionnaire is.

$$n = \frac{Z_{\alpha}^2 p(1 - p)}{\epsilon^2} = 80$$

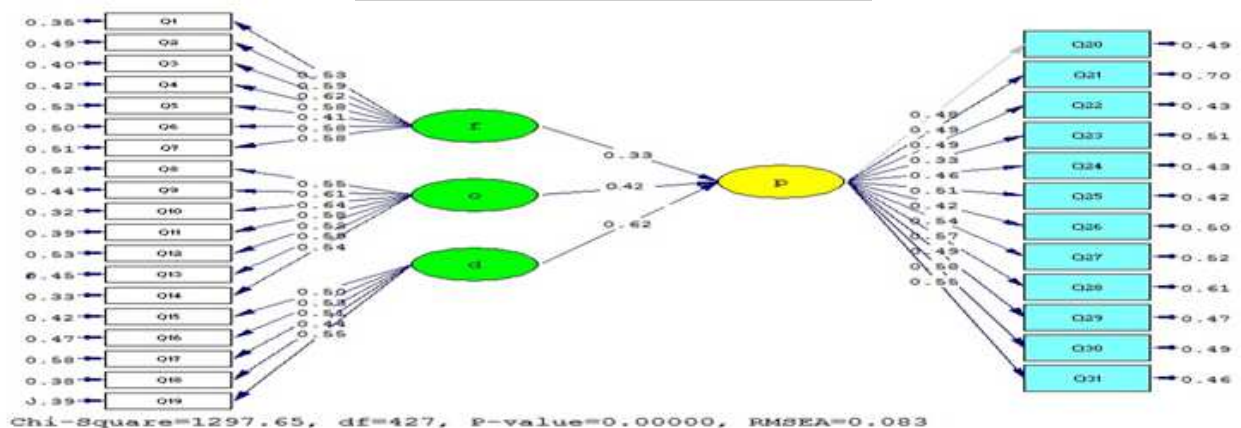
**RESULTS AND DISCUSSION**

In order to analyze the data and test the hypothesis of structural equation modeling is used. Structural equation modeling such as linear statistical models to examine the relationship between latent variables (unobserved) variables and manifest (observed) is. Indicators of overall fitness as well as index CFI and RMSEA are considered as the best indicator. Indicators of overall fitness to be place in ranges between 0 and 1. Coefficients higher than 0/90is considered to be acceptable, although the level, P=0/05, is optional.

This calculated value for the RMSEA index is equal to 0/083 to index CFI=0/91, which is indicative of the acceptability of the research model.

**Table 2: parameters associated with the model presented**

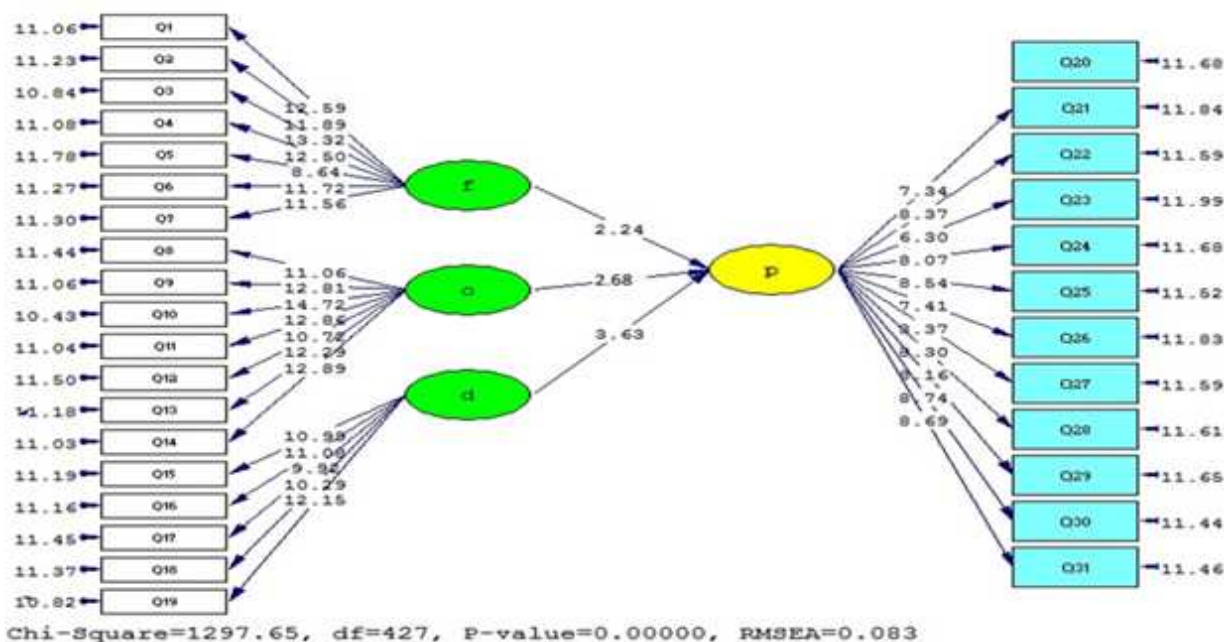
Acceptable fit	Amount	Index
Value between 1 and 3	2/321	Chi-square relative
RMR<%5	0/034	RMR
GFI>%90	0/915	GFI
AGFI>%90	0/936	AGFI
RMSEA<%10	0/083	RMSEA
CFI>%90	0/91	CFI
IFI>%90	0/902	IFI
NFI>%90	0/963	NFI



**Figure 1-4 estimated values of the coefficients in each direction**

In this section, we will model to determine the significance of the numbers, the numbers are significant, since this would be a 0/95 or error 0/05, followed by hypothesis testing, we used t test, significant numbers will larger than -

1/96 and +1/96 are. The following model ( Figure 4-2 ) are significant numbers obtained for the t-test can determine causal relationships ( measured with latent variables ) and effects ( both latent variables ) with respect to the items listed in the charts below, the model the fit parameters are in good condition .



