

# The study of the effect of united Nations Technology Indexes on Economical Development of Iran (from 2000 to 2012)

Mohammad Ahmadzadeh Ghasemabadi:

Ph .D. Student in Technology management of Tehran University – Pardis Alborz.

E- mail: m. ahmadzadeh.gh@ ut.ac.ir

Sahar AraghiZadeh : M.A.in Economics

Email: sahar.araghizadeh @ gmail.com

Safoora kashefi\* : M.A.in Economics

Email: safoora.kashefi@ gmail.com

## 1. Abstract

The United Nations (U.N) has accepted technology as a series of necessary information, skills, methods and tools for making required Products and their application (use) or providing required and useful services; in a way that it has suggested one of the international methods in technology measurement through the criterion of Technology Achievement Index (TAI)[1]. This index which is comprehensively expressed in annual report of united Nations Human Development; is a multi- dimensional figure which is defined given the achievements of a country in the creation and application of technology at large scale and providing experience infrastructure and human skills in the innovations of technology[2]. Ignoring the point that which country is the first in the world development of technology, above index focuses on the degree of success of that country in producing and applying technology .In this investigation, the effect of each of the technology achievement indexes suggested by United Nations on economic development of Iran between the years 2000 and 2012 is studied.

## 2-Introduction

The concepts of growth, economic development and factors causing them in economic analyses have always been accompanied with a lot of discussion. Numerous studies in regard with identifying the effects of different factors on economic growth have been conducted. And physical Capital; human Capital and workforce have been introduced as the most important factors. A large number of economic scholars believe that the role and importance of physical capital are gradually reduced and those of other indices such as technology as one of the most important key factors in growth has risen.

## 3-Review of literature

Fathi [3], in the investigation titled; Identifying the pattern of effective factors in measuring the relationship between information technology and financial performance of commercial companies ;with meta-analysis view ;the economic development of countries ;based on the division of counties into developed and under developing, concluded that financial performance of companies is effective on information processing output of technology. Also Fathi et al. [4] in an article titled; presenting the route of the relationship between information technology and the performance of commercial companies; along with strategic analysis on measurement factors in efficiency puzzle; introduces information technology as an effective factor on the Performance of companies. The findings of Assari Araee and Aghaee [5] ;in the article titled; The effect of information technology on economic growth of OPEC countries reveals a strong and significant correlation between economic growth and information technology and communications in these countries until 2004.In addition, Najarzadeh; et.al.[6] following the studies of Assari et .al, study the effect of information technology on the economic growth in counties which are members of Islamic conference and conclude that there was a strong and significant correlation between economic growth and information technology and communications in these countries until 2004. Akhavan [7] in the investigation titled; Comparative study of wise management policies and science and technology at national level; introduces technology management as one of the most important tools for achieving developed human capitals. Rabiee [8]; in the study titled; The effect of updating and transferring technology on economic growth; has studied the effect of updating technology on domestic gross production growth in the country. In his study, he has explained the importance of technology on economic growth using domestic growth models and while studying domestic model for economic growth of Iran and the effect of technology, he has estimated the human capital and other factors based on the test conducted using multi- variable regression method. His findings indicate that one per cent increase in investment and updating

\* corresponding author

technology, 18 per cent increase in production and one per cent increase in investment on intermediate goods and raw materials; 0.5 percent increase in production, 1 percent in human capital and 28 percent in the rate of production. The results of investigation by Komijani and mohmoodzaleh [9] who studied the effects of applied infrastructure and information technology overflow and communications on economic growth of under developing countries ;shows that physical capital; fixed phone Penetration coefficient. Network index, information use and internet access freedom have positive effect on economic growth but the rates of population growth and inflation have negative effects on it. Emadzadeh et al. [10] by studying the effect of human force quality on economic growth in some countries expressed that the effect of the model under study in high – income countries reveals the positive and significant effect on education variables, experience and health of work force and life expectancy index on economic growth. In average –income countries; this result was confirmed; too. In low – income countries only the variables of education and the work force experience were effective on the economic growth of these countries. Emamverdi et al. in their study titled, "the study of the effect of electronic commerce and information and communications technology on economic growth; in G8 group counties and member countries in Islamic conference", Studied the effect of electronic commerce and information and communications technology on economic growth used panel Data method in time span 2000 to 2011 in two groups of above- mentioned countries and concluded that electronic commerce and information and communications technology are effective factors in economic growth in a way that all available variables have significant, Positive and direct effect on economic growth. Finally, Shah Hosseini [12] in his investigation studies the effect of technology management factors on the economic development of developing countries from 2008 to 2011.

