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# Using BIM for Maintenance Management/Operation of Buildings

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## 1. Promoting BIM in the Field of Architecture

Endeavors for so-called BIM have been spreading, where the building information covering the planning and design to the construction and maintenance management of architectures is integrated and visualized and various entities share and use the information, in attempts to sophisticate the business efficiency and use of buildings. In Japan, at the beginning of the 21<sup>st</sup> century, endeavors for BIM started to attract the awareness of people as a new tool and/or method of design and construction following the publication of software products that were able to process the information of the structures by adding attribute information to 3D models, the introduction—by leading designers—of examples of the use of such software in architectural design, and so forth. Subsequently, the enterprises, organizations, and other entities that were advancing their leading endeavors studied the technology and service appropriate for their business, the rules for transferring information and using data, and the like, made progress in applying these tools and other practices, starting with those projects and processes in which they were able to determine to introduce them. As each enterprise etc. expanded their endeavors, for a wider range of relevant entities and processes to make use of BIM, they started to share the awareness of the necessity of the formats of the programs that were used and data defined among each specific organization or relevant entities in relation to a project, rules of operation concerning information sharing, and so forth by dividing and

organizing them in “the field of competition” and “the field of cooperation.”

To solve such problems and to organize the environment of BIM usage comprehensively from the phase of planning and design of an architecture to the phase of maintenance management, the “BIM Promotion Roundtable” was founded in July 2019 as an endeavor among the government and private sector, where an extremely wide range of entities participated, including private sector associations related to each phase of Building production, the relevant divisions from the Ministry of Land, Infrastructure, Transport and Tourism, and so forth.

## 2. Our Aim in the Usage of BIM

At the first Architectural BIM Promotion Conference, the statuses of endeavors by each participating organization were reported. At this time, there was a conspicuous difference in the introduction and use of BIM among enterprises and organizations; thus, cooperation across fields was regarded as a problem (although there were some leading endeavors in the fields of design and construction). Therefore, in the third round of the same conference, “The Future Image and Milestones of Architecture BIM” was compiled. Its content included the tasks that should be advanced in cooperation among all entities in the field of architecture, current achievements, targets that should be organized, and so forth. (Fig-1)

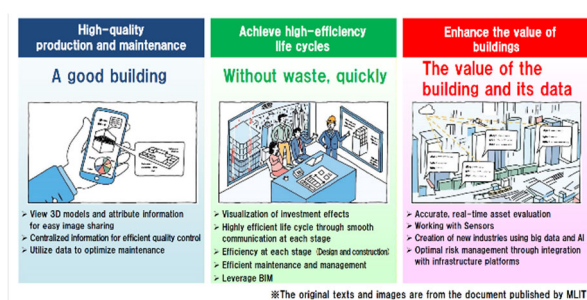


Fig-1. Future usage of architecture BIM

In the use of BIM, the portion of its conspicuous characteristics, “using 3D shapes to ‘visualize’ the building in an easy-to-understand way and thus to enhance communications and understanding” may easily attract our interest. However, the essence of BIM is “being able to add attribute information to models”; thus, the future image was depicted in providing “some value to a building and to data” as a platform for the use of information through the processes of Building production and maintenance management/operation by making use of it being a technology that “can the information through the life cycles of the buildings, which can also be linked to the IoT.”

### 3. Endeavors in the Collection of Information in Building production

Endeavors related to improving the rationalization and efficiency of Building production through the use of information technology have been undertaken for many years.

In development of technology related to the keywords “information collecting construction and automated construction,” industrializing construction methods that enable labor saving and man saving have been examined, where the informatization of the required performance in relation to the parts or members in architectures, and electrification to machine and manufacture members and parts at a factory, with the aim of achieving both mass-

production and securing quality, were major themes. As the Internet spread, some endeavors were made in the development of “CALS/EC” technology to transfer and share the information related to design and construction by network in a fully-fledged manner, including the development and formulation of standard file formats, common codes for building production, the development and formulation of standard for CAD drawing, and so forth to transfer and share information among entities related to Building production, including the owner and the designer/constructor, the constructor and the sub-constructor/manufacture, and so forth.

