

Innovative application of digital platform in construction waste supply chain management under circular economy

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Purpose

With the continuous advancement of China's urbanization process in recent years, the construction industry has developed rapidly. Construction, renovation, and demolition activities generate large amounts of construction waste (CW) (Yuan et al., 2021). Not only in China, has the rapid growth of CW production posed challenges for its recycling in developing countries. As the world's largest developing country, this situation is even more prominent in China. The low recycling rate of CW also creates environmental, social and economic problems (Wu et al., 2016). Although more policies and regulations are being introduced and implemented, the efficiency is still unsatisfactory (Chandna, 2021). The reuse and recycling of CW to resources (CW2R) has become a major challenge for CW supply chain management (Liu et al., 2019).

Researchers have investigated how CW2R can be improved in different aspects through different methods (Menegaki & Damigos, 2018). The main disadvantage of the fragmented waste trading digital platforms (DP) currently on the market is that they cannot cover the entire life cycle process of CW supply chain. Take a construction supply and marketing platform in Nanjing as an example. The platform trades certain building materials including CW, but its recovery and reuse of CW is still in its infant stage.

Increased use of DP is critical for shifting CW towards sustainable materials management (Aivaliotis et al., 2021). With the continuous development of digital technologies such as blockchain (BC), Internet of Things (IoT), and artificial intelligence (AI), it is necessary to transform the traditional management model of CW "use-disposal" and develop a new DP to bringing together emerging players and providing a complete platform to improve the ever-increasing CW2R model (Ramos & Martinho, 2021; Wu et al., 2022). Therefore, the research aims to develop a DP for improving CW supply chain management and CW2R as an integrated and effective strategic tool in the circular economy.

Methods

The research adopts the research method of Design Scientific Research (DSR). The information collected for the CW industry and some scattered platforms mainly adopts literature collection, field investigation and interviews, and generates CW industry chain research reports and case study reports. Through expert interviews and literature analysis, the feasibility opinions and relevant data support of platform economy in CW management are obtained.

The core aspects of DP construction are the design of operating models and regulatory mechanisms. Based on the B2B model, IoT is used as the core digital technology to realize the matching mechanism of each process and platform service in the CW supply chain. IoT is composed of GPS satellite navigation and positioning technology, Radio Frequency Identification (RFID) technology, sensing technology and other hardware devices such as mobile handheld devices to track various information (Corporate information, transaction information and shipping information, etc.) of CW in the platform and realize the intelligence management of CW supply chain. Additionally, regular surveys of end users are essential throughout the design process. Apply this

information to the design process by understanding the changing needs of users, changes in values and other factors.

Results

A new DP for CW supply chain management and CW2R.

Conclusions

The DP is constructed to provide a gathering place for CW supply chain management. The information sharing feature of the new DP eliminates the problems of uneven distribution of resource power, low resource utilization, opaque information and difficult supervision in the entire life cycle of CW. The new DP provides users with a place where supply and demand match. Quick matching of information and resources helps users save time and costs. It also virtually helps users reduce transaction costs and improve resource allocation efficiency. The new DP can continuously expand the user scale through user aggregation. The increase in the number of users can attract more high-quality supply and demand parties to participate, forming a virtuous circle and benefiting all stakeholders. The new DP covers the entire life cycle of the CW supply chain management. The platform model can better collect and manage data in the entire cycle, thereby helping the government and other departments to better supervise the processing of CW, and lay a solid foundation for the implementation of circular economy. From a practical point of view, the new DP provides an effective tool for all stakeholders in the CW supply chain, as well as a data source and testing basis for the development of CW2R.

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