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TÍTULO: Evaluación de métodos de los modelos de transferencia de tecnología.

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RESUMEN: La ventaja de la tecnología espacial en la prestación de servicios a diferentes partes del país es tan evidente, que además de utilizar la tecnología en la gestión de crisis, los desafíos del medio ambiente y los desastres naturales, el espacio y la tecnología espacial también desempeñan un papel en la gestión de otras posibles crisis. La tecnología de las comunicaciones espaciales puede llenar el vacío de comunicación y acelerar el proceso de proporcionar asistencia y servicios a las personas. En este estudio, realizado en la industria espacial del país, se seleccionaron 14 expertos de la industria, profesores universitarios y expertos administradores de la industria especial; los factores del modelo se eligieron por el método Delphi, diseñándose el modelo de investigación.

PALABRAS CLAVES: transferencia de tecnología, modelos de tecnología, modelo de transferencia de tecnología, industria espacial.

TITLE: Evaluating methods of the technology transfer models.

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ABSTRACT: The advantage of space technology in providing services to different parts of the country is so evident that in addition to using the technology in crisis management, the challenges of the environment and natural disasters, space and space technology also play a role in managing other potential crises of the country. Space communications technology can fill the gap of communication and accelerate the process of providing assistance and services to the people. In the present study, which was conducted in the spatial industry of the country, 14 industry experts were selected, university professors and the rest of the experts from the spatial industry managers, and the model factors were chosen by the fuzzy Delphi method, and then, the research model was designed.

KEY WORDS: technology transfer, technology models, technology transfer model, Spatial industry.

INTRODUCTION.

Considering the difficulties and complexities faced by managers of technology transfer projects, researchers, consultants, and practitioners of technology transfer, many different authors have presented TT models that are oriented to improve the planning and implementation of technology transfer projects (Sazali et al., 2009; Sihgh and Aggarwal, 2010).

Considering the existing barriers and considering that moving to new technologies for organizations is indisputable, organizations should analyze all aspects of technology entry before their technology

transfer and development. The technology transfer process is a complex category, which includes legal issues, technical complexity, financial calculations and marketing (Lipinsky et al., 2008).

Technology transfer was done by actors including developers, owners, suppliers, buyers, recipients and users of technology; e.g, universities, researchers, private or public companies, individual consumers, financiers, governments, transfer organizations, NGOs, etc. (Manning et al., 2008).

Transfer of technology and research and development is one of the most important factors driving the global economy today, and much research has been done in this regard. Some, like Siegel et al. (Siegel, 2013), have assumed that the technology transfer model is completely linear, which has been beginning with inventions and exploration, it continues with evaluation and registration, and eventually ends with the launch of the market and obtaining a license. On the other hand, some people like Itaio et al., in addition to verifying and accepting the network's attitudes, they have become so important that they have added it as a separate argument to the network's attitude (Siegel, 2013).

Technology transfer is an important category in promoting the level of technology of a country and ultimately moving towards sustainable development. The importance of choosing technology transfer techniques in many developing countries has led to testing different types of technology transfer methods to select the most appropriate ones.

Given the rapid growth of new technologies and their importance in terms of providing national security, public welfare and economic growth, neglecting them may help us out of technological constraints. Therefore, it is necessary to look for ways to achieve the fastest possible access to these technologies (Hsu, 2015). The transfer of technology and strategic cooperation between technology companies, although already existing, but its significance since the 1960s, due to the creation of the rapid development of knowledge and technology in the industrialized countries on the one hand, and the need for its development in the non-developed countries has been raised by many authors. Moreover, due to the technological advances of other countries, our country will have to create or

transfer technology from the countries that own the technology to inside your borders. In this regard, recognizing the choices of technology and models for choosing the appropriate technology transfer process is very important (Liua, 2015).

DEVELOPMENT.

Space technology, in its initial period, included space rocket manufacturing and launch technology, planetary satellites and planes, digital imaging, space sensor design and development, interplanetary trips and flight attendants. But today, with the advancement of space science are done in various areas, such as spatial navigation, system optimization, smaller, lighter and more efficient subsystems, more space-based engines, modern energy in space, spatial space spatial and space tourism. For this reason, various countries have tried to take action in this field and create space for themselves on the international level using space technology (Blomqvist, 2009).

