

Progress of production research in the field of housing research

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1. Shift from securing quantity to quality of housing

We cannot stress enough that one of the most important issues in housing policy and housing research is the measure to reduce vacant houses.

When the Ministry of Construction was established in 1948, post-war restoration was the most important issue facing the nation. Housing was in an absolute shortage due to the many houses destroyed in the war by fire and people returning to Japan from overseas. Then, the production of housing mostly focused on volume due to the increased housing demand among young workers of which the population increased through the policy to gather them in large cities during the rapid economic growth period. In other words, the number of housing units available in 1948 was 13.90 million, while the number of households was 15.98 million, meaning there was a shortage of 2.08 million houses.

Yet, the House and Land Census in 1968 found that the number of housing units was larger than the number of households. The number of housing units became larger than the number of households in all prefectures by the census of 1973. Since then, housing availability has been an excess (vacant houses) up until today.

Research Team I of the Building Research Institute of the Ministry of Construction, the former organization of the NILIM Housing Department, responded to the housing policies that have been changing with changes in the housing situation based on social movements through its research.

Around 1965 to 1974, when housing was in short supply in terms of quantity, our predecessors advocated the concept of architectural production in their housing research ahead of others.

2. The start of housing and architectural production research

Architectural production is a concept that regards the series of architectural actions of plans, designs, and construction of architectures as an industrial production process. It also includes maintenance and management, renovation, and the disposal phase, which is considered downstream of production in recent years. This concept is used when discussing the relationship between the factory production of architectural parts and on-site construction work, as well as the function of architectural

production organization (e.g. architecture, subcontractors, and specialized contractors).

Research themes include the economic efficiency of use of already available items in architectural production (1965), the relationship among architectural industries and the improvement of the efficiency of contracted construction (1966), the residential standard of housing and the economy of the mass production of housing (1966), and the modernization of architectural production organizations (1967–1968).

The relationship among architectural industries and the improvement of the efficiency of contracted construction was conducted under the following assumptions. To improve rationality in housing and architectural production, the unit of orders should be expanded to a suitable level as industrial production under the condition where buildings, such as public housing, can be planned based on relatively the same quality and standards to ensure continuity, stability, and plannability of the construction periods. The research also suggested recognition of the contribution of producers (contractors) in the design phase to improve the rationality of production designs based on research findings. It also proposes the setup of active conditions in which factors other than prices are taken into consideration in the bidding when placing orders for public buildings, while not selecting the lowest bidder as the winning bidder. These are not new ideas from today's standards. Yet, these were innovative ideas back then.

The residential standard for housing and the economy of the mass production of housing that was conducted as a part of the industrialization of architectural production and the modernization of architectural production organizations was the applied research conducted when the prefabrication of housing production was regarded as a major challenge of the housing policy. This research was conducted under the following idea. While the demand for prefabricated housing has not sufficiently expanded among owners (buyers of houses), rapid progress in the establishment of a production and sales system for prefabricated housing could not be expected only by waiting for prefabricated housing manufacturers to make the effort; instead, there was public demand for research by the only public research institute that studied housing and construction to look into this matter. From today's perspective, the role of public research facilities

seem different. Meanwhile, the points of nurturing housing-related industries, which are still weak, and the bottom-up of technological ability of the industry are still in the exploration phase today.

The concept of architectural production that our predecessors advocated became a common concept in the Proposal for an Architectural Production Theory (Architectural Production Division, Architectural Economy Committee, Architectural Institute of Japan) a few years later. Also, investigations and research at the research facility became useful as data that supported the architectural design modernization investigation conducted by the Ministry of Construction (1967–1969) and the report of the Housing and Residential Lot Council. Then, in 1971, the Architectural Production Laboratory was installed in Research Department I (Housing).

3. Development of production research

The rationalization of housing and architectural production again became a major research theme after the 1990s. In response to the aging of workers at construction sites, the occupation was associated with the image of being dangerous, dirty, and hard, as well as representing a shortage of skilled workers, so developments were made to produce easy and high-precision structural work methods using robots at construction sites and using various ideas to join architectural components. Research was simultaneously conducted on the digitalization and automation of construction using advancing IT technologies to realize unmanned construction sites or reduce the number of workers at construction sites. These research projects were conducted as a part of the development of new construction technologies to be used in construction projects (field of architecture) (1990–1994) as a part of the General Technology Development Project. The aim was to rationalize the production of reinforced concrete building structures. These are probably based on the same concept as the productivity revolution that is being advocated for construction projects today. Yet, the author believes that the essential point is to secure the quality of architecture, which is the final product of all efforts.

We use the terms “upstream” and “downstream” for architectural production. Multiple experts and companies, including the client, organize a team for a specific project and workflow. An architecture is eventually produced as the item that reflects the demand (goal) of the client, who started the entire flow. Not all architectures are necessarily sound, however, and some architectures have defects. The defects are assumed to occur when information or communication is omitted or mistaken while the team is working in a flow. A model connecting the goal and methods covering from upstream to downstream of production is created to reduce the omission or mistake as much as possible (Figure). Humans are the executor of specific architectural designs.

Omissions and mistakes are therefore unavoidable as long as humans are involved in the design, construction, maintenance, management, and renovation. Yet, such mistakes result in a situation where the final product has defects, or enough quality is not secured in the final product. We cannot stress enough that we definitely need to use robotic technologies and IT technologies, as well as support by AI, which will work along with people engaging in production. We would like to work toward securing and improving the quality of the final products by exploring how these technologies play important roles in the flow of architectural production while coming to terms with the human factors of maintaining the sense of satisfaction for the work.

It is important and indicative that architectural production research started in Research Division I (Housing) at the Building Research Institute of the Ministry of Construction just when housing availability reached a sufficient level in terms of volume around 1965 to 1975. This is because the author believes that the essential point was to secure the quality of housing and buildings.

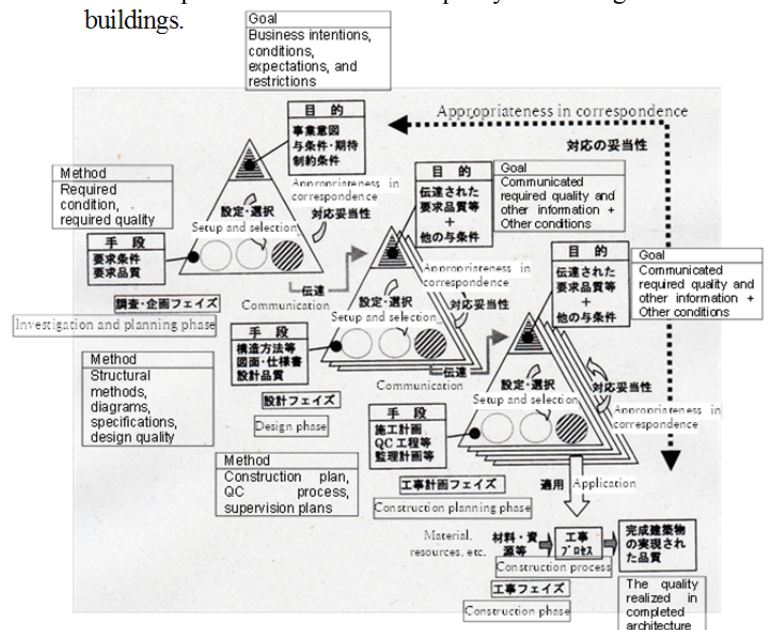


Figure: The concept of the quality and the link between the purpose and method for architectural production

For detailed information

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