
Exploration of Internet model of Chinese Engineering Cost Consultation

Zhang Haijun, 554895197@qq.com
Beijing Xiaoli Technology Co., LTD., Beijing, China

Cui Liming, 170764006@qq.com
Beijing Xiaoli Technology Co., LTD., Beijing, China

Pan Gang, 55051552@qq.com
Beijing Xiaoli Technology Co., LTD., Beijing, China

Li Bo, 88383424@qq.com
Beijing Xiaoli Technology Co., LTD., Beijing, China

Abstract

With the rapid development of the construction industry at the present stage, China's construction cost consulting is constantly developing towards diversification and globalization under the construction market, and the market competition pressure of China's construction project consulting services is also increasing. The development status of engineering cost consulting industry and the application of BIM technology, cloud computing and big data under the background of "Internet +" provide a new path for the transformation and upgrading of traditional engineering cost consulting enterprises. In order to maintain good competitiveness in the increasingly fierce market competition, Beijing Xiaoli Technology Co., Ltd. adopted the Internet model, developed a computer workshop platform, explored the feasibility of engineering cost Internet, and carried out the Internet practice of cost consulting business, which has achieved good results.

Keywords

Internet, engineering costs, computer workshops, construction, decarbonization

1 Introduction

The deep integration of the Internet and traditional industries has become a new form of economic development. The 13th Five-Year Plan of the Ministry of Housing and Urban-Rural Development points out that all new civil buildings in China after 2020 must meet the energy conservation standards stipulated by the state. "Internet Plus" can give full play to the optimization and integration role of the Internet in the allocation of social resources, deeply integrate the innovation results of the Internet in various fields, enhance the innovation and productivity of the whole society, and form a broader economic development with the Internet as the infrastructure and realization tool. The engineering consulting industry itself has the natural attributes of data, and has the innate advantages of acceptance and integration of the "Internet +" model. The arrival of "Internet +" model has brought new catalysts and

productivity to the development of engineering consulting industry, as well as new thinking models and development space.

With the withdrawal of the cost consulting qualification, the downgrading of the list of mandatory works to a group standard, the gradual degradation of quotas to consumption standards, and the fact that audits cannot be used as a basis for settlement and a series of other policies and norms, the degree of involution of the engineering cost consulting industry is becoming more and more serious. Construction engineering field as a traditional industry, the degree of Internet is still relatively low, engineering consulting, especially engineering cost consulting, mainly to data, information, model as the main service content, information docking channels are relatively poor, it is difficult to maximize the integration of resources. In the era of constant challenges and competition, the development of engineering consulting is bound to limit its further development by relying only on its own resources.

The development status of the engineering cost consulting industry and the application of BIM technology, cloud computing and big data under the background of "Internet +" provide a new path for the transformation and upgrading of traditional engineering cost consulting enterprises. "Internet + engineering cost" for the industry to provide a sustainable development of the data platform, breaking the traditional data and information transfer channels a single barrier. Traditional engineering cost consulting mainly relies on personal experience, which needs to be accumulated over a long period of time to be able to do the job, but now it can realize data sharing, data support, and information integration through the construction of databases, knowledge bases, and the building of information sharing platforms, so as to reduce the cost of consulting and improve the quality of consulting results. In this context, the engineering cost consulting industry should make full use of the big data advantages of "Internet +", such as the convenience of inquiry, comprehensive pricing, etc., so that the Internet and the engineering cost consulting industry can be deeply integrated to create a new ecology.

How to make all kinds of engineering projects and excellent enterprises better match? How to use the Internet + integration of resources to provide high-quality engineering management services? 2015 Calculator Workshop in China's "mass entrepreneurship, innovation" policy wind was born. Several founders created the first Internet engineering costing service platform in China, creating an innovative business model of "Internet + engineering costing", Beijing Xiaoli Technology Co. Beijing Xiaoli Technology Co., Ltd. has been studying the application of "Internet + project costing", actively exploring how engineering consulting organizations can adapt to the changes and challenges brought by the "Internet +" era, and exploring the service innovation of "Internet + project costing". We are committed to finding the combination point of Internet and construction engineering field, adopting the Internet mode, developing the platform of Calculator Workshop, exploring the feasibility of landing on the Internet of engineering costing, and carrying out the Internet practice of cost consulting business, which has achieved good results.