Considering the special importance of space technology and the need for this technology to be used to facilitate people's lives, the upstream documents of the Islamic Republic of Iran have received special attention in recent years. For example, in the 6th Development Plan by the Supreme Leader, the issue of increasing the penetration of spatial technology as one of the industrial strategies in advanced technologies and has been emphasized on the development of spatial technology by designing, constructing, testing, launching and exploiting space systems and maintaining and exploiting the maximum of the orbital points.

In the 20-year vision document of the system and the fifth development plan, the achievement of modern science and technology in providing space services to Iran, guidance and development, and the space infrastructure required by the country, and the development of research and teaching on space science and technology, Title is one of the strategies of the ICT sector of the country. In addition to the development of the space industry by achieving a complete satellite cycle, the definition and

implementation of space research and research projects with the participation of domestic and foreign universities and the creation of the National Space Laboratory have been emphasized; on the other hand, the strategic orientation in developing the sixth five-year plan of the country, as well as the 10-year plan of space in Iran, also pursues these goals (20-year Iran vision document).

A review on the research literature.

A country's competitive advantages increasingly lie in its capabilities to generate further innovations and to effectively use new technology (Choi, 2009). Nevertheless, technology transfer is a complex, difficult process that includes legal issues, technical complexities, financial calculations, and marketing, even when it occurs across different functions within a single product division of a single company. TT is commonly acknowledged to be a complex process that needs time to evolve (Lipinski et al., 2008).

Today, the importance of technology is not covered by the success of companies. Companies (both large and small) are constantly struggling to reach new technologies, and thus, become more competitive than their rivals in the marketplace. Therefore, the development of technology has always been a matter of great importance. Development of technology may take place in two ways (Khalil M. Tarek, 2007).

Technology transfer is also referred as TOT, which stands for Transfer of Technology, which is the process of transferring skills, knowledge, technology, production methods, production prototypes between the government and universities and other institutions to ensure of scientific and technical progress, which is being implemented among a wide range of users who can take on the development and exploitation of new products, processes, applications, materials and services.

Technology transfer is strongly associated with the transfer of knowledge. Horizontal transmission (level) is the movement of technologies from one area to another. The technology transfer (TOT) is

initially and horizontally (level-level). Vertical transfer occurs when technologies from the research center are used by other research and development agencies. Technology managers are people who find out how to guide the emerging world and apply concepts or trends to organizations or new ones. The term commonly used in this sense is the term "technology value". While the term work (conception) is conceptually used for many years, (in ancient times, Archimedes can be cited for the use of science in scientific matters), the amount of research today, when combined with the high failures in Xexox PARC and elsewhere, has focused on the process itself (Boarini, 2014).

Currently, the topic of TT is wide and dynamic. In addition, concepts of TT encompass many different interpretations and views depending on the organizations' objectives, research background, researchers, developers, users, research areas and disciplines and underlying perspective (Wahab et al., 2009). However, in a simple way, the term technology transfer can be defined as the process of movement of technology from one entity to another. Commercial technology transfer may be defined as mutually agreed and goal oriented. The transfer may be said to be successful if the receiving entity (i.e. the transferee) can effectively utilize the technology for business gain. The transfer involves cost and expenditure that should be agreed by the transferee and transferor (Singh and Aggarwal, 2010).

Transition process.

Warren et al. (2008) reports three models for university TT that are oriented to resolve conflicts between mission and methods, and the dependency on geographic location.

Eckl (2012) created an Interactive-Recursive model of knowledge transfer related to generation, diffusion and absorption of external knowledge. Meanwhile, Kim et al. (2009) developed a conceptual model that includes a set of propositions for impacting factors and a proposed process made up of phases that can be used to measure the TT success accurately, and proposed a TT model based on an efficient university-industry linkage that necessitates the reengineering of educational,

research and commercialization processes of university-based research outcomes (Khalozadeh et al, 2011).

