Research on Technological Development and Economic Benefit of International Communication Satellite Based on Information Consistency

Xiaoxi Liu[1,*], Yifeng He[2], Nan Ye[2], Rui Zhang[2]

[1]Shaanxi Yanchang Petroleum Finance Co,.Ltd., Xi'an, China

[2]China Academy of Space Technology, Xi'an, China

Keywords: Consistency; Communication Satellite; Economic Benefit

Abstract: At present, in many countries, satellite industry is a national strategic industry. Its rapid and healthy development will bring huge economic and social benefits to the country. The development of China's satellite industry still has a gap compared with the world's space powers. Research on the application of satellite technology needs to be strengthened. This paper discusses the relationship between the economic benefits and technical performance of communication satellites. In the end, China's satellite mobile communication market has great potential, diversified business types and terminal requirements; and it has the advantages of differentiated domestic price and terminal price, seize market share, and finally achieve economic profitability.

1. Introduction

The convergence of information technology and communication technology has created a new concept of information and communication technology. Due to the huge role of the ICT industry in promoting global economic growth, countries around the world have listed it as a priority industry. The challenge of fiber-optic communication requires that the economic benefits of communication satellites must be improved in order to remain competitive. The economics of satellite communication engineering can be divided into two parts [1]. One part is the space part and the other part is the ground part. The main control objective of a multi-agent system is to achieve the same state of each agent without a organizer and coordinator through a distributed protocol. In multi-agent network system, with the change of time, the state of all agents tends to be consistent through communication and coordination among agents. It is said that the system achieves information consistency [2]. The most typical application of multi-agent collaborative information consistency problem is cluster coordination control problem of unmanned navigation platform [3]. At present, domestic operators are acting as agents for foreign satellite mobile communication systems. There are many drawbacks and limitations in the process of business development. Only by building our satellite mobile communication system, can we get rid of the predicament of people and ensure the security of satellite communication transmission in our country.

The aerospace industry is one of the most competitive fields in the world, and it is an important symbol of the comprehensive national strength. It occupies a very important position in the contest between countries. By dividing the total cost of satellite by the product of channel number and working years, the cost of communication satellite channel has been reduced by two orders of magnitude over the years [4]. The equilibrium point of the system determines the final state of the system and the purpose of the task, while the general research only considers the condition of how the system achieves information consistency, and the effect of the initial state of each member of the system on the final equilibrium point is not too much involved [5]. Therefore, the research on satellite technology transfer based on industrial chain construction is of great practical significance for the application and industrialization of satellite technology in China. It is helpful to stimulate the development and improvement of satellite technology, and to accelerate the transformation of satellite technology achievements. Domestic operators are all implementing satellite communication functions by acting as agents for foreign satellite mobile communication systems. There are many drawbacks and limitations in the process of business development, and they are often in a

  DOI: 10.25236/icebfm.2019.028

predicament restricted by people at all levels. Therefore, the establishment of satellite mobile communication system is a problem that our country must solve in the future.

2. Revenue Analysis of International Satellite Mobile Communication Service

China's satellite mobile communication system is positioned as a national major public welfare project, focusing on national information security, social stability, emergency response, village-to-project and other countries to ensure the stability, coordination and sustainable development of the national economy. Each value activity uses a technology combined with purchased inputs and human resources to produce an output. As a collection of various activities, it is also a collection of various technologies. The development of satellite ground stations to small and mobile is economical and flexible [6]. According to statistics, the cost of a satellite ground station is approximately proportional to the square of the antenna diameter. Therefore, the economic benefits of satellite mobile communication services generally do not exist directly or separately, but are implicit in the economic effects and social activities of their service targets, and are indirectly exerted through the beneficiary units. As the weight of satellite increases, the weight of telemetry, remote control and attitude control subsystems does not increase proportionally with the increase of the total weight of satellite, and the increase range is small, so that the payload weight can be greatly increased [7]. The economic efficiency factor of communication satellite can not only express the economic efficiency, but also have two functions: one is to be used as the design criterion for developing arsenic communication satellites; the other is to be used as the measurement standard for measuring the technical level of various communication satellites. In addition, compared with other groups, the impact of ICT use on economic growth of high-income groups is more obvious. This means that the country needs to formulate specific policies to promote the use of ICT, improve the operational efficiency of ICT industry, and optimize the economic growth structure.

