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ADOPTING BUILDING INFORMATION MODELING FOR FACILITY MANAGEMENT

Building Information Modeling is the latest software technology being introduced throughout the AEC profession. A complete 3D digital representation of a building system or subsystems. This sophisticated technology is both a visually accurate model of a building and a database for recording the breadth of information developed and associated with building components. Beyond being a drawing and documentation tool. BIM offers a platform for enhanced interdisciplinary collaboration, the capability to manage change, and the ability to extend information support throughout the building lifecycle. Therefore the aim of this article is to highlight the advantages and possibilities of using BIM technology throughout the whole life cycle of buildings, and also to the possibility of adapting BIM technology in the field of facility management.

Key words: Building Information Modeling, Facility Management, Data Exchange.

Інформаційне моделювання будівель (BIM) є останньою програмною технологією, що впроваджується і дає повне цифрове 3D представлення системи будівлі або підсистем. Ця складна технологія є як візуально точною моделлю будівлі, так і базою даних розроблених і пов'язаних із компонентами будівлі для запису інформації. Крім того, є інструментом для створення креслень та документації. BIM пропонує платформу для розширення міждисциплінарного співробітництва, здатність керувати змінами, а також можливість розширити інформаційну підтримку впродовж життєвого циклу будівлі. Тому метою статті є виділити переваги та можливості використання технології BIM протягом всього життєвого циклу будівлі, а також можливість адаптації технології BIM в галузі управління об'єктами.

Ключові слова: інформаційне моделювання будівель (BIM), технічне обслуговування будівель, обмін даними.

Introduction

Building Information Modeling is a technology that incorporates elements of architecture and engineering. It combines professionals across the building industry see fig.1. With this technology we can digitally in 3D plot main structural system and subsystems, which will be located in the building. We recorded visually very accurate model of the object and the individual building blocks that are associated with a variety of records assigned to them. The elements of our definition and in this way create an information database that has great information value for each area, which affects the design of the structure.

BIM technology provides us with tools for 3D plotting and creating an information database offers a platform for increased interdisciplinary collaboration, the ability to more easily manage updates and changes in the production process and also provides extensive information database that can be used during the use of the structure [1].

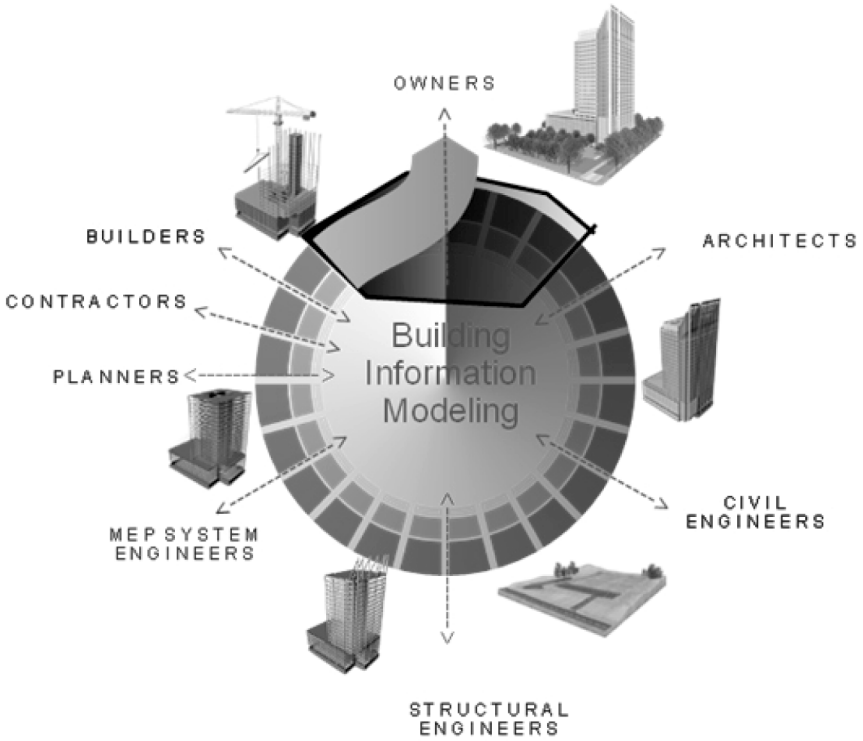

Fig. 1. Building Information Modeling in the life cycle of buildings and co-designers of the building profession [1]