Many companies, universities, and government organizations now have the transfer technology organization TTO, also are known as Tech Transfer or TechXfer, committed to identifying research that has strategies and business profits for how to extract it; for example, a research result can have commercial and scientific benefits, but monopoly rights are only natural for practical processes and not necessarily the researchers must comply with a practical scientific process; for example, the other consideration is commercial value, while there are many ways to solve a nuclear gap; other business values are those that generate more energy than they need (SamadiMoghaddam, 2012).

The process of creating business research is very different. This could include certification of agreements or regulation of joint actions and partnerships to share in both the risks and rewards associated with the entry of new technologies into the market. Other synchronized tools and devices, such as side devices, are also used where the host organization does not have the desire for resources or skills to develop new technology. Often, these methods are linked to the growing risk capitalization (VC), but as a financial development tool (the development process), an action that is more common in the United States than the EU and a more conservative approach to finance VC. Affiliated companies are the most well-known instruments of commercialization in Canada, that is, as far as the University of Canadian research grant rates has remained below American interest rates (Ismael Zadeh, 2014).

Technology transfer organizations can work from research organizations, governments, and even large multinational organizations. As a result of the complexity of the technology transfer process, technology transfer organizations are often multidisciplinary, including economists, engineers, lawyers, marketers, and scientists. The dynamics of the technology transfer process are considered on their own, and there are many committed journals and communities (Jalili, 2010).

There is a significant increase in technology transfer that has taken place in its field since 1980 and is largely due to the Bayh-Dole Law and the Equality Act of other countries and provides additional incentives for research. Technology transfer is a process in which technology or knowledge developed in one place or for a specific purpose is used and applied at a different location or for several other purposes. The term technology transfer is historically linked to federal activities; however, this process is not limited to government. The most common form of technology transfer between federal laboratories and non-federal organizations, such as the private industry, the academy, and state and local governments (Casanueva, 2012).

The federal laboratory consortium for technology transfer (FLC), formally conferred by Congress to facilitate technology transfer in the United States, extends the definition that adapts and modifies the activities of technology transfer in a wide range of federal agencies and laboratories and research and development centers.

Technology transfer is a process in which the knowledge, capabilities, or capabilities developed under the supervision of the findings of the Federal Development and Research (R & D) are used to address the public and private needs (Chen, 2015) Technology transfer can also take place between federal agencies, although the initial emphasis is on transfers to non-federal agencies, but not from federal facilities to the other. There are opportunities for technology to be transferred from organizations to federal states to benefit from lab measures.

Technology transfer can be described as market pull or technology pressure. Technology transfer occurs as a result of the market pull, of course, when the need or problem of the company leads the company to seek federal technology. Technology pressure occurs when inventions or innovations are used to create new markets or consumer needs. The overall goal is to get advanced R & D out of the market environment for business. However, there is the opportunity for the government to bring developed technology into the federal R & D industry by the industry, in order to make further

research; development and trade available to all major partners (Christensen, 2015) Different definitions have been given for technology transfer.

Technology transfer models in Mexico.

In general, previous studies to obtain evidence about TT in Mexico are very limited and mainly focused on topics such as types of knowledge, networks and linkages. The different mechanisms to transfer knowledge or technology are omitted and the few results that there are show the lack of interest from industrial firms in technological R&D to use TT as a factor in raising their competitiveness (Casalet and Casas, 1998). This evidence indicates that there is an important weakness in the analysis of the TT processes between scientific and industrial environments (Feria and Hidalgo, 2011).

In the National Innovation System of Mexico, it is possible to identify a gap between the generation, transformation and application of knowledge. In general, the line followed by most of the research centers and universities has been to provide human resources to firms, acting like a spectator of industrial and economic development of the country (Feria and Hidalgo, 2011).

One of the reasons, why TT is limited in Mexico is that Mexican researchers in universities or research centers are responding to the incentives created by the National System of Researchers (SNI, based on the name in Spanish) and by the National Council of Science and Technology (CONACYT), which encourages researchers to continue publishing throughout their lives but does not encourage them to obtain patents or transfer their inventions.