2 Exploration of Internet in engineering cost consulting business

2.1 Current situation of engineering cost consulting industry

The engineering cost consulting industry belongs to the engineering consulting industry, belong to the consulting industry specialization, specializing in a branch of industry. At present, China's engineering consulting enterprises are developing in an orderly manner with the whole process, full penetration, diversification and international competitiveness. Professional engineers use multidisciplinary knowledge and rich practical experience to

provide high-quality consulting services for the national and "Belt and Road" economic construction as well as the investment decision and implementation of engineering projects.

2.1.1 Market scale analysis of engineering cost industry

(1) The number of engineering cost consulting enterprises and employees changes

Since the founding of New China, China's engineering cost consulting industry has undergone several reforms, especially since 2016, with the introduction of a number of policies to encourage the development of the consulting industry in China, the number of enterprises in the engineering cost consulting industry has increased rapidly, and the number of employees has also increased rapidly. Figure 1 shows the growth of the number of enterprises and employees in the construction cost consulting industry in China during 2016-2020. As can be seen from Figure 1, the number of enterprises in China's construction cost consulting industry totaled 7,505 in 2016, and the number of enterprises in China's construction cost consulting industry exceeded 10,000 for the first time in 2020, reaching 10,489. The number of employees increased from 462,200 in 2016 to 790,600 in 2020.

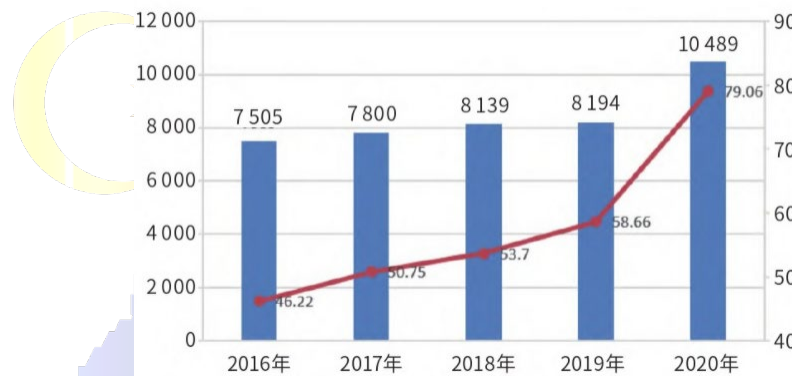


Figure 1. Growth of the number of enterprises and employees in China's construction cost consulting industry from 2016 to 2020

Note: Blue is the number of engineering cost consulting firms; Red is the number of practitioners; Unit per 10,000 people

(2) Operating income and profit

The operating income and net profit of China's engineering cost consulting industry from 2016 to 2020 are shown in Figure 2. The operating income shows an increasing trend year by year, and the operating income will exceed 200 billion yuan in 2020. However, after the net profit achieved high growth in 2016-2017, the growth rate after 2017 was significantly lower than the growth rate of operating income, in addition to a certain impact of the fiscal and tax system, In addition to the increased cost of high-end technical talents in the cost consultation of the whole life cycle of construction projects, it more reflects the increasing pressure of market competition faced by China's engineering cost consulting industry in recent years.



Figure 2 .Operating income and profit of China's engineering cost consulting industry from 2016 to 2020

Note: Blue is total operating income; Red is net profit growth rate

2.1.2 The problems existing in the engineering cost consulting industry

(1)The scale of enterprises is small, and regional development is unbalanced

The enterprises engaged in engineering cost consulting are very unbalanced in terms of regional distribution, with more cities in the eastern coastal region and relatively few in the western region. Although the number of engineering cost consulting units has increased, there are relatively few professional engineering consulting enterprises, which has a big gap with developed countries. Therefore, the development of China's engineering cost consulting industry is slow. And restrict the improvement of local economic level.