BIM is not 3D CAD modeling that we know in its traditional form, that we know for 20 years. CAD is the simple geometric figures, consisting of primitive structural elements such as lines, curves, surfaces, which represent the physical location and configuration of a simple building block. However, it is not possible to describe the detail of the elements, although simple in form is certainly possible to assign a given element information, but is losing value while interacting with other elements that are defined in the project.

And it is difficult to work with additional data entry, which is bound to an element other than in the form of description. While for BIM technology obvious interaction between itself and a description element that attached to it, as well as the elements are themselves.

In BIM, the elements are virtual simulation of concrete building blocks. The wall is a wall, radiator is a radiator, and all objects have their own identity and attributes. Through various types of applications in BIM can watch the types and quantities of materials, equipment and facilities. Major building systems can be represented in different and separate BIM models that may or may not be integrated into one main model. This information can be imported as well as extract from the main model for further utilization. You can also export the data in the form of matrices blind and repost individual documents in this format to all interested parties. Problematic in this respect might be retrospective application of these systems and information to the main model.

The scope of work for the main model may be limited for various parties. You can display the individual elements, the entire grouping elements or entire systems that relate to the subject. Information that can be allocated to a given element and facilities may be defined already in the design process, where we can enter information from the manufacturer, respectively information will serve as a basis for integrated management and maintenance of the building. This option represents a potential benefit for owners and operators of buildings.

Traditional CAD documents are sometimes difficult to interpret, especially for complex engineering systems. 3D BIM is a way to better understand the object itself and the individual components and systems. Except that in this case, it is a very powerful data applications BIM technology has the potential to be able to carry significant changes which affect the implementation of projects.

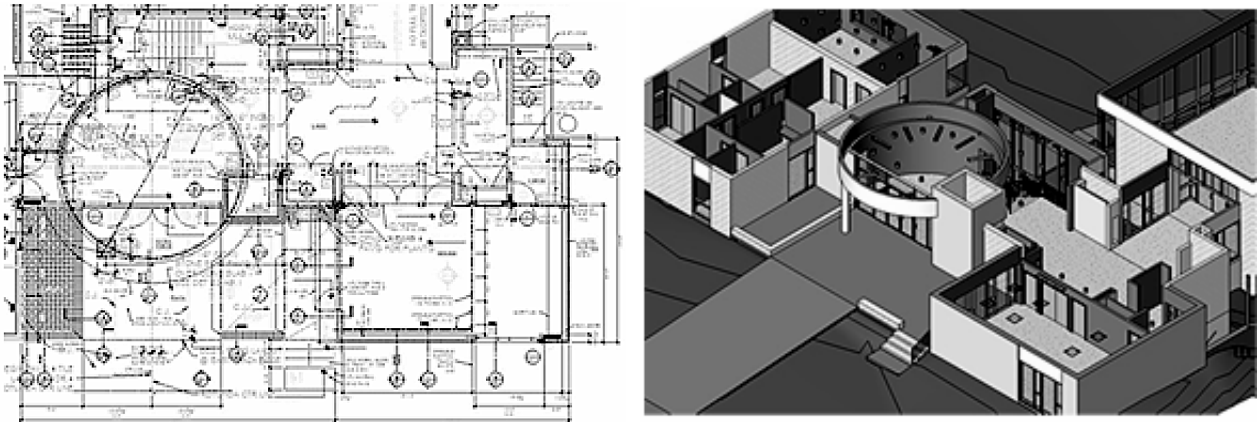

Fig. 2 The difference between traditional CAD modeling and 3D processing BIM model

Designers and professionals in designing a promise from the use of BIM technology for greater integration and streamline the process of design, better collaboration, and reduce overall construction costs and promote efficiency in the following ways:

Speed up the processing of key decisions and changes, which can help to reduce the time needed for preparation of project documentation and thus can have a positive impact on the overall cost of project documentation.