Although researchers in Mexico typically have tenure in their respective institutions, their base salary is about one-third of what they can actually receive. The other two-thirds are given in the form of pecuniary compensations directly from SNI and from the university where the researchers work; they are also a function of SNI's appraisal of the candidate's proficiency. Moreover, SNI is based on current

performance and does not guarantee any type of "tenure". In addition, its payments are not considered as a salary when establishing a person's retirement pension. Therefore, researchers are reluctant to retire, and they have to continue publishing some papers in order to receive these salary complements, which works against activities oriented to generate TT.

Mexican researchers can choose between allocating time to publishing, to patenting, or to teaching. Perhaps these activities complement each other, but if not then the current reward system may be giving fewer incentives to those activities that produce a higher social payoff (Gonzalez-Brambila and Veloso, 2007).

In recent years, Feria and Hidalgo (2011) from the Department of Business Administration of the Universidad Politécnica de Madrid reported a science-technological knowledge transfer model in Mexico as a means to boost the limited relations between the scientific and industrial environments. This proposal is unique in Mexico and is based on the analysis of eight organizations (four research centers and four Mexican firms), which have varying degrees of skill in the practice of science technological knowledge transfer.

Feria's (2011) study used a case study approach. His analysis highlights the synergistic use of the organizational and technological capabilities of each organization as a means to identify the knowledge transfer mechanisms that are best suited to enabling the establishment of cooperative processes and to achieve results in R&D and innovation activities. Feria and Hidalgo (2011) concludes that the results of the application of his model reveals the need to improve the TT and cooperative processes in relation to the science and technology (S&T) activities developed by these organizations.

At the level of cooperative relations, it is noted that most of these organizations make use of all available mechanisms. However, the intensity with which they are applied varies greatly between the mechanisms and among similar organizations. Although all of these institutions have developed their

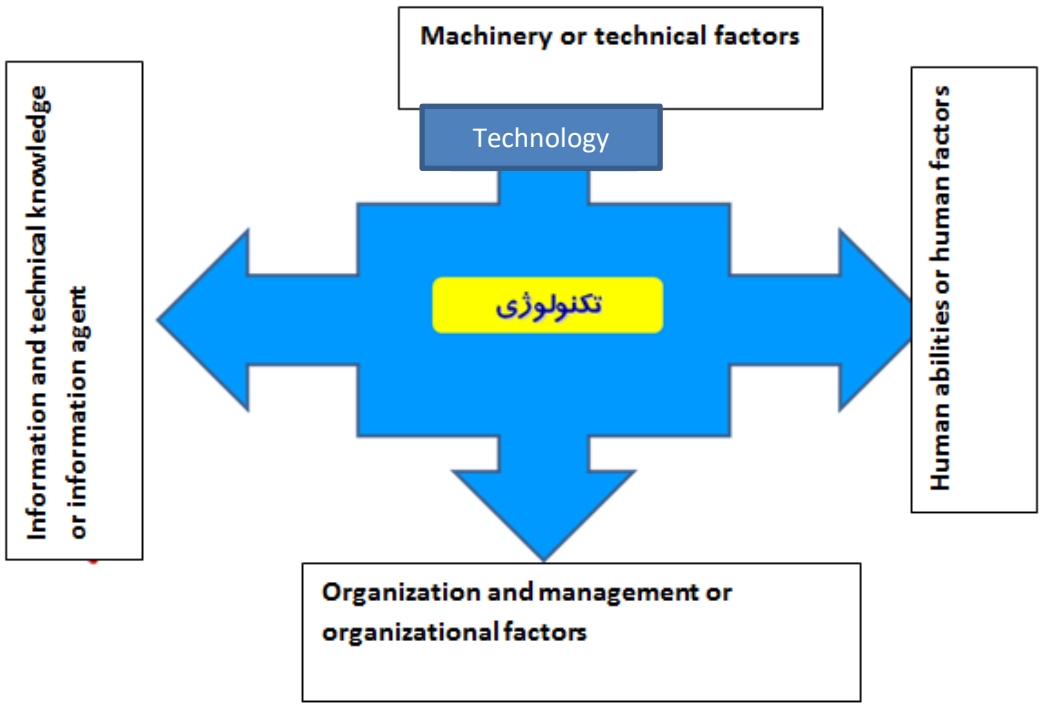
R&D and innovation activities at different degrees of intensity, the analysis showed several weaknesses with respect to the form to transfer and the absorption of the S&T results.