(2)The professional titles of employees are low, and high-quality talents are scarce

Statistics show that as of the end of 2018, the construction cost consulting industry employees including 497,933 formal employees and 39,082 temporary employees, a total of 537,015 people, an increase of 5.8% over last year. Among them, 91,128 registered engineers and 346,752 professional and technical personnel, an increase of 3.6% and 2.1% over the previous year, accounting for 17.0% and 64.6% of employees, respectively. Overall situation: The overall education is low, some cost personnel are not proficient in business, professional and technical level is limited, and core competitiveness is lacking.

(3)The project cost consulting enterprise has a good development trend and its operating income has increased

According to statistics, the business revenue of engineering cost consulting enterprises in 2018 was 172.145 billion yuan, an increase of 17.2% over 2017. The specific business income and its proportion are shown in Figure 3.

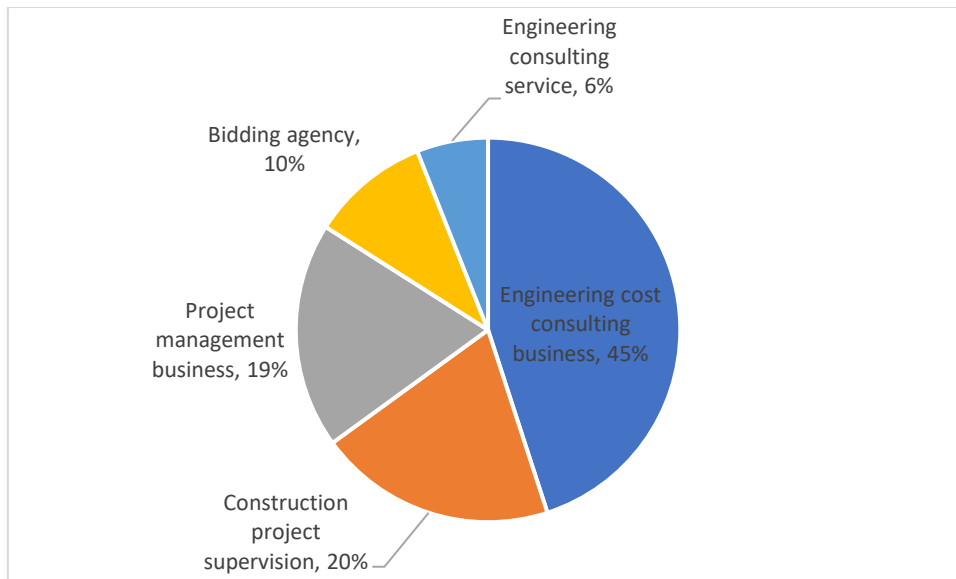


Figure 3. Income of various business of engineering cost consulting

(4) Do not pay attention to the whole process of project cost consultation, mainly in the construction stage and completion stage consultation

The income proportion of engineering cost consulting business in different stages in 2018 (see Figure 4). The business focus of most enterprises is concentrated in the construction stage and the final accounting (settlement) stage of the project, and the consulting proportion of the whole process of the project cost only accounts for 26%. At the same time, the key point of investment control - the design stage is not enough attention, and the project completion acceptance and delivery are taken as the end point of the business process, and the project operation cost is not considered enough.