Foreign satellite mobile systems are potentially dangerous in terms of security and authority control. Domestic satellite mobile communication providers are constrained by others. Whether government, industry or public users, they have to choose foreign services. Once an emergency occurs, it is easy to be constrained, and the consequences will be unimaginable. From R&D department to production workshop, to process or product design department, almost every link of an enterprise needs technical efforts. Multi-agent systems exchange information through neighbor nodes is the key to achieve consensus. The constraints of real networks can be roughly divided into two categories. One is the constraints of communication channels: delay, packet loss, communication bandwidth, measurement noise and so on. Today's technology can modulate and store satellite received signals, that is, error correction of the digitized uplink signal, and then remodulate the signal using a modulation technique that is different from the uplink signal and suitable for the downlink. A kind of regenerative signal is sent to the earth. In addition, although various communication satellites have different uses and technical requirements, they are essentially relay stations, and economic performance factors can be used to characterize their technical performance. The existing distributed consistency algorithms are basically asymptotic algorithms, which theoretically require infinite time to achieve information consistency. After the satellite mobile communication system is built and put into operation, it will promote the pace of reform and development of the business, promote institutional, technological and management innovation, enhance competition awareness and competitiveness, and vigorously develop China's satellite mobile communication business.

Since the beginning of the satellite mobile communication system in the world, almost no satellite mobile communication operator has immediately gained revenue. Even some operators have experienced the recent years of careful management, such as bankruptcy, restructuring, and development. The profit of the second time. The particularity of the organizational form of the industrial chain determines the particularity of technology transfer in the industrial chain. The technology transfer based on the industrial chain is not a simple addition of the various components, but a technical network composed of members as the object of the transfer system. The key to

reducing the number of satellite launches is to extend the working life of the satellite. The service life of geostationary orbit communication satellite has reached 10 years. In order to improve economic efficiency and prolong working life, it is necessary to ensure adequate space-borne fuel, public compartment and effectiveness. The definition of economic efficiency factor of communication satellite is that it consists of equivalent omnidirectional radiation power, satellite lifetime and satellite weight from satellite irradiation to given coverage area. Among them, weight is the most important factor, which is most closely related to the performance parameters of satellite subsystems. The convergence time of existing consistency algorithms will increase rapidly with the increase of formation size, and it is difficult to meet the requirements of convergence time under different formation size conditions. According to its own particularity, the satellite mobile communication service belongs to the scarce resources in China. It is suggested that only one professional operator should carry out this service and operate autonomous satellite mobile communication service through reasonable operation mode and tariff policy. Short-term returns are not expected to be significant, but long-term returns can not be ignored.

3. Policy Suggestions on Developing International Satellite Mobile Communication Service

The satellite mobile communication business is proposed to be developed by the strategy of starting by the state and then following up by the market. In the early stage of the development of the satellite mobile communication industry, the investment should be based on the state behavior. At the same time, the government should formulate the industrial policy of the satellite mobile communication, guide and support the development of the satellite mobile communication industry. On the whole, the process of technology transfer determines the structure type of industrial chain, and the different characteristics of labor-intensive, capital-intensive or knowledge-intensive links in the industrial chain as a whole, which determines the core links and drivers in the industrial chain. Unmanned vehicle formation and cooperative control have special requirements for information consistency: this requires that the cooperative information among multi-agents should be consistent within a limited time. In the initial stage of launching communication satellites, there are two backup modes, orbit and ground, to ensure continuous operation. The performance of each subsystem is not a simple linear relationship between the weight of the whole star and the economic efficiency factor. When the performance parameters of each subsystem are improved by a certain percentage, the decrease in satellite weight value and the improvement of the performance factor are much higher than this percentage. In terms of the overall policy environment, we will do a good job in the long-term planning of satellite mobile communication services, applications and industrial development from the national level, and coordinate the implementation. With reference to the "Beidou" industry development experience, in the initial stage of system development, the coordination system development department and the user communicate effectively, and do a good job of connecting the upstream and downstream of the industry chain. The role of science and technology in improving people's living standards today cannot be underestimated. In particular, the role of ICT in modern life cannot be separated from many important tasks in daily life.

From the terminal side, increase support for satellite terminal manufacturers. The terminal is the foundation of the satellite mobile communication industry, with the largest number of applications in the future and the widest range of applications. Research technology transfer can better understand the various links of the industry chain and the technical characteristics of products to examine the technical barriers faced by an industry in various links or products. Satellite capacity can be allocated at any time based on ground needs, preventing satellite transponders from being unloaded and meeting the temporary requirements of other users. This result just shows why the difference between the performance of the two satellite systems is not significant, and the difference in the design of the whole star is quite large. The information state of any node depends only on the information state of its neighbors. Therefore, the process of information consistency has spatial Markov property. The construction of independent system drives the motive force of independent research and development of the whole industrial chain. It is suggested that the state should allocate financial funds to select manufacturers with multi-chip capability through a series of standards,

formulate unified standards jointly, and develop chips with multiple identities and put them into use. For the technology with shorter life cycle, enterprises or departments should not only master the technology currently used, but also have the ability to adapt to the continuous renewal of the technology life cycle, in order to think that they have completely overcome the barriers to entry.