The UN definition of technology transfer includes: The importation of specific technology factors from developed countries to developing countries allows these countries to develop and deploy new means of production and expand existing tools (Chapple, 2016).

Technology transfer from NASA's perspective: Technology transfer is referred to as the process by which the use of the technology of an organization "according to which the organization has developed" in another organization "and" other purposes "is possible" (Al-Mabrouk, 2009).

Technology transfer from Khalil's point of view: Transfer of technology is a process that generates the flow of technology from the source to the recipient (Khalil, 2007).

Technology components: Technology will be introduced in four main dimensions, which will focus on each aspect of the technology transfer in terms of transmission methods (Rossi, 2010).



In this model, from a managerial point of view, technology cooperation methods are considered. Technological methods are meant to be technology transfer methods that allow access to the technology through collaboration with the other party. In other words, the parties contribute to a technology partnership in order to achieve the desired technology. The purpose of the collaboration, the ability to define the terms of cooperation, and familiarity with technology and market are the factors that are considered in this model. The methods proposed in this model are limited to technological cooperation methods and do not include all the methods of technology transfer. In this model, technology transfer techniques are classified based on features such as integration, flexibility, control, and impact on the technology receiving company, and the following table has been presented with these characteristics (Chiesa, 2008).

Ford Model.

In this model, similar to the previous model, general methods of access to technology are considered. In other words, this model is not exclusively in arts by choosing the right method of transmission. The factors that have been considered in this model for deciding on the appropriate method for accessing technology include: the relative ability of the organization in the technology, the need for rapid access to the technology, the need for technology ownership within the organization, the status of technology in the life cycle curve and the technological (strategic) competitive (strategic) effect of technology. According to these factors, the methods proposed by the model are a combination of methods for technology transfer and endogenous development (Savoiu, 2014).

Criterion / Ownership method	Relative ability of firm in technology	The need to quickly get technology	The need to inherit technology within organizations	Competitive effect	Lifetime of technology
Endogenous development	High	Very low	Very high	Privileged or vital	Genesis
Cooperation	High	Low	High	Privilege or base	Beginning of growth
Submission of some of the activities as a contractor	Low	Low	Low	Privilege or base	Growth ends
Buy royalties	High	High	Very low	Privilege or base	Puberty
Buy product technology	Very low	Very high	Totally unnecessary	Foreign	Deterioration

Figure 1. Ford Model (Savoiu, 2014).

Knowledge Transfer Technology Knowledge Model Feria.

The Feria model is based on the fact that organizations that have succeeded in TT have different characteristics that facilitate or prevent these processes. The creation of TT agreements is usually the result of a combination of many aspects, including: organizational characteristics (e.g, organizational features and management system); technical specifications (e.g R & D and innovation activities, information resources, techniques Management, and technology management models); knowledge transfer characteristics (i.e mechanisms, communication with other organizations and structures to support knowledge transfer); and motivation (i.e, effects, benefits, and barriers). This model shows the relationship between the influences of these profiles, in order to create the knowledge of the transfer process (Feria and Hidalgo, 2011).

