

Research on Full Process Engineering Consulting Based on Digitalization

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Abstract: In the context of the country's efforts to promote the whole process of engineering consulting services and the informatization transformation of the construction industry, in view of the problems existing in the current engineering consulting industry, from the perspective of the development needs of the engineering consulting industry, the "whole process engineering consulting services" and "digitalization" are proposed as an effective response strategy, and the "goal implementation" path of the whole process engineering consulting services Digital transformation is constructed. And from the aspects of organizational structure design, standard system construction, infrastructure construction, demand guidance, and improvement of laws and regulations, the paper puts forward the leading points of the whole process of Digital transformation of engineering consulting services. The whole process engineering consulting in China is in a rapid development stage, and it is urgent to seek a development path for the whole process engineering consulting. The digital management technology and platform of the whole Process engineering consultation can effectively improve the level and efficiency of engineering management. This article can provide useful references for the transformation and development of the entire process of engineering consulting.

Keywords: Digital Economy, Full Process Engineering Consulting Services, Digital Transformation

1. Introduction

In order to deepen the reform of construction project organization and implementation methods, and meet the diversified development needs of the construction industry market, in 2019, the National Development and Reform Commission and the Ministry of Housing and Urban Rural Development issued the "Guiding Opinions on Promoting the Development of Full Process Engineering Consulting Services" (Development and Reform Investment Regulations [2019] No. 515), which clearly stated that modern information technology and resources should be vigorously developed and utilized, and efforts should be made to improve the level of information application and management, To provide guarantees for conducting the

entire process of engineering consulting business. Compared to the traditional engineering consulting model, the full process engineering consulting service emphasizes that consulting companies provide integrated and integrated engineering consulting services to customers through a cross stage, multi professional, and multi business integration engineering consulting approach. Therefore, the entire process of engineering consulting services requires more project information, higher information utilization rate, and digital degree of information.

A large number of scholars have conducted research on the entire development process of engineering consulting services for enterprises such as survey, design, supervision, and cost from the perspective of enterprise transformation. Some scholars have also proposed from the perspective of

promotion that there are many problems in the market demand, policies and regulations, enterprise implementation, and other aspects of the entire process engineering consulting service [1]. They have summarized the advantages and disadvantages of the entire process engineering consulting service from both internal and external aspects. Explored the organizational structure and management system of the entire process engineering consulting from a project perspective; There is relatively little research conducted from a digital perspective, among which Lu Minmin focuses on engineering consulting projects and proposes that digital management should be introduced into the entire process of engineering consulting projects, utilizing digital technology to support the development of the entire process of engineering consulting. Pan Duozhong and others proposed the functions and architecture of a new generation of intelligent management platform for engineering projects in response to the entire process of engineering consulting. Although this composite pattern can achieve the consulting services throughout the project life cycle, there are still information silo Difficulty in information exchange and other issues, unable to maximize the value of engineering consulting throughout the entire process; Meanwhile, with the transformation of industry informatization, the engineering consulting industry has made certain progress in the direction of informatization, but still lacks the ability to apply digital technology and cannot achieve digital information driven engineering consulting services. Therefore, under the dual trend of current information development and whole process service, it is urgent to discuss the Digital transformation of engineering consulting industry [1-3]. The integration of "full process engineering consulting services+digitization" can help the engineering consulting industry transform from business driven to data driven, and from a traditional cost driven development model to an internationally accepted innovation driven model. The integration of digitization is an important issue for the promotion and even development of the entire process engineering consulting industry.

Therefore, the engineering consulting industry should clarify the actual needs and implementation path of the Digital transformation of the whole process of engineering consulting services, deeply integrate the engineering consulting business with the data resources of the whole life cycle of the project by using digital technology, form the digital business model of engineering consulting, improve the efficiency and effect of the whole process of engineering consulting by digital means, and further promote the value of consulting services. Based on the practical needs of the development of the engineering consulting industry, this paper takes the whole process engineering consulting service as the research subject, puts forward the goals and leading points of the Digital transformation of the whole process engineering consulting service, preliminarily discusses the Digital transformation of the whole process engineering consulting service, and provides reference for the engineering consulting industry to better realize the whole process service.

2. The Industry's Actual Demand for General Consulting Services in Digital Transformation

The 13 departments including the Ministry of Housing and Urban Rural Development proposed in the "Guiding Opinions on Promoting the Coordinated Development of Intelligent Construction and Building Industrialization" (Jian Shi [2020] No. 60) "to promote the industrialization, digitization, and intelligent upgrading of buildings, accelerate the transformation of construction methods, and promote the high-quality development of the construction industry". Constructing global engineering data from multiple dimensions and implementing digital services is an important way for the intelligent development of the engineering consulting industry and even the entire construction industry. However, the engineering consulting industry currently faces many problems in the practical process [4-9]. Digital transformation should start from consulting services, and provide change management for customers with full life cycle services by virtue of digital technology. The whole process of Digital transformation of engineering consulting services is the practical demand for the future development of the engineering consulting industry, and "whole process engineering consulting services + digitalization" can solve the development problems of the traditional engineering consulting model.