The major interest of endeavors was establishing efficient and automatic on-site construction by attempting to transfer the intention of the design between the phases of design and construction and by aiming to achieve data linkage. At this time, the viewpoint of providing data that was easy to use at the phases of maintenance management and operation and of organizing and keeping information was not conspicuous.

On the other hand, in the field of housing, the endeavors have been made in the organization and use of housing historical information (storage and accumulation of records, including how a house was built, what performance is available, and what inspections, corrections, reform, etc. have been made since its construction). Specifically, the drawings at the time of construction, documents for the confirmation of construction, inspection results, reform records, and so forth are applicable. It has been reported that the usage of housing historical information accumulated at the time of construction of a house and during maintenance management (e.g., reform) may be of value for further maintenance management and transaction of the house.

At present, it is not easy to imagine that the owners

may inherit the very BIM data that is handled in design BIM or in construction BIM as part of the housing historical information for management or other uses. Therefore, we have examined the method of using BIM data that are appropriate for current maintenance management and operation practices, using public rental apartments as elements. For the maintenance management of apartments, the outside walls, the interior decoration of each apartment, the attachments outside the apartments, and so forth are regarded as portions and parts that are involved in management. Accordingly, it is thought that extracting a 3D model of applicable portions and parts from the design BIM model and linking the inspection records etc. kept in an electronic ledger etc., as a model for the method of construction of a simplified maintenance management BIM model may be a way that the information can be used in a realistic manner. (Fig-2)

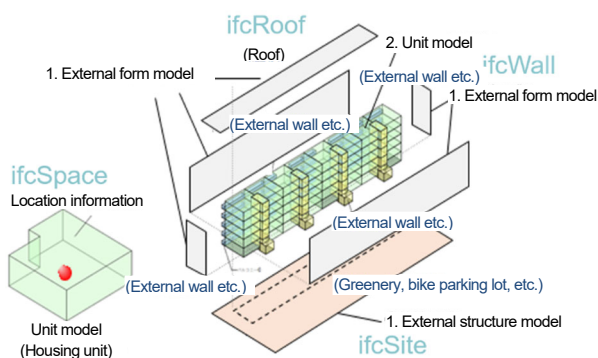


Fig-2. An example of examining the maintenance management BIM model of apartments

#### 4. Value for Buildings and Data Alike

In our endeavors in the promotion of BIM, we have firstly been advancing the examination of standard workflows and the method of using them, mainly focusing on the phases of planning, design, and construction in new construction projects. At the beginning, we discussed it as a method of enhancing productivity, with the aim of sharing information, accelerating decision making, and reducing the

unnecessary steps (e.g., by stepping back using BIM) in terms of the work processes followed by designers, constructors, etc. As our discussion went deeper, the workflow to create the maintenance management/operation BIM model for the purpose of maintenance management/operation was created, which the owner (administrator) can apply in maintaining and using the building appropriately.

Houses and architectures, by nature, produce value of use after their construction and when the activities and businesses intended for the buildings are performed. In a sustainable society, the long use of buildings is expected. Thus, it is anticipated that changes in the purpose of a building, large-scale refurbishment, and so forth may be made in the phase of maintenance management and/or operation. For the examination of changes in the planning of use a building or for the design of modifications, the realization of methods of using BIM that are able to easily confirm the information necessary for the conformity to or restriction from a building standard, the performance of the house, and the like, this should contribute to the appropriate evaluation and use of the building.

Click here for more details

1) NILIM Lecture Meeting, FY2021

<http://www.nilim.go.jp/lab/bbg/kouenkai/kouenkai2021/kouenkai2021.html>

2) BIM Promotion Roundtable, the Ministry of Land, Infrastructure, Transport and Tourism

<https://www.mlit.go.jp/jutakukentiku/kenchikuBIMsui shinkaigi.html>