

# identifying the factors affecting the transfer of operating room medical equipment technology and prioritizing them using the Weighted mean method

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## Abstract

Successful technology transfer requires identifying the goals of the industry, technologies needed, technological resources, transfer methods and factors affecting it, how to absorb and develop it, and to do any of these requires the use of relevant specialists. Without the use of experts in this field, the transfer of the desired technology is usually incomplete and inappropriate and at a distance from the original goal. Technology transfer is a complex and difficult process, and without the necessary study, it is not only not useful, but may, in addition to wasting capital and time, weaken national technology. The technology transfer process has some precautionary and preventive scales that must be addressed before considering the technology transfer model. These factors include: Awareness of the important and basic factors required for technology transfer, knowing the factors of technology transfer failure in the past and continuous search for the appropriate technology to obtain the appropriate internal position and communication with existing and older technologies. In this study, we will use a weighted arithmetic mean to rank and evaluate the final factors affecting technology transfer. Operating room medical equipment was considered as a case study. The results showed that "application", "selection and appropriateness" and "organizational factors" ranked first to third.

**Key words:** Technology, transmission, weighted arithmetic mean

## 1. Introduction

in today's world, technology replaces new products, services and materials with old products, services and materials, saves on material consumption, automates machinery and minimizes their need for manpower, shortens the life of products and their rapid obsolescence. And continuous innovation plays an important role in the market and competition [1]. Technology, as an effective factor in converting data into data sets, can play a pivotal role in the productivity and efficiency of the organization; In this way, technology can contribute to the economical and efficient use of resources and raw materials and increase the quantity and quality of production despite the constant amount of other resources [2]. Consequently, technology enhances the productivity and productive capacity of countries and, as a result, promotes economic development and improves living standards. Advanced technology provides new threats and opportunities for the organization. Technology is also one of the main factors in

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achieving competitive advantages and enhances the capacity of organizations and countries in the field of domestic and international competition. Porter considers technology as the main factor in improving the competitive position of firms and believes that the development and change of technologies themselves is not valuable; Rather, the value of its changes stems from the fact that these changes affect the competitive advantages of companies [3]. Due to the importance of technology in the creation and survival of organizations, many organizations in their organizational structure have a management called technology management [4]. In organizational and management studies, technology along with strategy, environment, size and life cycle of the organization, power and control and human resources form a set of factors affecting the organizational structure; That managers, when designing the structure, should pay attention to these factors [4]. in addition to; Technology, as one of the environmental components (factors that affect the performance of the company and are beyond its control), can affect the structure of the organization.

## **2. The nature of technology transfer**

Technology transfer is a complex and difficult process. Purchasing and transferring technology without the necessary study and research will not only be useless, but may, in addition to wasting capital and time, lead to the weakening of national technology. Transition should be seen as a process through which imported technology is acquired in a way that is not only used to produce the product, but also as a basis for the creation of new technology [5]. Technology transfer requires frequent and intensive interaction between source and receiver. Organizations need to overcome existing limitations and improve and increase capacity to transfer knowledge and technology [6]. Technology is all the knowledge, products, processes, tools, methods, and systems used to create goods or provide services. One of the areas of technology management practice that requires comprehensiveness and introspection is technology transfer. Today, industrialization is deeply dependent on the transfer of technology. Technology transfer is the application and application of technology in a place other than the original place of its creation. In other words, another process that causes technology to flow from source to receiver is called technology transfer [4]. Technology transfer takes place in two ways: vertical transfer and horizontal transfer. In vertical transfer or research and development transfer, technical information and applied research findings are transferred to the development and engineering design stage and then enter the production process with the commercialization of technology. In horizontal transmission, technology is transferred from one level of capability in one country to the same level of capability in another location. In this case, the higher the level of technology receiver, the lower the cost of technology transfer and its absorption is more efficient [5]. Through the steps that an imported technology goes through (selection, acquisition, production, adaptation to the internal market, minor changes and improvement of use and finally export to the market of developing countries) and the degree of mastery of this technology, a country can claim indigenous to have that technology. The intensity of indigenous efforts and the process of technological learning play a role in accelerating the process of mastering and embracing imported technology and its localization. The experiences of developing countries show that technological learning generally begins with mature and embedded technologies [8]. Historical stages of technological learning in countries facing industrial backwardness, there are three stages of engineering, development and research. This procedure is the opposite of the procedure of countries with technology, which is in the form of research, development and engineering.

