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Prospects of Future Changes in the Architectural Service Industry according to the Fourth Industrial Revolution

진태승 Jin, Teseung
김신성 Kim, Shinsung

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SUMMARY

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This study was designed to present a policy response strategy for the promotion of the architectural service industry based on the comprehensive analysis of how the phenomenon called the 4th Industrial Revolution will affect the architectural service industry.

The 4th Industrial Revolution is not a complete discussion of it or a clear vision of the future, it is an ongoing process. Therefore, this research focused on the digital transformation of the architectural service industry as a process of implementation, focusing on the usefulness and influence of the 4th Industrial Revolution, as outlined in the preceding study, rather than discussing the differences or exploring the ideal orientation in a straightforward manner.

The architectural industry has chronic problems such as the opacity and risk of the business process due to the inaccuracies of the initial plan, low labor productivity, analog knowledge transfer systems, and inaccessible services. The architectural service industry can generate productivity and higher value added through the process of digital switching, while it needs to respond to social, economic, and environmental future

changes such as urban population growth, housing price increase, low growth economy, climate change, and depletion of natural resources.

The architectural service industry technology trends can be summarized in five categories, 'Automation of Planning and Design' by architectural service level, 'development of immersive experience technology as a communication tool, 'transfer to digital manufacturing method', 'Operation Management through Digital Twin' and 'extension of BIM as a system integration tool for the entire construction process'. At the architectural planning and design stage, attempts are being made to dramatically reduce the time and effort required to automate or autonomous the legal review and design process through digital technology into data-driven. As an efficient communication tool at the architectural design and construction stage, immersive experience technologies such as VR/AR are replaced by drawings and models and are utilized and newly developed for architectural presentation, review of design plans and construction monitoring within the work team. Research and implementation of digital manufacturing, such as 3D printing, continues at the construction stage, and is expected to be a driving force for the growth of the building industry in many ways, including implementation of innovative architectural designs, advanced custom production, environmental benefits through saving time through saving building materials, and securing accuracy due to autonomous construction. Although the digital twin is relevant and can be implemented at all stages, it is likely to be used in particular in order to optimize energy use and to determine the maintenance and remodeling of older facilities during the operational management phase. BIM is an integrated tool for collecting and communicating data generated throughout the construction process, and its concept and scope are gradually expanding.

On the other hand, based on a survey of technology companies' trends in architectural services through the CrunchBase, which provides the latest technology firm database, the technology firms involved in architectural services can typically be divided into five categories, depending on the scope of their activities: 'Prefabricated design-builds', 'plan and design support software', 'construction management support software' and '3D printing' and 'architectural service connectivity platforms'. This is the case for a 'prefabricated' firm, which is based on the pre-fabrication and modular construction method, seven out of 35 companies surveyed in a package of design-to-construction. Among them, Katerra is an overwhelmingly large company with both investment

inducement and annual profits, and its business model continues to thrive, integrating the value chain of design, material logistics, and construction based on digital technology. In the 'Planning and Design Supporting Software' category, companies that review legal and real estate values through big data and AI technologies or support 3D modeling or immersive technology (VR, AR, MR) are included. In order to improve the efficiency of construction management at the construction stage, companies in the "Software for Construction Management" sector support digital tools for managing and collaborating various information produced at the overall project stage or recording of drawings, photographs, site records, etc. These companies are already recognized for their wide range of activities and growth potential in the market. A "architecture service connection platform" is a platform that provides materials and products for design and construction, and a service that connects designers or products from consumers, but it is meaningful to facilitate the delivery of architectural services – architectural customers and architectural service providers. Although 'Digital Manufacturing such as 3D Printing' is realizing a radically different design than before, it has yet to prove its success in the market.

Based on these technology trends, the productivity and efficiency of architectural services will continue to improve and transform into more user-centric services. In addition, the integration of the value chain of the architectural service industry, driven by digital technology, can bring major and minor changes to the existing industrial ecology, which can be predicted by several scenarios depending on how quickly the technology-employee and builders accept digital technology and succeed in switching to digital. If the digital transformation of construction service providers and construction companies is carried out together, the productivity and efficiency of the entire industry will gradually increase without significant changes in the existing industrial structure and while maintaining positive cooperation. In the second case, construction service providers have a faster digital conversion rate while builders are slow. While the digital capabilities of the construction service provider are strengthened, if the digital capabilities of the construction service provider fail to meet the requirements of the architectural service provider, architects and others will lead and manage the overall construction project, and if possible, they will be able to carry out all processes from planning to completion of the building without the contractor, along with digital application technology suppliers such as 3D printing. Building service

providers have recently created a team dedicated to digital technology solutions within a firm, or, even a minority, start a new technology company derived from a company, and architects are trying to start a technology-based business. The third scenario is when the digital transformation of the contractor is rapid, while the change in the architectural service provider is slow. The contractor will employ architects within the firm for productivity and quality innovation, or buy several architectural firm offices to carry out the project in an integrated manner. If the project can be carried out without an architect under the system, the contractor may be able to work with the design automation software provider. That would reduce the role of architects across all phases of the project and take the initiative in the project to constructors. In general, construction service operators' capital size is significantly larger than that of architectural service providers, and recent investments in construction technology have increased dramatically, according to McKinsey & Company (2018.10) report, spending on construction technology has doubled between 2008 and 2012.

Judging from what you are doing, this possibility is compelling. Finally, both the construction service provider and the construction company's digital switchover is delayed. At this point, IT-based solution companies looking for opportunities in underdeveloped industries can emerge as new entrants, potentially transforming their industry structures. The possibility that they will lead the architectural design market with abundant data is not ruled out.

To counter this change, the government first needs to support the adoption of digital technology by architectural service providers, as in Singapore. In addition, innovative ecosystems for digital switching should be created by facilitating exchange between related industries so that research, education, practice and investment can be made together. Finally, as the architectural industry is digitized, it is necessary to allow room to accommodate new building materials and construction methods or to quickly identify and take action to improve regulations.

This research anticipates that private business holders such as community companies will fulfill public roles to ensure sustainable urban regeneration projects, and ensure competency and self-sufficiency.

Keywords :
the Fourth Industrial Revolution, Architectural Service Industry, Prospects of Future Change