2.1. Solving the Problem of Delay and Fragmentation of Consulting Services

The information data of traditional consulting models mostly comes from the historical records formed by engineering consulting business work, and the role of databases has a certain degree of delay, making it difficult to ensure the timeliness of data and the scientific nature of consulting services. The essence of the whole process engineering consulting service is to implement integrated management on projects, which can solve the phased restrictions and fragmentation problems of different consulting businesses. The digital whole process engineering consulting service takes data as the core business element of the engineering consulting enterprise, guides the consulting service of the enterprise through real-time analysis, calculation and application of data, and can further consolidate the whole process consulting business relationship based on network collaboration. Through a full process engineering consulting service model driven by project data as the core, consulting organizations can provide consulting services in a wider range of fields and over a longer period of time, and can more accurately grasp the different demands of multiple entities throughout the project lifecycle [10-15]. The integration of digital means can stimulate the advantages of the entire process business model, while improving project efficiency, further realizing the role of engineering consulting in project decision-making.

2.2. Solving the Collaborative Dilemma of Engineering Consulting Service Organizations

At present, many engineering consulting companies undertake the entire process of engineering consulting business through simple superposition of business, and there are problems such as internal information communication barriers and organizational collaboration difficulties in engineering consulting practice. At the same time, the entire process engineering consulting service model also involves organizational issues such as internal resource allocation reorganization, unclear responsibility boundaries, and imperfect achievement evaluation mechanisms in engineering consulting enterprises, which require corresponding organizational changes to adapt to the transformation of business models.

Engineering consulting enterprises can use digital means to assist in organizational change, solve the organizational collaboration dilemma under the full project lifecycle mode, and adapt to the implementation of new business models. The whole process engineering consulting service emphasizes the integrated management of different stages and service contents of the project, which is in line with the common business model requirements of cross-border cooperation in the digital economy era. Digital transformation can help enterprises to conduct real-time management and whole process tracking of the dynamic changes of the consulting business of different organizations and different positions covered by the whole process of engineering consulting business, form a comprehensive and integrated digital interaction system, further help consulting enterprises to develop the whole process organization collaboration scheme, establish an accessible cross departmental cooperation mechanism, and effectively solve the coordination dilemma of engineering consulting service organizations.

2.3. Removing Obstacles to Cooperation Between the Consulting Party and All Parties Involved in the Project

One of the expected effects of promoting the full process engineering consulting model is to establish a cooperation mechanism between the owners, operators, consultants, regulators and other participating parties, enhancing trust and interaction among all parties. However, many consulting companies only focus on completing engineering consulting tasks, and there is a gap between the overall service and responsibility mechanism, leading to low transparency in the consulting process and obstacles to information exchange among all parties in the project. The completion of the entire process consulting task depends on the joint efforts of the owner, consulting party, and other project stakeholders, and a high degree of dependence among all parties will promote interaction and cooperation among partners.

The Digital transformation of the whole process engineering consulting service can enhance the cooperation potential of all parties in the project and further tap the value of the whole process engineering consulting service: for the owner, the adoption of digital technology can improve the

real-time and accuracy of information transmission, make the engineering consulting process more transparent, help the owner better monitor the implementation of consulting services, and enable the owner to obtain a higher sense of participation. At the same time, increase the trust of the owner in the entire process of engineering consulting; For project operators, digitalization of the entire process of engineering consulting can systematically preserve and trace project process data and engineering consulting results, further helping operators achieve comprehensive takeover of project delivery, providing a scientific and comprehensive data foundation for subsequent project operation and maintenance stages, and improving operation and maintenance efficiency and efficiency; For environmental, fire, safety and other regulatory departments, digital means can achieve a shift from one-time or regular fixed point supervision to dynamic real-time supervision.

2.4. Improving the Consulting Party's Lack of Proactive Control over the Project

Although the engineering consulting industry as a whole is transitioning from a traditional "task centric" passive control to a "customer centric" active control direction, the concept transformation and action implementation of relevant consulting companies in the industry are relatively slow, and there is still a problem of insufficient active control of projects by consulting parties in engineering practice.

The Digital transformation of the whole process engineering consulting service can provide favorable conditions for the consultant to take active control to a large extent. The consultant can use digital technology to establish information feedback channels between project reality, virtual data, and consulting services, and track, adjust, and optimize plan nodes, business logic, and project resources in a data-driven manner in real time. This can effectively help the consultant achieve active control of the project; At the same time, the real-time information sharing mode throughout the entire process, including project planning, implementation, and operation and maintenance, can provide comprehensive and reliable data support for consulting parties, thereby improving the scientific nature of control measures.