### 3. How to transfer technology to developing countries

Technology transfer takes place through three stages of selection, absorption and adaptation:

- Technology Selection: Connected activities according to the objectives, conditions and needs of the recipient countries to determine the most appropriate technology required as well as the production of products, the creation of systems and the creation of opportunities for the desired production of goods and services along with various technological processes. Also, its most appropriate holders are made with the best conditions, technical, economic, and legal relations.[7]

The choice of technology affects not only the production and products, but also the organization and working and living conditions, people's relationship with their work environment. Appropriately, therefore, is a set of ideas with a framework in which to think and act for the development of society and to bring prosperity and wealth to countries. is.

- 1 .Maximizing and achieving mass production of consumer goods
- 2 .Maximizing the product produced
- 3 .Maximizing the pace of economic growth and development
- 4 .Reduce unemployment
- 5 .Encourage the development of regions where economic zones are currently being implemented in Chabahar, Khorramshahr and Abadan ports and many border markets of the country.
- 6 .Reduction of debts and balance of payments and proper financial turnover that leads to economic growth of the country.
- 7 .Promoting political development
- 8 .Improving the quality of life and welfare of society
- 9 .Reducing the flood of population to urban centers and preventing marginalization in large cities of the country
10. Preservation and continuation of cultural and indigenous heritage and tourism development

In choosing technology, one must choose the appropriate type of technology that will increase profit and economic growth. Thus, the technology transferred to developing countries should become an indigenous technology upon arrival. At the macro level and strategic policy-making for technology transfer, care must be taken, but at the level of industrial production units, the necessary arrangements must be made for the choice of technology. Technology, especially the most advanced technology, has made it difficult for countries to remain competitive in the market, but the important point is that not only advanced technology leads to this development, but also the technical, economic, and feasibility of the project must be considered. In some cases, the most sophisticated technology has proven that under certain circumstances it is not possible to lead countries to progress, but one technology that is very profitable for one organization may have the opposite effect for another. In addition, the infrastructure of organizations must be able to support new technology.[10] Technology absorption: Technology absorption is the process of reviewing, training, and some of the barriers to the technology recipient, and the various items needed to produce goods and services and perform processes. After the arrival of technology, production, design, and then the goods produced are distributed throughout the country, and organizations take action to produce products and products. These actions are carried out through internal facilities, using the manpower,

technical, trained and internal organizations. It is obvious that the imported technology should be absorbed and adapted to the conditions of the country and should be changed according to the local situation and the situation of the countries should be favorable. The effective absorption and dissemination of technology depends on the existence of a social phenomenon, which is beneficial in the application of that technology, the use of new machinery and various technologies leads to the development of the country. From this point of view, there should be objective interest in selecting and using special technologies. That conforms to mental interest and senses objective interest. Thus, in order for technology to be absorbed and disseminated, it must be developed in a society that is indigenous through absorption and improvement and generates new technologies itself. If there is no ability to modify, improve and improve, imported technology will not be difficult to meet the needs of the natives. That means breaking free from attachment. In order to compete with advanced countries in the field of original technologies, it is necessary to invest heavily in infrastructure and sophisticated technologies as well as research so that countries can absorb the latest world-class technologies. Therefore, all developing countries have accepted it as a matter of course, but it has been very difficult to use it as a basis for action, as priority should be given to the efficiency and effectiveness of existing foreign technologies, so developing countries should develop Improve and invest appropriately in attracting imported technologies, choose the most economical way. In this way, they can increase the activities of internal development, private industries and benefit from domestic research organizations [9].

#### **4. identify criteria for ranking the factors affecting technology transfer**

After accurately defining the purpose of the decision, which here is to evaluate and rank the factors affecting technology transfer, we must determine the indicators that affect the purpose of the problem, the information of which can be collected. In this study, while reviewing and conducting preliminary studies using interview methods with experts, professors and specialists in the field of technology transfer in medical equipment and the use of library resources and related sites, some criteria that potentially affect the decision of project managers. Was determined. These criteria are: 1- Selection and acquisition 2- Adaptation 3- Absorption 4- Application 5- Development and improvement 6- Dissemination 7 Financial factors 8- Organizational factors

#### **5. Calculation of index weights using the weighted arithmetic mean method**

To calculate the weight of the indicators, a questionnaire is prepared using the opinion of experts, in which each indicator is placed in a row and one of the two-dimensional spectrums is placed in the columns. Each expert or decision maker, a copy of Completes the questionnaire by marking the degree of importance corresponding to each indicator. This method is more flexible and accurate than the relative frequency method. The sample questionnaire for calculating the weight of 8 indicators in terms of 5-point Likert spectrum is as follows to conduct this research.

Table 1. Expert scoring table of indicators in terms of Likert scale

The degree of importance				
Very high	high	medium	low	Very low
9	7	5	3	1

Then the steps to determine the weight of the main indicators based on the balanced scorecard are as follows:

Step 1: Complete the weighted average arithmetic questionnaire using the opinion of experts

Step 2: According to the Likert 5-choice spectrum, we consider the value to be very low equal to 1, low equal to 3, medium equal to 5, high equal to 7, and very high equal to 9. They are.