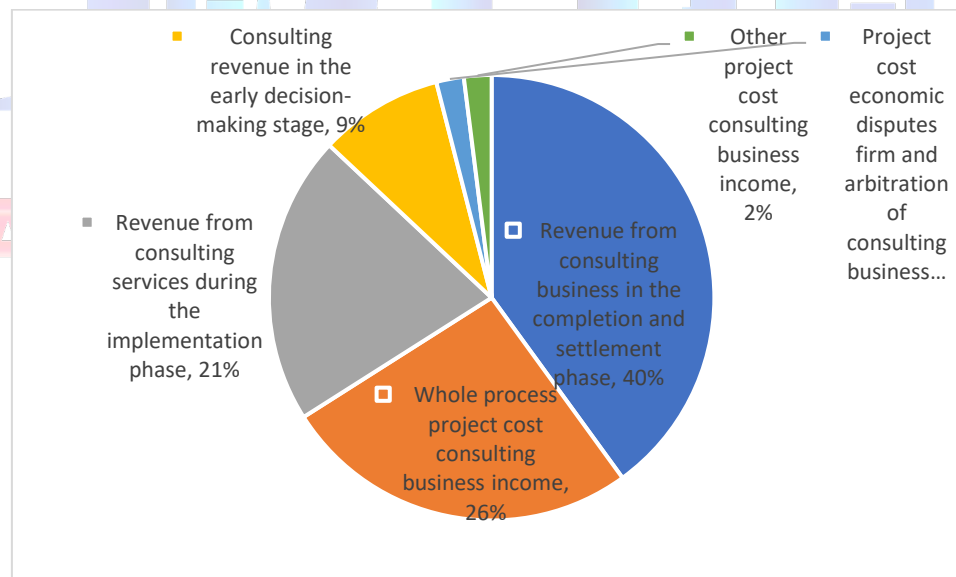


Figure 4. Project cost consulting business income at each stage

(5) The application rate of Internet management system is low, and data sharing is not formed

Most traditional engineering cost consulting enterprises accumulate information and data, but there is no data sharing, data reserves are small, and mainly rely on government quotas and

information. Do not make full use of the Internet management system, most enterprises do not have a relevant management system, according to the Internet and big data service capacity is limited, the quality of service is relatively low.

2.2 Exploration of Internet in engineering cost consulting business

2.2.1 "Internet + Engineering Costing" Mode of Calculator Workshop

The "Internet + Engineering Cost" model is to build an Internet-based system for engineering consulting organizations, with rich information resources as the management center, and at the same time, fully integrating the business processing systems and business information of customers, consulting, sales, etc., and supporting the effective communication between the various levels within the engineering consulting organization and between the engineering consulting organization and the external environment. Information management system. In order to meet the specific requirements of business management of engineering consulting organizations, improve the efficiency and quality of engineering consulting services, develop high-quality information resources, and promote the development of the engineering consulting market, the system can be set up according to the functions of basic applications and management applications. Based on the function setting of the innovative "Internet + Engineering Costing" mode, Calculator Workshop takes the mobile network as the realization carrier of the system and interconnects internal and external resources online.

2.2.2 Business Scope of Calculator Workshop

Through the Internet mode, Calculator Workshop can complete basic cost consulting services such as quantity calculation and pricing, and also undertake services such as BIM modeling, drawing design, technical bid preparation, online professional Q&A and online project management. The platform has completed the consulting business, the project scope covers housing construction, municipal, water conservancy, aviation, chemical industry, highway, railroad and other specialties, the project area covers all provinces and cities in China. At the same time, Counting Workshop has actively explored and participated in the completion of some international projects, such as a stadium in Guinea, a logistics business complex in Malaysia, an office building in Angola, a frame structure plant in Thailand and other projects of cost consulting. On the Internet platform of Calculator Workshop, the complete operation of a consulting project can be completed, including: online release of the project → online bidding and selection to form a project team → online hosting project costs → online submission of consulting progress and outcome documents → online payment of fees → online project evaluation.

3 "Internet + engineering cost" mode analysis

3.1 Current situation of engineering cost consulting industry

3.3.1 Mobile network as the realization carrier of system functions

Through the use of mobile network office can realize the seamless combination of mobile devices and engineering consulting management system, so that managers and users can work anytime and anywhere through mobile devices such as cell phones, breaking through the limitations of office time and space, improving office efficiency and execution capabilities, but also for the new period of engineering consulting automation office to provide a new way of thinking about the product. The Internet provides a new type of communication such as network-type functions, that is, the use of cell phones and other mobile devices, for engineering

consulting managers, employees, partners, customers and experts at any time and any place to provide good communication and exchange of relevant project information, knowledge, can provide real-time feedback and determine the next step in the development of the plan, the use of platform technology to establish a big data set of intelligent analysis, digging for effective information, and quickly assist in corporate decision-making and the formulation of enterprise strategy.