But in none of the investigations conducted on (TAL) which has been suggested by United Nations (UN) Iran's economic development has been studied.

#### **4. Theoretical Foundations of the Study**

##### **4.1. Management of Technology**

The definition of technology is very various and each writer has presented a special definition of it [13]. For scholars, technology is the final product of investigations or the technical knowledge and information which could be changed into a commercial product. For engineers; technology is a tool or process which is used for making better products (products with better efficiency, lower cost and higher possibility or probability of selling in new markets) .For marketers, technology is a kind of challenge which, in one hand, provides a chance for achieving competitive benefit (Advantage) against competitors through providing variety in products or quick arrival in new markets. Technology is commercially considered machineries used in production. Some others refer to the knowledge applied in conducting activities as technology and another group has focused on the human and social aspects of technology in production. Some of the definitions are as follows: technology is the art and knowledge used in the production and distribution of goods and services. This view refers to the method which an organization is using the resources for making products, delivering services and being in contact with others. Technology faces the question; is used technology considered art and knowledge in that applying scientific rules is along with art. For example, Automobile production depends to a large extent on using complicated technology based on scientific principles but Automobile designing in addition to the necessity of applying scientific principles requires the use of artistic skills and tastes. In another definition, technology is the process of delivering necessary inputs into the organization and turning them into outputs. The components of technology consist of techniques and equipment, in other words, technology focuses on this point that how inputs are turned into outputs. In this regard, it could be said that organizations which are active in any field, are practically busy turning inputs into outputs.

Technology management is a process which consists of planning, guidance, control and cooperation in development and technical capacities to form strategic and operational objectives of the organization. On other hand, technology management is an inter–disciplinary subject which connects engineering and management sciences. From the viewpoint of technology management; technology is the most important factor in producing wealth and wealth is something more than money consisting of factors such as improving or promoting knowledge, mental wealth, efficient use of resources protecting natural resources and other factors influential in promoting standard and the quality of life. Technology management is in fact a systemic management which makes creation, achievement and application of technology possible and it consists of responsibility which conducts these activities toward delivering services to human and meeting the needs of customers. Researches,

invention and development are most fundamental dynamics of creating technology and, indeed are technical advances. But, there are more important dynamics in producing wealth that is, applying and making technology commercial. In other words, the advantages of technology are achieved when the customers have access to its results. Customers could be a company or a governmental institute or an organization such as defense organizations. An invention which is kept on the shelf does not produce wealth and when an idea emerges but is not applied- even it is patented as an invention does not have financial output. Technology leads to wealth production when it becomes commercial; or it is applied toward achieving operational or strategic objectives of an organization.

Although in the technology management discussion it is supposed that technology is the most important factor in wealth production system, other factors are effective in this production system. For example, formation of capital and investment play an important role in economic growth, and social, political and environmental considerations are also influential in the process of wealth production. In technology management discussion, technology is considered the primary seed for wealth production. This primary seed is turned into a corpulent tree through right nourishment and appropriate environment. Other influential factors in wealth production consist of capital, work force, natural resources, general policies, etc. In fact, appropriate environment and other requirements form this plant. Each one of these factors consists of their own specific ground, instructions and investigation technology management as an inter- disciplinary discussion or subject combines the knowledge of all these fields. A learning course of technology management at advanced level requires a deep study of each of these factors. Technology management consists of national, organizational and individual aspects. At national or governmental level (large scale); technology management helps the formation of general policies. At institution level (small level) it results in the formation of competitive institutions, at department level; it helps the promotion of personal value in the society.