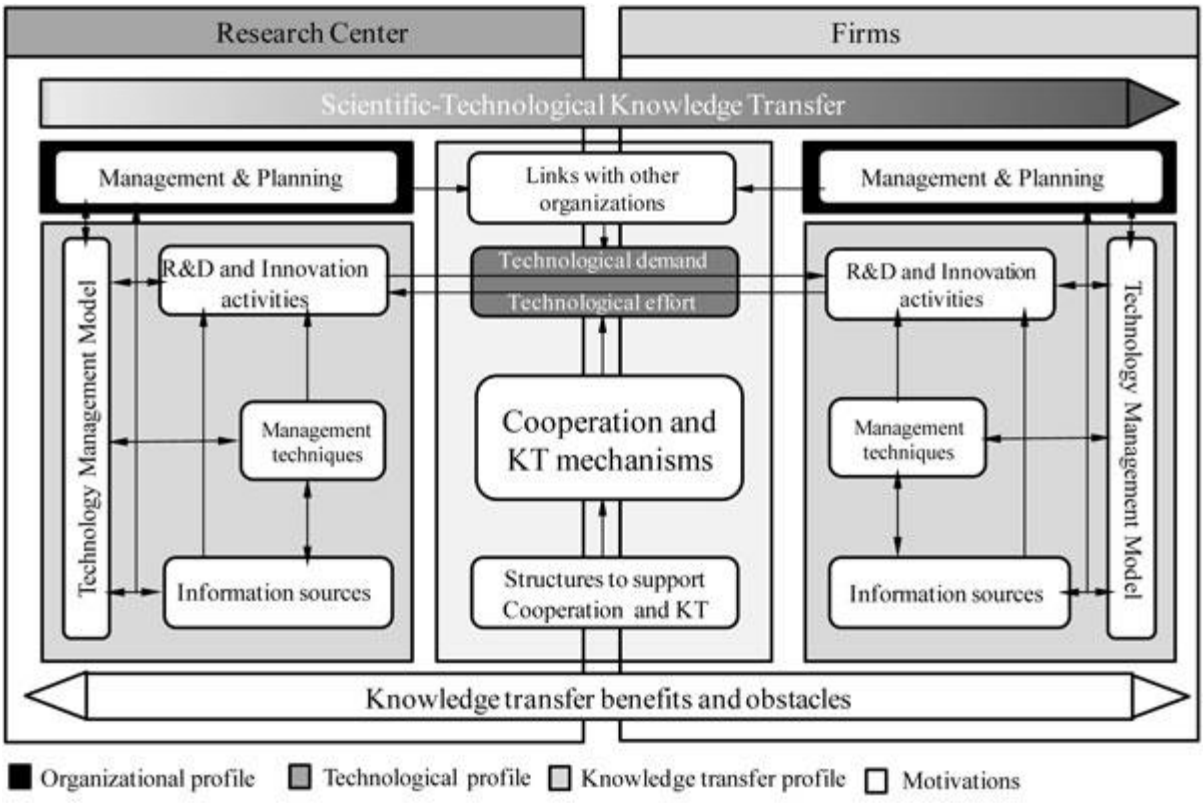


Figure 2: Technical Knowledge transfer (Feria and Hidalgo, 2011).

Therefore, the model answers the question of how the R & D activities are implemented and innovation in the organizations analyzed into knowledge transfer processes. It is developed by other organizations. Some aspects of the scientific-knowledge transfer model were not considered for use in Mexican universities; for example, this model was proposed for the analysis of only research centers in Mexico, regardless of universities. The main driving force in Mexico has been focused on public universities (60% vs. 10% in research centers) (CONACYT-SIICYT 2011). Meanwhile, companies selected for study are not industry representatives in Mexico; for example, the Mabue and Silane innovation systems have been known as one of the best in the country. In addition, in Mexico, the basic needs in TT have not been resolved; this problem relates to communication strategies, motivation, regulation, and increased confidence in intellectual property (Cabrero et al., 2011). Finally, the Feria model does not pay attention to the fact that researchers at universities or research

centers still respond to the incentives created by the National Researchers System (Feria and Hidalgo, 2011).

The Bar-Zakay (Bar-Zakay) Bar-Zakay's model developed a relatively comprehensive TT model based on a development model. The project management approach employed the TT process to search, adapt, implement, and maintain its operations in each of these activities, shows strengths and points of decision. Steps have been shown in Figure 2. The upper half of the figure defines the activity and requirements, Transmitter (called "Donor") and lower half, Transmitter or "Receiver". The activities carried out in this model are precise and relevant. Both the transfer and transfer manager has been emphasized on technological forecasts, long-term planning, and project-related information gathering (Savoiu, 2014).