The possibility of a more precise definition of structural elements and thus the ability of effective communication of the various stakeholders.

Better interdisciplinary communication and the possibility of automatic control model, including visual inspection.

Accelerating the process of generating data from the model, we can extract almost automatically, thus being preparatory and define budgeted prices more quickly than with traditional methods.

Information that can be allocated to different elements and documentation are much more comprehensive and clearer, making it easier for individual tasks related to the process of project documentation for each professional.

Bridging the data gap between BIM technology and facility management

Facility managers constantly face the challenge of improving and standardizing the quality of information available to them, and for this purpose the daily operational needs of the building. Equally problematic is the reporting of reliable reports and data that are essential for sound management of the organization and planning costs. Then there is the range of data that are essential for the management of facility management in organizations, which may include – CAFM, CAD, IWMS, EAM, CMMS and other systems, as each of these applications and programs covering a different range of activities. The range of applicability FM software is in this respect very wide and selected program and applications are practically tailor-made by the organizations and business units.

Building Information Modeling offers in this respect a new level of functionality for the management of buildings and fixed assets in them. Assets and report objects covered by the primary data-centric applications, so that they can fulfill the role of information support. Graphical interface and options in CAFM and IWMS applications mainly focus on spatial management. Often times the required changes in the CAD files which come to the facility managers in the design and implementation documentation.

Often times the data that is contained in this documentation do not correspond to the real situation, in which case the facility managers must provide documentation of not only the work of FM applications, but also the actual documentation. In this case it is very important graphical control and the possibility of automatic inspection BIM model, which is a form of prevention during the elaboration of project documentation. It is a relatively new technology that has not yet found full application in the commercial sector.

Building Information Modeling is a comprehensive application and is not suitable for occasional users. First, it is suitable for organizations that can afford to employ BIM specialists and technicians who

will take care of timeliness and quality of the model itself so that it can be used at any time in the facility management [2].

Standardisation and exchange data

BIM provides a single digital repository of all structural elements, and data assigned to them as well as the 3D model itself. It is capable of displaying visually very well defined interiors and the exteriors and thus clarify the drawings compared with standard 2D, see fig.2. The individual element in the BIM environment free to join essentially infinite data series, either in the application itself or in BIM fomre external database. For example, Oracle creates a potential repository of data that can be used as an additional data storage. Oracle uses this way ArchiFM application, which is directly traceable to BIM software. These repository we have to create project documentation to enter the data to be transmitted together with those elements and project documentation. These may include: basic physical attributes more detailed specification of those elements, the data relating to the administration and maintenance, respectively, manuals, and links to manufacturers, etc.

Information gap that exists between the information contained in the actual design documentation and traditional management facility management of buildings is large, see fig.3. Therefore, some large organization starts the supply and require the use of their own BIM models in the design of buildings and downstream operations management, and not only the information derived from them, but the very models used in managing and providing facility management of these buildings.