#### 4.2. Economic growth and development

Nowadays in economic literature of political science, social sciences and media culture the terms of economic growth and development are used. And in this regard, countries are divided into developing, under developed and growing, etc. The concept which is currently presented for these two special terms or expressions is a completely different concept and is contrary to the concept of previous decades, although the concept of growth may not have changed, but the concept of development have been evaluated over and over and a new insight about it has emerged and the rethinking and analysis of development is still going on and it is assessed from new aspect each day. Economic development is growth along with increase in final capacity of production including physical, human and social capacities. The way economic development is looked at is different in developed and under developed countries. In developed countries the main object is to increase welfare and accommodation for people, but in under developed countries the eradication of poverty and raising social justice is of priority. In a general look at the discussion of development the indexes of development have usually been defined based on the degree of progress in education and training, per capita, life expectancy, public hygiene (health), fighting against poverty and the rate of access to public services. But in developing countries, they have generally concentrated on two important indexes of gross national product (GND) and Gross domestic product (GOP). Indexes required for measuring economic development are as following [12]:

- A. Per capita index: per capita is obtained from dividing national income or Gross National product (GOP) into the population of that country. This simple and assessable index in different countries is compared with per capita level of developed countries
- B. Human development index (HDI): this index was introduced by United Nations (U.N) in 1991 and it is computed based on indexes such as real per capita, life expectancy, access to education as a function of adult literacy rate and the mean of schooling years of individuals.
- C. Other indexes which include:
  - Unemployment rate (as an index for the purpose of creating employment by governments)
  - Economic growth
  - The exports share with advanced technology in total industrial exports.
  - Life expectancy

#### 3-4- The study of Index of United Nations technology Achievement

United Nations has accepted technology as a series of information, skills methods and tools required for making needed products and their application or meeting useful and necessary services in a way that one of the international methods in measuring technology is through the criterion of measuring technological achievement

index suggested by United Nations [1]. This index which is completely presented in annual report of United Nations human development is a multi-aspect figure which ranks different countries according to international scale in terms of technological achievement. This index is defined considering the achievements of a country in creation and application of technology at widespread level and providing the experience background and human skills for participating in technological innovations [2]. TAI index without considering the fact that which country places the first in the international development of technology concentrates on the rate of success of that country in creation and application of technology. For example although in America more internet users and patented inventions have been registered compared to Finland but its rank, that is, TAI index, is lower than that of Finland since internet has widely spread in the society of Finland and more activities have been conducted for developing the infrastructures skills.

To measure TAI, United Nations has defined four components as following: creation of technology; Diffusion of Recent innovations, Diffusion of old innovations and Human skills which are described below.

#### **A: creation of technology**

TAI uses two indices in the creation of technology.

\*Number of patents granted per capita

This index reflects present level of innovative activities

\*Receipt of Royalty and license fees

This index shows the successful cover or support of past innovations which are now applied and are of commercial value.

#### **B: Diffusion of Recent innovations**

The rate (degree) of adaption and conformity with recent innovations is considered a criterion for assessing technological advances in these countries.

This criterion is measured using two indices:

\*The number of internet users

\*The rate of High –and Medium – technology exports

#### **C: Diffusion of old innovations**

For participation in the age of old innovation development network one factor is basic. The progress of technology in an accumulative process that is adaptation of a country to recent innovations along with wide diffusion of old innovations will be meaningful. That is, the given country to what extent is industrialized and to what extend old technologies are accessible in the society.