National Space Organization.

Iran's Space Organization is the National Space Agency of Iran. The mission of the organization is to plan for the use of space and expand spatial technologies in the country using indigenous knowledge and international cooperation. On the one hand, the development of satellite technology and telecommunications, remote sensing, launch and space transportation, and the development of human resources, ground stations and appropriate infrastructure for satellite control on the other hand, are the focus of the activities of the Iranian Space Agency (Sun, 2008).

The organization is currently developing Satellite Manufacturing Technology in Iran. The research explorer is the latest space rocket tested by this organization. The Iranian Space Agency also plans to send the first Iranian astronaut through space technology by 2020. The Iranian Space Agency has a legal personality and financial independence, and it is administered as a governmental institution affiliated with the Ministry of Communications and Information Technology (Statute of the Space Organization of Iran, 2008).

The country's space industry is one of the largest and most important manifestations of the scientific progress of the country, which, despite all the limitations, has achieved significant achievements in various fields such as elite training and specialists, the acquisition of design, construction and launch technologies for satellites and probes, and the creation of complex native infrastructures and to acknowledge the credible international authority of Iran in the spatial domain, it is one of the few countries that hold the full cycle of technology and in the specific sense of the emerging powers of this field.

The consolidation of the technological achievements recorded so far and its stabilization, the establishment of the formation of private businesses in the development of space technology and the possibility of the introduction of this technology in other industrial areas and strengthening the role of space technology in the realization of the fourth industrial revolution, is one of the actions to be implemented in the future. Provisions of Article 47 (47) of the fifth draft law, the comprehensive scientific plan of the country and the provisions of the policies of economic resistance within the scope of the duties of the Ministry of Communications and Information Technology are among the most important legal indicators emphasized in this report. The government's performance in implementing written and oral programs provided by the Minister of Communications and Information Technology has also been studied on the management and development of the spatial sector of the country (Azami, 2017).