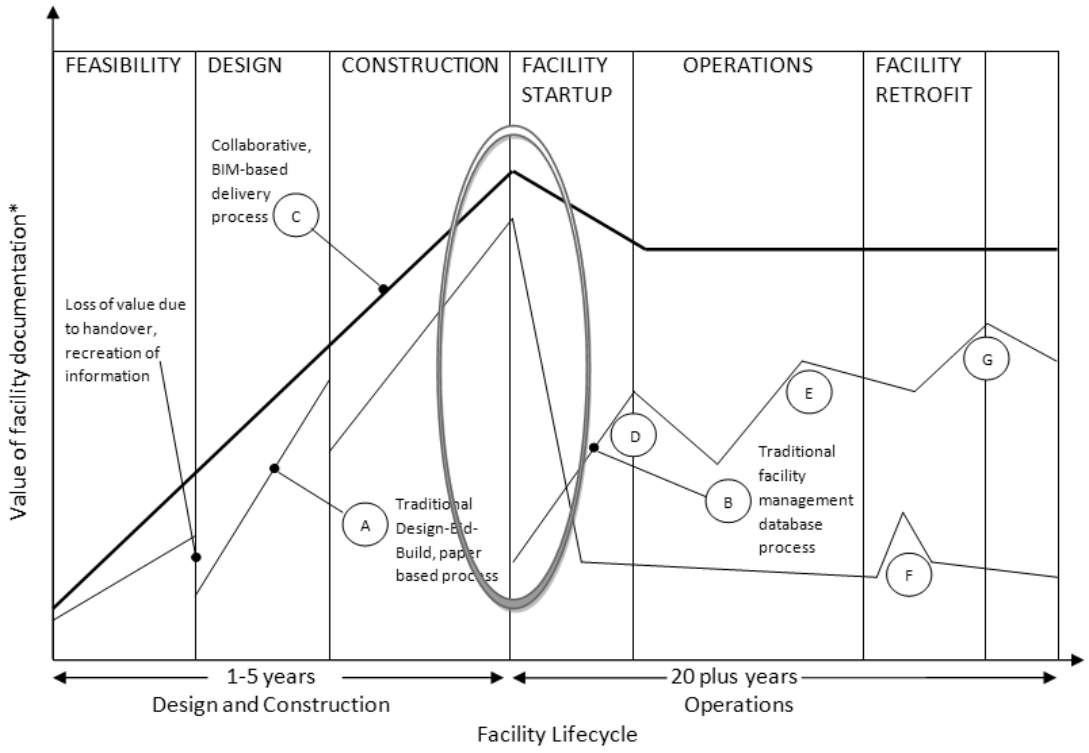

Fig. 3. Impact of collarotative BIM-based delivery process to value of facility documentation in facility startup [3]

** Slope of line communicates effort to produce and maintain information*
A, Traditional single-stage drawing-based deliverables,
B, Traditional facility management database system,
C, BIM-based deliverables throughout the project delivery and operation process,
D, Setup of facility management database,
E, Integration of FM with back-office systems,
F, Use of „as-built" drawings for retrofit,
G, Update of facility management database.

In order to use BIM technology throughout the life cycle of buildings, it is necessary to define and develop new standards for data exchange between professionals in the field of design and professionals in the field of facility management. The National Institute of Building Sciences (Nibs) establish a Committee of National Building Information Model Standard (NBIMS), which aimed to establish a common methodology for describing information relating to building object. At the same time there are other organizations that deal with unifying and defining standards in the use of BIM technology, including [4]:

Construction Specifications Institute (www.csinet.org) Development and evolution of the international framework (IFD) elements for buildingSMART, which will open the program terms and freely shareable, using international terminology for structuring object-oriented features and security information connectivity and seamless data exchange.

OSCRE (www.oscre.org) – Organization dedicated to the development of global standards for the electronic exchange of information and data.

FIATECH (www.fiatech.org) – Organization that works on accelerate the development and adoption of technologies that automate the integration of investment in terms of demanding projects.

It developed an enormous effort to define requirements and information to be included in the models, and which should define itself suppliers of those elements. Because, facility managers often begin their work in building structures that such information must be redefined and re-create an information base that will serve them as a basis for management of facility management in place. To overcome these barriers are not only using the IFC format.

Industry foundation classes (IFC) format

In the BIM standards for data exchange, IFCS (Industry Foundation Classes) are open, neutral formats, developed by the International Alliance for Interoperability (IAI) to facilitate collaboration and information interoperability in the building industry. IFC format facilitates the transmission of information and the integrity of data between intelligent BIM models of buildings and information systems, which play a role in the preparation and execution of construction. IFCS offer the ability to transfer data from BIM applications to the associated software programs that can be targeted such as CMMS, or spatial management. Industry Foundation Classes-IFCS, are the main buildingSMART data standards. IFC is registered as ISO namely ISO / PAS 16739 and are in the process, which should provide the format for the role of official international standard ISO / IS 16739 [5, 6].