Two indexes have been considered to assess this factor:

\*Telephone

\*Electricity consumption

Both of these indexes are expressed in logarithmic form

#### **D: Human skills**

Human skills as the support for skills in an active and dynamic technology are very necessary. The initiators and users of new technologies both need the skills. Nowadays, technology requires conformity to skills for mastering the fixed current of innovations. The foundation of these abilities is the basic training and education [14]. Here like previous cases two indices are used:

\*Mean years of schooling

\* Gross tertiary science Enrolment Ration in Engineering 'Mathematics and Science

\*Method of computing TAI

First, Arithmetic mean of both indexes related to one dimension as a figure related to its TAI is obtained. Then, the arithmetic mean of four dimensions with equal weight will determine TAI index rate. To compute each of the indices related dimensions, the researcher should normalize all of them at a scale from zero to 1 degree. For this purpose, a series of standard figures are used. In this way if the amount of TAI is an index equal with the higher limit of the standard figure, it is normalized to figure

one and if its amount is equal to the lower limit of the standard figure, it is normalized to zero and this could be conducted using below formula.

$$\text{Amount related to index} = \frac{\text{Real Amount} - \text{Minimum Amount observed}}{\text{Maximum Amount observed} - \text{Minimum Amount observed}}$$

#### **Formula 1: Method of computing the amount related to each index**

Choosing standard figure related to maximum and minimum limit is optional, but it should indicate the best possible figure for introducing the concept of each index. For example it is not possible to determine the desirable amount of invention registration or technology exports. Thus the upper and lower limit of standard figure will be the served maximum and minimum amount related to each index [15].

### **F. Ranking and Division of countries according to index**

Forerunners (TAI greater than 0.5)

In this group in 2001 Finland, United States, Sweden and Japan were the first four countries. These groups were pioneers in technological innovations and had great achievements in creating and spreading technology and raising skills. The republic of Korea ranked fifth and Singapore ranked tenth. These two countries have considerably progressed in the field of technology during past decades.

Potential forerunners (TAI between 0.35 and 0.49)

Most of these countries have invested on human skills at high levels and have extended old innovations. But they have not succeeded considerably in the creation of innovations; however, the level of raising human skills in this group is comparable with that of pioneer group. For example, Spain and Italy are at upper part of this group. Malaysia with an index of 0.396 is ranked 30<sup>th</sup>.

Compactable Dynamic Countries (TAI between 0.2g and 0.34)

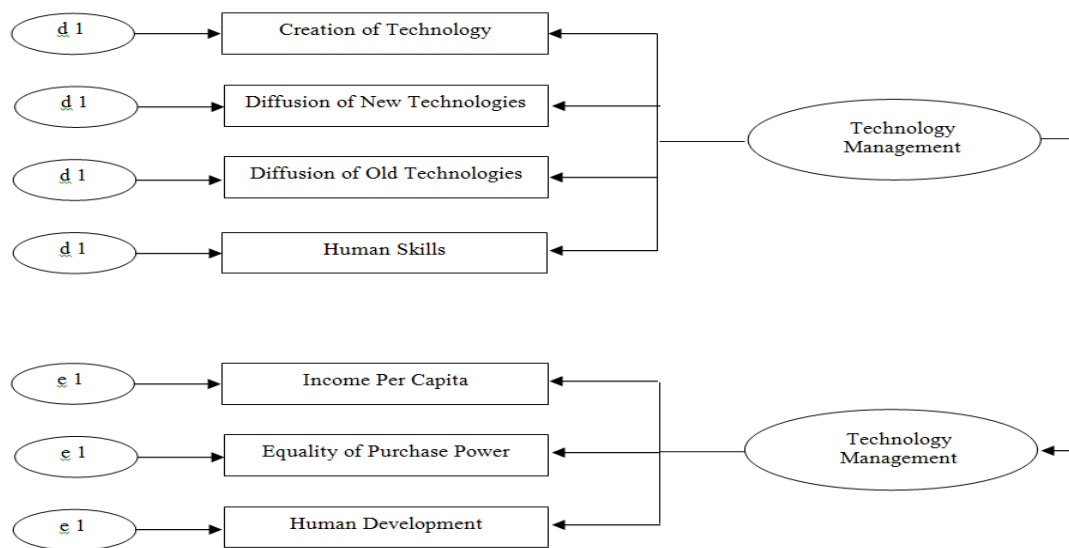
These Countries are innovative in applying new technologies. Most of them are developing countries with high human skills. In this case, countries such as Brazil, China, India, Indonesia, South Africa and Tunisia could be mentioned. Most of these countries have important industrial centers but the diffusion of old technologies in these countries is not widespread. The Islamic Republic of Iran with index of 0.262 belonged to this group in 2001.