3.3.2 "Internet + engineering cost" mode breaks through traditional limitations

The construction of "Internet + project costing" mode has upgraded the original way of working, transforming many "face-to-face" working modes into "key-to-key" modes. Through the establishment of a powerful information resource base, it realizes consulting informatization, management informatization, marketing informatization and decision-making informatization. What is more important is that the "Internet + engineering cost" mode of development is unlimited, connecting the work of engineering consulting with the Internet, so that engineering consulting can be instantly docked with unlimited knowledge, experts, information, etc. A project can be connected to powerful data through the Internet. A project can be connected to a powerful data and information base through the Internet, providing a large amount of relevant theoretical knowledge and concepts, and then communicating and discussing with more experts through online consulting, and finally automatically matching with other similar cases around the world to provide constructive comments and suggestions, all of which can be accomplished through this system. The "Internet + engineering cost" mode breaks through the traditional limitations, using the Internet information technology by integrating information flow, data flow, workflow and capital flow to form a strong agglomeration effect, so that the engineering consulting industry in the future market competition continues to develop, showing an unrestricted development trend.

3.2 Application Analysis of "Internet + Engineering Cost" Mode

3.2.1 Employees to realize the liberalization of mobile office

Relying on the mobile office mode of the Internet, the engineering consulting staff from the solidification of the desk office out, greatly giving the engineering consulting staff to work on the convenience of the work, so that the work is more efficient. The mobile office mode not only improves the staff's working ability, but also connects the overall thinking together and upgrades the way of thinking. Engineering consulting staff often have to travel, visit, field research, which causes a lot of office work can not be carried out, and mobile office mode can solve this contradiction, will be dispersed in various regions, enterprises, departments working in the individual consulting staff connected, the formation of the scale effect and the long-tail effect, the realization of a number of work at the same time, to enhance the overall efficiency of the consulting and shorten the cycle of work.

3.2.2 Mobile network as the realization carrier of system functions

Engineering consulting units not only need professional and technical talents, but also need the participation of legal, accounting, taxation and financial talents, and even more need to have relevant knowledge of composite talents as project managers or responsible persons. Leading talents, innovative talents and composite talents and other talent teams to become an engineering consulting design to lead the new normal important support, but the reality is that these talents are often in different geographical areas, it is difficult to convene at the same time. For a problem to be solved in a timely manner, the traditional way of discussion there is a huge lag problem. The engineering consulting platform system can use the Internet thinking to build

the database and expert database belonging to the organization itself, use the network to connect the independent researchers or professionals dispersed all over the world, and build the project expert group, organically and maximize the role of experts, and form the scale effect and synergy effect. At the same time, it can connect experts and companies with each other for relevant consultation and two-way docking.

3.2.3 Mobile network as the realization carrier of system functions

Although the traditional management mode has been used for a long time, but gradually exposed many problems, cumbersome workflow, labor and material resources, easy to error, breeding rent-seeking, supervision is not in place and other issues, the above problems seriously impede the development of engineering consulting.

Intelligent management mode can avoid these problems, through the software system design, make the work into the paperless era, approval, reporting, application and other operations can be completed in the system, so that the work is more convenient, the response is also more timely, and significantly reduce the probability of error, and by reducing the actual communication between people in the workflow will reduce some artificial "rent-seeking" phenomenon, within the system. The phenomenon of "rent-seeking" will be reduced, and supervision within the system will be more effective. Such as in the process of engineering consulting payments settlement with experts, I need to repeat the procedures, and each settlement is required to carry out the same workflow is a waste of efficiency, and through the online payment system, the experts can operate by self-help, higher security.

3.2.4 Mobile network as the realization carrier of system functions

"Internet +" to promote the continuous development of engineering consulting, not only a technical, management innovation, but also a change in the mode of thinking, pay more attention to the user-oriented thinking, to provide customers with more convenient, personalized services, innovative menu-type service work mode.

Innovation and development of engineering consulting industry, in the work management is a very important manifestation, but more important is to establish the "Internet +" thinking, in order to promote the integration of innovation, to create intelligent services for engineering consulting, mainly from the following three aspects.

(1) Establishment of communication quickening. Engineering consulting organizations will consultant information on the system platform for query, and customers no longer need to face-to-face communication, can be more comprehensive, convenient to understand the information they need, and according to the needs of the fast query to select the relevant professional project manager and experts.