According to the hypothesis 1 and Figure 2-4, Figure 1-4, is studied. Endogenous latent variable path coefficients between endogenous human capital on financial performance 0/33, with a value of t equal to 2/62 error in 0/05 statistic of the null hypothesis that there is a significant lack of be rejected and the coefficient of human capital in the production of biotech companies has an impact on the financial performance of this company. According to the hypothesis 2 and Figure 1-4 and Figure 2-4, according to information, is studied. Path coefficients between latent endogenous capital structure on variables endogenous financial performance 0/42, with a value of t equal to 2/68 on error 05/0 statistic of interest is significant and the null hypothesis based on the absence of factor reject the capital structure and financial performance of the companies in the firm's biotech crops. According to the data of Figure 1-4 and Figure 3 hypotheses 2-4, are studied. Endogenous latent variable path coefficient of Relational Capital on the endogenous variables of financial performance 0/62, with a value of t equal to 3/63 error in 05/0 statistic of the null hypothesis that there is a significant lack of despite the rejection ratio and investments in companies related to financial performance of the firm's biotech crops.

**RESULTS**

Results	T-statistics	Standardized coefficients calculated	Hypotheses
+	2/62	0/33	1 - Human capital in the biotech companies has an impact on the financial performance of this company.
+	2/68	0/42	2 - Structural capital in the biotech companies has an impact on the financial performance of this company.
+	3/63	0/62	3 - Relational capital in the biotech companies has an impact on the financial performance of this company.

**CONCLUSION**

Based on the results, Human capital in the biotech companies has an impact on the financial performance of this company. Structural capital in the biotech companies has an impact on the financial performance of this company. Relational capital in the biotech companies has an impact on the financial performance of this company. George Claudio (2006 ) The challenges facing organizations in a dynamic economy in the use of intangible assets and intellectual capital knows no utilization .in today's era of recognition and identification vectors and four wood - related technologies, organizational intellectual capital is essential . According to a study Regiment (2010) is consistent with all aspects of intellectual capital and knowledge based on organizational learning is positively related to that.

**REFERENCES**

[1]Bontis, N. (1996), "there is price on your head: Measuring intellectual capital strategically". Business Quarterly



Summer, pp. 41-47.

[2]Bontis, N. (2001), *International Journal of Management Review*, Vol. 3, No. 1, pp. 41-60.

[3]Bontis,nick,(2004),"Intellectual capital: An Explanatory study that Develops Measures and Models: management decision,36/2:pp:63-76.

[4]Bounfour,Ahmed,(2003), *journal of Intellectual capital*,4/3:396-412.

[5]Chen, J, Zhu., Z. and Xie, H.Y. (2004), *Journal of Intellectual Capital*,Vol.5, No. 1.pp. 195-212.

[6] Chen, M. (2005), *Journal of Intellectual Capital*, vol. 6, No. 2, pp 159 –176.

[7] Day, y. L.,kuo, A. T. and szu, w.y. (2009), *Journal of Intellectual Capital*, vol. 10, No. 2, pp. 260-276.

[8]Greoge, Claudiu,2006, *Strategic Management Journal*, 15, 53-61.

[9]Kwee, K.ch. (2008), *Journal of Intellectual Capital*, Vol. 9, No. 4,pp. 609-638.

[10]Lopes dos,Felipa,2010,"the Model of Intellectual Capital Approach on the Human Capital Vision", [Dissertation Abstract Ed.D] Open university of Portugal.

[11] Marr,Bernard and Giovanni Schiuma,(2001),"Measuring and Managing Intellectual Capital and Knowledge Assets in New Economy Organizations.", in M. Bourne(ed),Handbook of Performance Measurement. London: Gee publishing Ltd.

[12] Martines, Isabele, 2009, the Importance of Intellectual Capital in Organization",[Dissertation Abstract Ph.D] university of Glomorgan Business School, Pontypridd UK.

[13]Stwart, Thomas.A,(2006)"Intellectual capital: the new wealth of organization", New york, NY. Doubleday, currency.

[14] Sung-Choon- Kang, 2005, "Intellectual Capital Architectures and Bilateral Learning: A Framework for Human Resource Management", Center for Advanced Human Resource Studies Cornell university of New York.

[15]Wang, W Y and Chang,C.(2005) *journal of Intellectual capital*,Vol6,No2,pp.222-226.

[16]Winiewski,Pioter,2009," the Global Economic Crisis of 2007-2009 :its Relation to Intellectual Capital",journal of Management Research Macro Think Institute, vol 2, no :1,1:Ep.

[17]Yi-Chun-Hang, 2009, *Strategic Management Journal*, 20, 637-653.Zack, M.