Step 3: Divide the weighted value of the index by their sum to obtain the weight of each index.

## 6. Statistical community and calculation of weights

in this study, we used 18 knowledgeable people to complete the questionnaire. Due to the small number of these people, the whole number was used. The answers are as shown in the table below.

Table 2. Expert scoring table of indicators in terms of Likert scale

Row	Indicator	The degree of importance				
		Very low	low	medium	high	Very high
1	Selection and acquisition	9	2	3	3	1
2	Conformity	4	1	5	2	6
3	Absorption	6	0	4	1	9
4	Application	6	8	1	3	0
5	Development and improvement	4	2	5	3	4
6	Release	5	2	4	4	3
7	Financial factors	2	5	3	7	1
8	Organizational factors	6	5	1	2	4

Finally, using the weighted average method, the weight of each index is obtained. The importance of each indicator that is proportional to its weight is shown in the chart below.

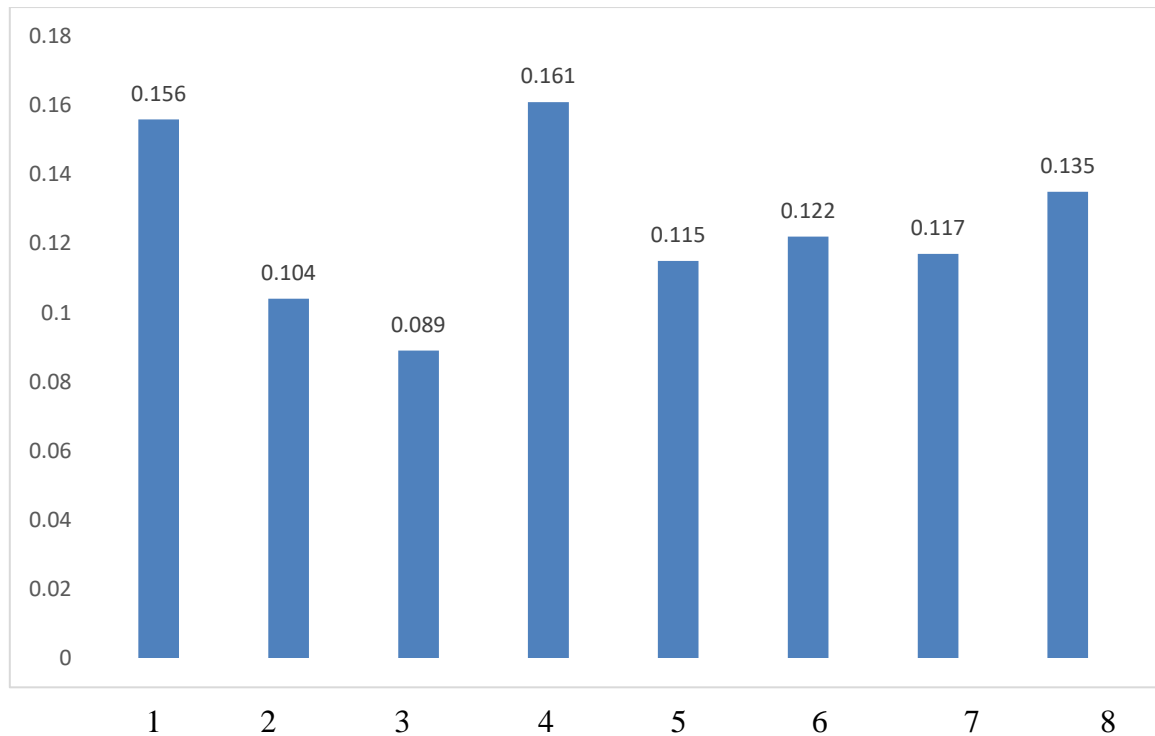


Fig1. The weight of technology transfer agents

## 7. Conclusion

The choice of technology affects not only the production and products, but also the organization and working and living conditions, the relationship of individuals with their work environment. In order to compete with advanced countries in the field of original technologies, it is necessary to invest heavily in infrastructure and sophisticated technologies as well as research so that countries can absorb the latest world-class technologies. Therefore, all developing countries have accepted it as a matter of course, but it has been very difficult to use it as a basis for action, as priority should be given to the efficiency and effectiveness of existing foreign technologies, so developing and developing countries should Choose the most economical way to invest in attracting imported technologies. It is the process of linking imported technologies with the goals, conditions and facilities and needs of the importing countries and the receiving organization that must be adapted.

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