"Openness" is the key to the true value buildingSMART standards. IFC format can be used for exchanging and sharing data between BIM applications developed by different manufacturers software without the user having to install several native formats, see fig.4.

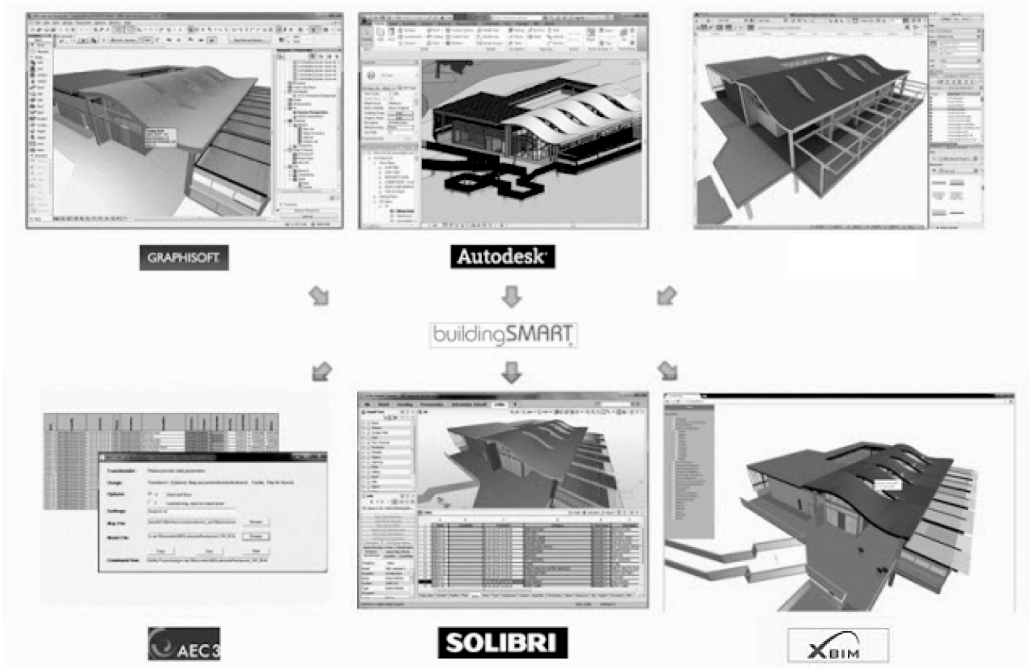

Fig. 4. From design package > to IFC > to COBie datasets [8]

As an open format, IFC does not belong to any supplier of software, is a neutral and independent. Therefore, it is impossible to continue further progression and development of software that will use this format and supporting with data exchange via IFC format will be defined more precisely our demands on the data itself. These requirements will further specify the information that we need to be present for the exchange or sharing of data in a certain phase of the project. It is important that the information was specific and required [7].

Organization dedicated to the development of an information data rates required for use in FM (COBIE-Construction Operations Building Information Exchange), developed at the research center (CERL-Corps of Engineers Research Lab), format template and standardize the transmission of information which will and can be used to overcome information barriers between BIM technology and the management and maintenance of buildings. A prerequisite is the definition of information during the process of preparation of project documentation and during the actual construction of buildings.

Cobie matrix provides several tools by which we can define individual information. What is of great value for facility managers, who will be working in a BIM environment where there is an effort to integrate BIM software with enterprise system ERP (Economic Resource Planning) [9].

Transmission of information in this case is ensured by means of the standard format for Microsoft Excel, or by using IFC format. Procedures and scope of the information that is needed for easier and more efficient management of facility management in construction projects are currently verified in the United States on several case studies.

There are several ways to generate Cobie data, for example (8):

Manually – very hard option, but for the larger building structure is not fair. May be interesting for manufacturers range, as the producer can structure the list of their products placed in the house of Cobie format, for example through Microsoft Excel.

