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## Is servitization of construction the inevitable choice of Internet Plus construction?

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The rapid growth of Internet users in recent years transformed the Internet into an important tool in achieving business growth and market development (Zhao et al., 2016). In 2016, the number of Internet users worldwide reached 3 billion; the total Internet economy of G20 reached 4.2 trillion USD, which is higher than the GDP of Germany, the world's fifth largest economy (Dean et al., 2012). With the rise and development of a new generation of information and communication technology (ICT), such as big data, cloud computing, and the Internet of Things, the Internet has become a new impetus for driving innovation in traditional industries. The Chinese government also introduced the Internet Plus plan to promote the integration of ICT and modern manufacturing and the healthy development of e-commerce, industrial Internet, and Internet finance in China (Wang et al., 2016).

Internet Plus is exerting a profound effect on all lifestyles. It will also bring about changes in the construction industry, thereby becoming an engine that drives the transformation and upgrade of this industry. To transform and upgrade the construction industry using Internet Plus, the key is to use Internet thinking to transform the upstream and downstream value chain of the construction industry. This approach entails improved allocation of market resources via the openness and sharing of Internet to facilitate large-scale collaboration. Thus, the construction mode will also change, thereby creating the Internet platform mode of the construction industry. What is the premise and theoretical basis to

achieve the platform mode of Internet Plus construction?

The essence of the platform mode of Internet Plus construction is Internet services, which means providing construction-related services to various types of participants via the Internet platform. This approach involves gathering resources that are involved in offline construction activities, bringing them online, and making online transactions on offline construction-related services. In this way, this platform becomes a virtual space that promotes or guides service transactions (Xu and Zhang, 2006). Two prerequisites must be met to achieve the platform mode of Internet Plus construction. One of these prerequisites is the servitization of construction, which means breaking down the construction process into a variety of construction services. The other requirement is the use of virtualization to encapsulate construction services as web services and publish them to the Internet platform, which will enable Internet users to find and use such services to attain sharing and collaboration of construction resources. The servitization of construction is the premise and foundation of the platform mode of Internet Plus construction.

The product of construction is tangible, but this does not mean that the construction process does not have the characteristics of service. A service is a process that consists of a series of activities with more or less intangible properties that may or may not be associated with a material product (Grönroos, 2000; Kotler et al., 2014). This definition shows that services emphasize on the intangibility of the process. Services are also characterized by the simultaneous occurrence of production and consumption, which cannot be stored. Analysis of the construction process indicates that the design and consultation process of construction bears the typical characteristics of intangibility. The construction process comprises a series of activities with more or less intangible characteristics, which occur during the interaction between construction units and tangible resources. Owners are engaged in the entire construction process; the production

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process and the consumption process occur at the same time; and the one-of-a-kind nature of a construction project determines the perishability of construction services. Therefore, the construction service can be considered as a series of activities performed by project participants to meet specific needs of the owners via certain people, equipment, facilities, or other tangible resources. From this perspective, construction is an organic combination of a range of services that are provided by different project participants, and construction services then become the basic unit of construction management.

The purpose of construction servitization is to realize the integration and sharing of resources and information via the construction platform to meet the needs of different types of construction projects. The one-of-a-kind nature of construction determines the differences between the needs of each construction project, and meanwhile each stage of the construction process contains a variety of services. To achieve the sharing among various platform participants, it is essential to realize the standardization of services, which indicates a standardized unified description of the abilities that services should possess to meet the specific needs of the project. Taking the construction service as an example, its standardization involves the standardization of resources (labor, machines and tools, equipment, and materials, etc.), construction techniques, service processes, quality and safety requirements, schedules, and so on. Service standardization facilitated data sharing in the Internet Plus construction platform and cooperation of participants. Only by achieving the standardization of construction services can service resources be gathered and reallocated in the platform via virtualization, thereby rendering the servitization of construction meaningful.

The integration of the Internet and construction

accelerated the servitization of construction and changed the organization and production mode of construction. The traditional organization model was gradually transformed into a user-centered, open, and shared new organizational model with platform-based services and social participation. Under the environment of Internet Plus, the division of labor of construction becomes more professional and thorough, and the cooperation between the upstream and downstream of the value chain becomes increasingly platform-oriented and real-time. Similarly, all data and information in the entire life cycle of construction become transparent. Thus, the entire process of material supply, life-long liability of quality management, and supervision of the whole process of safety management can be tracked.

**Acknowledgements** This research was supported by the National Natural Science Foundation of China (Grant No.71390524).

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