Marginal Countries (TAI less than 0.28)

These Countries have had considerable weaknesses whether in the field of old technologies or raising human skills. It could be said that old technologies have not been distributed appropriately in this group.

### **5-Theoretical Framework of the Investigation**

Present investigation aims to study the effect of Technology management based on TAI indexes of United Nations on Economic development of our country, Iran from 2000 to 2012. To understand the subject better, the investigator has presented an independent model in which the correlation between dependent and independent variables has been demonstrated. In this model, the correlation and effect of technology management as a main index with sub-indices TAI of United Nations on economic development which consist of three indexes are studied as follows:

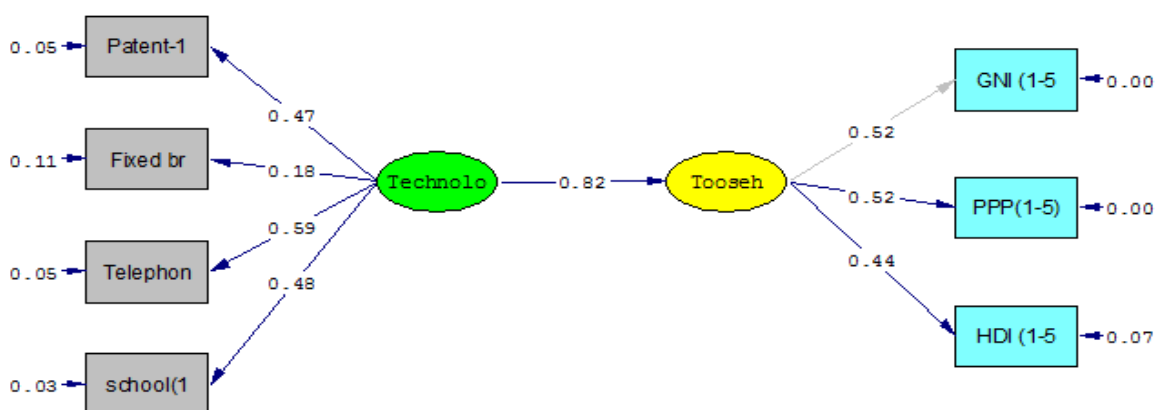


**Figure1: The Conceptual model of the correlation between Technology (through TAI Indexes) and Economic Development**

This investigation in terms of clustering is objective and applied and in terms of method is among correlative investigations. The information of United Nations [16] and World Bank [17] on our country (Iran) has been used and structural modeling has been used to analyze the data using Liseral soft-ware. Statistical society of the investigation consists of information related to indexes determined between from 2000 to 2012. (In fact, the sample volume consists of 13 cases for 7 indexes).

In this investigation TAI indexes of United Nations have been used to assess the effect of technology on economic development. And the indexes introduced by World Bank, that is, per capita index of power equality, human development index and stable income index have been used for the purpose of determining economic development indexes. It is necessary to mention that due to lack of access to information, the indexes of women participation in social scenes (activities) and national dependence, which is among the indexes of World Bank in computing economic development, have been ignored.

The output of the model based on Liseral soft- war has been demonstrated in figure 2.



**Figure2: Results of conceptual model of the correlation between technology (through TAI indexes) and economic development**

### 6- Analysis of Results

According to the experiment conducted it could be claimed that since the figure related to the correlation between technology and development is close to one (0.82 is the figure computed by the model), thus it could be accepted that there is significant correlation between these two variables (technology and economic development). This shows that which indexes introduced by United Nations in Iran, especially if the index of

internet development is developed, it will increase technology, and it will raise economic development in our country.