If the user needs more than the lifetime of a satellite, the modern dynamic planning method of launch time, including satellite manufacturing, can be used to optimize the long-term space partial launch arrangement. In addition to directly depending on the performance parameters of satellite subsystems, the economic efficiency factors of communication satellites are also related to the performance parameters of launch vehicles, launch sites, ground TT&C systems and ground communication systems. According to the definition of set, all collaborative information generated by the system is called a label set, which can be continuous or discrete. In the collaborative information consistency system, a continuous set of tags is used. It is recommended that experienced operators take the lead in the development and operation of satellite mobile communications using existing space segments and terrestrial networks. We will cultivate a good industrial environment, actively build a sound and healthy market system, and develop a vertical market. Enterprises or departments need to analyze the technologies that need to be acquired in order to overcome technical barriers. The required technologies may be parallel to the locally mastered technologies or may be upstream and downstream. The basis for improving the functionality and performance of communication satellites is to increase the weight of the satellite. That is to say, under the same technical level, the effect of a large weight satellite is better than that of a small weight satellite. When the autonomous satellite mobile communication system is put into operation, it will inevitably face strong competition from foreign satellite mobile communication system operators. Therefore, the state must introduce relevant and powerful policies as a breakthrough in the development of the market.

4. Conclusion

Through the construction and analysis of the satellite technology industry chain, the paper finds that the satellite industry faces huge market potential, and the transfer and application of satellite technology is a systematic process, which must be closely linked with the satellite industry chain. After China's own satellite mobile communication system is put into operation, it will face fierce competition from foreign satellite mobile communication systems. The service tariff has an important impact on the development of its own satellite mobile communication service, and the number of users is an essential factor for the survival and development of the system. In the design of satellite communication system, high-power, high-precision and long-life satellites should be developed as far as possible according to needs and possibilities, in order to greatly improve the economic efficiency factor. The application of satellite technology has restructured many basic technologies. The development of satellite industry can promote the rise and development of a considerable number of industries and play a positive role in the contribution of national economy and economy. Compared with foreign satellite mobile communication services, the advantages of self-owned satellite mobile communication services should lie in lower terminal prices and service charges, thus increasing competitiveness. In a word, there are many factors affecting the economic efficiency of communication satellite, which are related to the whole satellite communication engineering, satellite, intra-satellite subsystems and the schemes and performances of the equipment components of each subsystem. Therefore, it is everyone's responsibility to improve the economic efficiency of communication satellites.

References

[1] Loomis J, Koontz S, Miller H, et al. Valuing Geospatial Information: Using the Contingent Valuation Method to Estimate the Economic Benefits of Landsat Satellite Imagery[J]. Photogrammetric Engineering & Remote Sensing, 2015, 81(8):647-656.

[2] Siciliano G, Musolino D. Economic Evaluation of a Technological Leap in the Sector of Train Control and Signalling: The Case of German Regional Lines[J]. Transportation Research Procedia, 2016, 14:430-437.

[3] Brown-Connolly N E, Concha J B, English J. Mobile health is worth it! Economic benefit and impact on health of a population-based mobile screening program in new Mexico[J]. Telemed J E Health, 2014, 20(1):18-23.

[4] Yang Q, Losch M, Losa S N, et al. Brief communication: The challenge and benefit of using sea ice concentration satellite data products with uncertainty estimates in summer sea ice data assimilation [J]. The Cryosphere, 2016, 10(2):761-774.

[5] Wang X, Liu J B, Chai J P, et al. The Research in Satellite Television Channel Landing Fee of China Based on PageRank Algorithm [J]. Applied Mechanics and Materials, 2014, 644-650:1791-1795.

[6] Denig W F, Redmon R J, Rodriguez J V, et al. Book Review: Satellite Anomalies: Benefits of a Centralized Anomaly Database and Methods for Securely Sharing Information Among Satellite Operators [J]. Space Weather, 2014, 12(8):528-529.

[7] Balthazor R L, Mcharg M G, Enloe C L, et al. Methodology of evaluating the science benefit of various satellite/sensor constellation orbital parameters to an assimilative data forecast model[J]. Radio Science, 2015, 50(4):318-326.