Directly from the native model – in this case it is an opportunity that gives this format by setting certain border to define the elements themselves and generate outputs, which are called by a “button”.

Indirectly from the native model using the IFC – Cobie is subformat IFC. It should therefore be possible to automatically generate data from the IFC model.

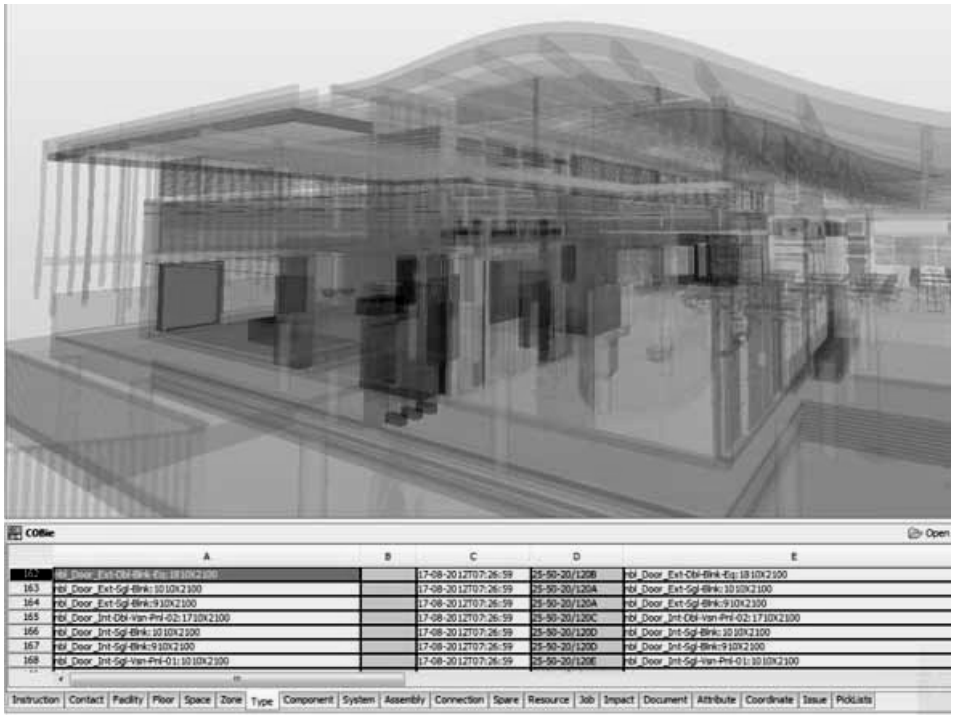

Fig. 5. A COBie dataset linked to the 3D model through IFC [8]

Conclusion

Range can be problematic elements that should be defined and which should assign information as to the elements as wall board, may require additional definition, as we face the system automatically generates a material composition should have a clearly defined by the designer. It is necessary to define other information? This is a question for facility management. Another problem to be faced is the definition of form elements, because BIM models, the individual elements are repeated and thus we have several options. Be the first to model the entire building and information supplied to the conclusion, which is very time consuming, or already during the course of entering information modeling approach, different for each element and these elements are a simple way to copy what is sensible path, but requires cooperation, because the range of informations.

Currently it is very difficult to define responsibilities for each data contained in the basic BIM models. Is it possible to directly define the designer that the data we want to include the elements, but there is a need for cooperation with the facility manager and the subsequent definition of responsibilities for the delivery of information from the designers of the professionals, and suppliers of the elements, which can be very difficult. In addition, we are asked whether it would be sensible to define individual information during construction so that the design documentation matches the real situation and the information value would increase.

Anyway, it is a fact that many professionals in the field of construction, be it architects, contractors or suppliers indicate client demand for the use of BIM technology. This technology can ensure the sustainability costs and makes it possible to create a knowledge base which will serve for the acquisition and sharing of actual and real data throughout the life cycle of buildings.

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