Also, given the results from the model regarding RMR titled Root mean Square Residual, as an index for the right beneficence (in case the figure is small), thus it could be concluded that given the figure 0.026 obtained for above index in present model, this model is of appropriate beneficence.

## 7- Summary and Conclusion

In this investigation, the effect of each one of the indexes of technology achievements, suggested by United Nations, on economic development of Iran, has been studied using the structure and equations between 2000 and 2012. For this purpose, at first, while studying the literature and theoretical foundations of the investigation, the investigator describes the indexes assigned by United Nations in details. Then, he presents a model using structural equation method in order to study the effect of the technology measurement indexes, suggested by United Nations, on economic development of Iran from 2000 to 2012. Based on the experiment conducted, the correlation between technology and development was significant. Also, given the RMR index, as an index for appropriate beneficence, this model is of appropriate use or fitness.

As a recommendation for future studies, the study of indexes suggested by United Nations for measuring the effect of technology on economic development of Iran could be extended to the past two decades instead of just last decade, which is the time span in present study. Also, the number of indexes in this model in the field of technology whether in regard with growth or economic development could be increased in order to make it as much accurate as possible.

## 8- References

1. Deasi.M, Fukda-Par .S. Johansson .C. F. Sagasti, "Measuring the Technology Achievement of Nations and Capacity to Participate in Network Age". Journal of Human Development, Vol.3, No.1, 2002
2. Fathi, S., (2007). "Presenting the pattern of effective factors on measuring consolation between information technology and finance performance of commercial companied, with meta- analysis insight", PH.D thesis, Tarbiat modares university.
3. AssariAraee, A. Aghaeekhandae, M. (2008). "The effect of information Technology on Economic growth of OPEC countries". Quarterly Economic Investigations, Eighth year, No II, page: 62.
4. Najarzadeh, R. Aghaeekhandae, M., Talati, M. (2007). "The effect of information and communications Technology on the Economic growth of Islamic Conference organization member countries". Commercial Investigation Quarterly. No. 44, pages: 49-87.
5. Akharan; P. (2008). "Comparative study of management policies of sagacity, knowledge and Technology at National level", Fifth International conference of Information and communications technology management.
6. Rabiee; M. (2008). "The effect of updating technology and its transfer on Economic Growth,". Third conference of Technology management.
7. Komijani, A., Mahmoodzadeh, M. (2007). "The effects of Infrastructure, usage and over flowing of communications and information on the economic growth of developing countries,". Commercial investigation Quarterly, No. 49. Pages: 44-73.
8. Tayebi, k., Emadzadeh, M., sheikhabaee, A. (2008). "The effect of foreign commerce and human capital on Economic growth of Islamic conference countries, ".Economic Investigation Magazine, series 44, No.1;53-73.
9. Emadzadeh, M., Dalatiisfahani, R., Samadi, S., Mohammadi, F. (2009). "The effect of work force quality on Economic growth in some countries." Quarterly of Quantitative Economy (Former Economic Studies). Series 6, No.1, PP:1-26.
10. Emamverdi, Ch.; karimi, M., Najarzadeh, N., Shahkaramoghli, M. (2012). "Study of the effect of Electronic Information and Communications commerce on Economic Growth, in G8 group countries and countries selected from Islamic Conference group,. "First Gathering of International Economic Assessment, Methods and Applications, Tehran, Iran.

11. Arab, Z., Shahhosseini, M.(2011). "Study of the effect of Technology Management Factors on Economic Growth of Developing Countries, (in Low-in come, Average- income and High- income countries, From 2008 to 2010." Tehran, Iran.
12. Jafarzadeh, A. (2009). "Modern Technology Management." Tehran university press.
13. Masudi, H. (2009). "Liseral Education in several minutes." Ferdowsi university, Mashhad.
14. [www.wikipedia.org](http://www.wikipedia.org)