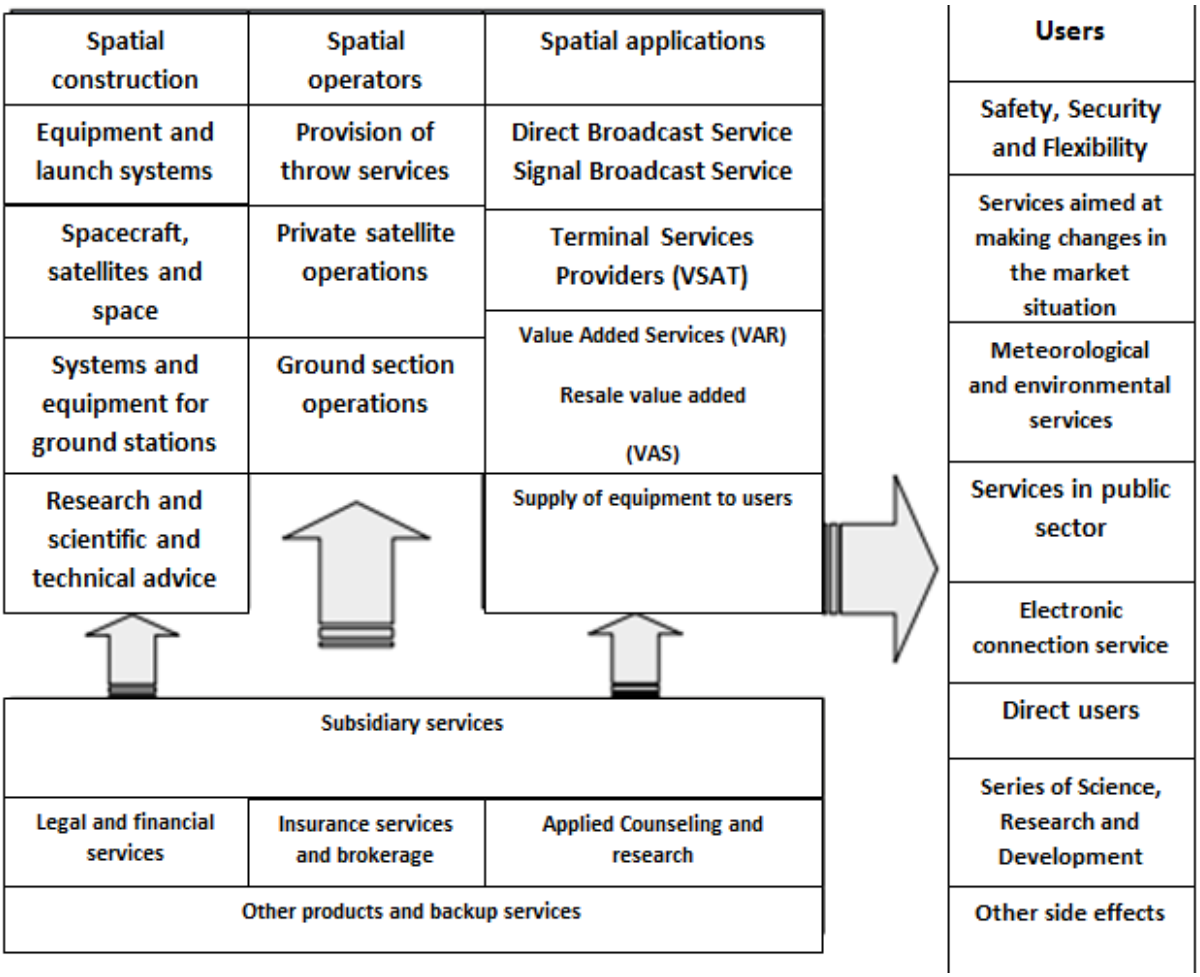


Figure 3. Global Value Chain in Space (Azami, 2017).

Research methodology.

As stated above, using the Fuzzy Delphi method, the factors were identified to design a conceptual model for the transfer of technology. The various dimensions used in this model are consistent with the literature of the subject and with the views of the experts. The variables and indicators of technology transfer are: the nature of technology - the creation of competitive advantage - the transfer of knowledge to industry - the efficient workforce of the operational needs - the elite and the public.First, we will discuss the use of the Fuzzy Delphi method to determine the factors affecting the transfer of technology, and then we will write about the conceptual model that will be developed

using the literature of the research and using the results obtained. In the following, the flow chart will be discussed and finally the scenarios will be discussed.

The research method in this thesis is based on information gathering and descriptive survey method. This is an applied research. The information gathering method will be in addition to the library method. The method of collecting field information through a questionnaire and interview is that the validity and reliability of the questionnaires will be tested. Resources include the use of the National Library database, sites and journals of the day-to-day collection of information through direct communication.

CONCLUSIONS.

At this stage, the goal is to determine the factors affecting the transfer of technology, in which many studies have been carried out. By studying articles in the field of branding and brand, 67 factors were identified which, with the help of the consultant professor, reduced these factors to 37. According to these factors, a questionnaire was developed in order to obtain expert opinions about the impact of these factors as well as their impact: Technology level, the level of technology risk, available infrastructure, how to communicate with the company in terms of cultural-political, product complexity, Industrial Research Centers, Military Research Centers, Knowledge-based Companies, Science and Technology parks, increase productivity, advancement of technology, industry profitability, increased market penetration of technology development, allocation of research and development budget, sales of technical knowledge and technology, increase market share, increasing university recognition of industry needs, transfer industry experience to university, creating and modifying academic disciplines, contact with the innovative company, joint meeting and joint activity, military commercial ideas, creating a platform for innovation and creativity, joint projects, contact with the innovative company, training human resources, obtaining confirmation and other

relevant forces, approval at the Strategic Defense Research Center, portfolio upgrade or technology transfer, contract or formal transfer of technology contract, Organizations of Jihad Self-Correct Research and Development AJA, VDA, NAJA, IRGC, informal transfer of technology, R & D investment.

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