Utilization of BIM in Facilities Management

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2. Utilization of BIM in FM for LCC
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1. BIM Situation
1-1. Goals of Introducing BIM

Utilizing BIM at the early stage of projects such as CD or SD by considering the operations of facilities management of the buildings could contribute to the improvement of energy management and reduction of building LCC.

6D: 5D + Operations

5D: 4D + Cost

4D: 3D + Time

3D: Modelings

(Source: B.I.M. Panama http://comarqpanama.wordpress.com)
1-2. BIM Utilization at FM phase

• How to use BIM

① Access and update of Facility information.
  • Link to the asset ledger
  • Coordination with facility record
② Access to the record of repairs and renewals
③ Preparation of FM plan or schedule

<table>
<thead>
<tr>
<th>Facility Manager</th>
<th>Building Owner</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Advantages</strong></td>
<td><strong>Clarification of long-term investment plan</strong></td>
</tr>
<tr>
<td>• Simulation of repair works</td>
<td>• Link to BEMS and FM software</td>
</tr>
<tr>
<td>• Visualization of concealed parts</td>
<td>• Simple access to the necessary information</td>
</tr>
<tr>
<td>• Confirmation/utilization of past work record</td>
<td>• accurately acquiring building information</td>
</tr>
<tr>
<td>• Securing safety</td>
<td>• Clarification of work priority</td>
</tr>
<tr>
<td>• Achieving reasonable FM cost</td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Tasks</th>
<th>Processes</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Investment in learning FM software used by owners</td>
<td>• Investment in BEMS or FM software and trainings of those systems for facility managers</td>
</tr>
<tr>
<td>• Establishment of rules or manuals to share FM information</td>
<td>• Establishment of rules or manuals for utilization of FM information</td>
</tr>
</tbody>
</table>

Link to the asset ledger

Coordination with BEMS
### 1-3. Typical BIM tools

<table>
<thead>
<tr>
<th>Name</th>
<th>Company</th>
<th>Features</th>
</tr>
</thead>
</table>
| Revit         | Autodesk               | • BIM software supplied by US company providing AutoCAD  
• Shares in US and Asia is large portion  
• It enable to integrate Design, structure, and MEP models into one integrated model                                                                                                                                                                                                 |
| ArchiCAD      | Graphisoft             | • BIM software developed by Hungarian CAD software supplier.  
• Mainly diffused software in Europe.  
• Easiness of modeling is liked by designers in Japan.  
• Difficulties in creation of Structural and/or MEP model                                                                                                                                                                                                 |
| Bentley       | Bentley Systems        | • BIM software by US company  
• Not very familiar in Japan.  
• Microstation based software providing a high freedom of modeling function, and enable to add parameters to topological solid having the free surfaces                                                                                                                                 |
| GLOOBE        | Fukui Computer         | • Japanese BIM software based on the Japanese law.  
• Provide a plenty of construction materials as modeling data based on Japanese specification.                                                                                                                                                                                                                                 |
| Digital Project | Gehry Technologies  | • US BIM software  
• Developed based on CATIA whose shares in automobile industry is large                                                                                                                                                                                                                                                                  |

**BIM software share in overseas**

![BIM software share diagram](image_url)

**BIM software images**

- Revit ![Autodesk REVIT 2015](image_url)
- ArchiCAD ![Graphisoft](image_url)
- Digital Project ![Gehry Technologies](image_url)
1-4. Typical BIM support tools

Various support tools existing. Versatile data linking among those tools enhance a learning effect of BIM utilization.
2. Utilization of BIM in FM for LCC
2-1. Utilization of BIM in the world

**Northern Europe:**
Utilization of BIM become mandatory in projects related to Government agency

**UK:**
Introduction of BIM is mandatory for all public projects from 2016

**USA:**
GSA requires BIM•IFC data for projects, USGC•USACE•NASA and others follow GSA

**Japan:**
Implementation of BIM in some Government agency projects.

**Singapore:**
BCA obligates Electronic application

- Introduce of BIM is led by the Government policy initiatives in BIM advanced nations.
- BIM definition, guidelines, or rules are established for BIM utilization in each country
2-2. BIM Utilization Case for FM

2-2-1. USCG (United States CoastGuard) (1/3)

### Overview

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Owner</td>
<td>USCG (United States CoastGuard)</td>
</tr>
<tr>
<td>Location</td>
<td>USA</td>
</tr>
<tr>
<td>Building Type</td>
<td>Office and other type of buildings</td>
</tr>
<tr>
<td>Project Type</td>
<td>Existing Buildings</td>
</tr>
<tr>
<td>Facility Type</td>
<td>Multiple Facility</td>
</tr>
<tr>
<td>Scale / Size</td>
<td>35 facilities operated by USCG (Total 70,000m²)</td>
</tr>
<tr>
<td>Term</td>
<td>Plan: 2001~</td>
</tr>
<tr>
<td></td>
<td>Implementation: 2004~</td>
</tr>
<tr>
<td>Phase</td>
<td>FM Phase</td>
</tr>
<tr>
<td>BIM Tool</td>
<td>ArchiCAD</td>
</tr>
<tr>
<td></td>
<td>• Onuma Planning System (FM)</td>
</tr>
<tr>
<td></td>
<td>• Vertex (FM)</td>
</tr>
<tr>
<td></td>
<td>• MySQL (Database)</td>
</tr>
<tr>
<td></td>
<td>• Apache (Database)</td>
</tr>
</tbody>
</table>

Case to utilize BIM in FM for 35 facilities

Facilities Overview

Models for each facility


Area diagram
2-2. BIM Utilization Case for FM

2-2-3. USCG (United States CoastGuard) (3/3)

• How to utilize BIM
  ① Add necessary information through FM to BIM model (objects).
  ② Link BIM model with FM database

• Output
  ① Reduce 98% of work load required to update facility information compared to the current work process
     • Reduce man-power by inputting huge amount of data from excel sheet to database
     • Reduce mistypes when updating data
     • Automation of FM documentations
  ② Diversification of data input
  ③ Update FM info. through both BIM model and database
  ④ Staff without CAD / BIM skills enable to update FM information.
3. Challenges for the future
• Problems in Current FM Work Flow

[Problems]
• A great volume of increase as repair plans or drawings are usually partial and they are not linked each other
• As result, man-power / work load required to arrange for the integrity or to access necessary information increased.
3-2. Current Situation and Problems of FM (2/4)

• Data Management in FM work flows

① Estimate and contract based on the design documents, as built documents, site surveying
② Preparation of M&E equipment ledger
③ Update ledger based on the information occurred and gathered which is related to the renewal works such as repair, or maintenance works.
3-2. Current Situation and Problems of FM (3/4)

• Summary of Problems

⇒ Enormous amount of time and man-power is necessary to comprehend actual condition

① Require management for massive amount of facility information
② Difficulty in access to the every facility information
③ Inconsistency between the drawings and actual conditions
④ Difficulty of Identifying the area, equipment, and quantity where troubles occur
⑤ Difficulty in clarification of asset conditions or demarcations
3-2. Current Situation and Problems of FM (4/4)

Thickened Information to be managed

Shrinkage in pipes

Difficulty in information management

Difficulty to Identify the troubles

Leakage

Difficulties in asset demarcations

Owner? or Tenant?
3-3. Owners’ Advantages in BIM Utilization at FM

Grasp facility condition based on the latest updated status

Easy access to the necessary information in facilities

Understanding the real time situation in facilities

Obtain the updated records

Integrated FM information

Identify the area and quantity of trouble occurs