3. General Consulting Services Digital Transformation "Goal Implementation" Path

Digital transformation is a systematic change triggered by information technology. The key driving factor is data, the fundamental task is to optimize the value system, and the core path is new capacity building. In response to the practical needs of the development of the engineering consulting industry, combined with the characteristics of the engineering consulting business and the time span of the entire process, this article draws inspiration from the perspectives of industrial digitization and digital industrialization, and proposes to use modern digital information technology,

advanced internet and artificial intelligence technology, supported and led by the new generation of digital technology, to achieve digitalization of consulting business through digital driven decision-making. The "goal implementation" path of Digital transformation of general consulting services based on the normalization of digital management and cloud based consulting services.

3.1. Digital Transformation Goal of the Whole Process Engineering Consulting Service

(1) Digitalization of consulting services. The digital expression of consulting service content is one of the goals of the transformation of digital services in the entire process of engineering consulting. Compared to traditional engineering consulting services, the whole process consulting has changed the process oriented consulting mode, transforming the engineering consulting business towards scenario and demand oriented. Therefore, the digitization of consulting business includes two aspects: project scenario digitization and scenario digitization. Project contextualization is the foundation of digitizing consulting service content. Through project contextualization, different consulting services in different stages of the entire lifecycle of the construction project are formed into knowledge modules. Enterprises update and manage the business knowledge modules through knowledge and experience accumulation and practical feedback, gradually forming a standardized database of engineering consulting services with reference significance throughout the entire process; Scenario digitization refers to the digital expression of project scenarios through information technology, based on project scenario digitization.

(2) Normalization of digital management. Unlike the production method of combining existing production factors in the industrial era, the digital age endows production factors with digital value. The data iteration and update throughout the entire project lifecycle are frequent, accompanied by the generation of a large amount of information data such as documents, images, sound, and images. Data management is a key issue in the digital management of the entire process of engineering consulting services. With the continuous application of BIM (Building Information Modeling), big data analysis, and artificial intelligence technology, the value of engineering data continues to rise. Having good data assets and effective data management has become a new competitive advantage for consulting enterprises. Therefore, normalization of digital management is an important goal of Digital transformation of the whole process of engineering consulting services.

The focus of digital management in the entire process of engineering consulting is to rely on advanced IT technology and management methods to form data assets, making them the foundation for project decision-making and control. The normalization goals of digital management can be further divided into metadata management, data source management, and digital achievement management. Metadata management is the primary task, and metadata refers to the data that describes data. A comprehensive metadata system can unify

the standards and dimensions of data, and obtain, define, clean, integrate, and analyze data resources; Consulting companies should do a good job in data source management to ensure the authenticity and security of data resources, as well as the reliability and traceability of data sources; Engineering consulting enterprises should carry out daily management of the digital results of phased engineering consulting, effectively improve the digital quality from consulting process documents to final outcome documents, and achieve the normalization of digital management.

(3) Cloud based consulting services. The development of cloud services provides a feasible and reliable support model for the Digital transformation of the whole process of engineering consulting services. Engineering consulting enterprises can deploy some facilities and consulting services to the cloud through co construction and sharing, which can effectively solve the problem of information barriers between engineering consulting services; At the same time, utilizing the network to obtain computing, storage, and data services provided by cloud service providers can improve the efficiency of project information resource allocation, reduce information construction costs, and more conveniently achieve data-driven full process engineering consulting services. This can achieve the upgrade of the engineering consulting digital platform model and effectively improve the intelligent level of engineering consulting services.

3.2. Implementation of Digital Transformation of Whole Process Engineering Consulting Services

The Digital transformation of the whole process engineering consulting service should take data empowerment as the main line, and the digital upgrading, transformation and reengineering of all elements upstream and downstream of the business chain should be aimed at achieving the accumulation, flow and application of project data with the goal of project data driving the consulting business. Therefore, this paper proposes that the engineering consulting industry and the whole process engineering consulting service organizations need to use platform terminals, communication networks, cloud technology and user terminals to build a digital association platform between government, industry, enterprises and projects, build a digital management system for the whole process engineering consulting projects, and complete the key implementation points of Digital transformation such as the collection, transmission, analysis, and decision-making of engineering consulting data. And build a "goal implementation" framework for the whole process of engineering consulting services Digital transformation.

4. Conclusion

Digital transformation is a necessary means for the engineering consulting industry to better realize the whole process of engineering consulting services. Relevant departments and the engineering consulting industry need to clarify the current urgent needs of the whole process of

engineering consulting services Digital transformation, take the digitalization of consulting business, normalization of digital management, and cloud based consulting services as the transformation goals, scientifically plan the action plan, from the organizational structure, standard system Carry out the whole process of Digital transformation of engineering consulting services in terms of infrastructure construction, demand guidance, laws and regulations. This paper can provide a reference for the Digital transformation of the whole process of engineering consulting services. On the basis of this research, we can further discuss the Digital transformation of the engineering consulting industry in the future in terms of business form, service scenario, market demand, etc. required for the whole process of engineering digitalization, help to achieve the Digital transformation of the whole process of engineering consulting services, and promote the improvement of China's engineering construction level and the quality of engineering consulting services.

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