(2) Development of personalized customization. Customers can choose the consulting services they need more independently according to the menu-type services provided by the "Internet + engineering consulting" system, and the innovative use of the Internet to collect to dock the personalized needs of customers. The original business process of each link can be entrusted individually or in combination, and now can provide high-quality personalized consulting services according to the needs and choices of customers, "Internet + Engineering Consulting" will provide a package of solutions as the future direction of expansion.

(3) Interactivity. Clients can get rid of the limitations of traditional information transfer methods, and can check the progress status of the project online at any time, and put forward the modification of the report and other needs in time to realize better consulting services.

4 Results

After several years of exploration and practice by the project team, the platform of Calculator Workshop has authorized the establishment of more than 30 Calculator Work Centers in various provinces and cities in China, and the number of certified Calculators has reached 92,077, making it the largest Internet engineering consulting service platform in China at present. According to the statistics on www.3kgc.com, Calculator Workshop has provided Internet cost consulting services for 53,691 projects nationwide, with the scope of projects covering all specialties such as housing construction, municipal, water conservancy, aviation, chemical, highway, railroad, etc., and the project areas covering all provinces and cities in China. According to the project team's system data statistics and manual return visit data, the employer satisfaction of the completed projects reached 98%. Through the Internet mode, the platform has actively explored and participated in the completion of some international projects, such as a stadium in Guinea, a logistics business complex in Malaysia, an office building in Angola, a frame structure plant in Thailand and other projects of cost consulting. This new model of Internet costing, which is recognized by the market test, has also been affirmed by the industry software vendors, and large software companies such as Quanta Corporation and Morning Sun Technology have signed strategic cooperation agreements or technical support with the platform. At the same time, social capital outside the industry has also paid great attention and actively invested in shares. Calculator Workshop increases R&D investment year by year, gradually establishes and improves business center, technology center and data center, and successively develops a series of intelligent software tools such as "Cool Cost Intelligence" and "Quantity Indicator Tool", which help the platform calculator to improve the consulting efficiency. At the same time, Calculator Workshop has created the "9 Tables System" to improve the quality management of consulting projects and guarantee the quality of consulting results.

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6 Reference

[1] sheng-min huang, Liu Shan. "thinking of the Internet thinking" [J]. Modern communications (journal of communication university of China), 2015 ((02) : 1-6.

[2] Tian Shuang, Liu Haifang. Research and Practice of Innovative Talent Training under the "Internet + Engineering Consulting" model [J]. Built in shanxi, 2020 46-48 (8) : 179-181. The DOI: 10.13719 / j.carol carroll nki cn14-1279 / tu 2020.08.081.

[3] Wei Bin. The exploration and practice of "Mass Creation Workshop" Internet + Engineering whole industry chain service platform [J]. Bidding and Procurement Management,2019(11):52-54.

China Engineering Consulting,2015(08):15-16.

[5] Huang Yongchun. Engineering cost consulting Project Management in the era of "Internet +" [J]. Building construction, 2015, 5 (8) : 1024-1025. The DOI: 10.14144 / j.carol carroll nki JZSG. 2015.08.045.

[6] guangyuan, li lei. "Internet + engineering consulting" innovation analysis [J]. Architectural technology, 2017, 44 (22) : 5-7.

[7] Tian Shuang, Liu Haifang. Research and Practice of Innovative talent Training under the "Internet + Engineering Consulting" model [J]. Built in shanxi, 2020 46-48 (8) : 179-181. The DOI: 10.13719 / j.carol carroll nki cn14-1279 / tu 2020.08.081.

[8] Zhang Chunhui. Research on transformation path of engineering cost consulting industry under the background of Internet [J]. Modern Communication,2020(09):247-248.]

[9] Zhang Ce, Li Jiguang, Zhou Yue et al. Problems of engineering cost consulting industry development in China [J]. Journal of engineering and technology research, 2023, 8 (7) : 136-138. The DOI: 10.19537 / j.carol carroll nki. 2096-2789.2023.07.043.

[10] Tao Yuliang. Analysis of current situation and strategic development of M&A of engineering consulting enterprises based on engineering cost consulting [J]. Construction supervision, 2023 (7) : 43-45, DOI: 10.15968 / j.carol carroll nki JSJL. 2023.07.003.

