

THEORETICAL ANALYSIS OF BUILDING INFORMATION MODELING LIBRARIES (BIML)

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The main countries benefiting from BIM support are countries like Finland, Norway, Denmark, Great Britain and USA. One of the support from BIM are Building Information Modeling Library (BIML). This paper presents the development of a BIML based on parametric models with the parameters. The BIM Library as for example NBS National BIM Library contains thousands of generic and manufacturer BIM objects from leading and global manufacturers. BIM objects are construction product information presented in a 3D format. Every BIM objects are created in open standards industry foundation standards (ifc) or other open format. The main goal from this paper will be a survey on the use of Building Information Modeling Library in the parametric design and construction of buildings. The article will be describes the basic use of BIM modeling approaches in different countries and using BIM library.

Key words: Building Information Modeling Library, BIM project, NBS BIM library.

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ТЕОРЕТИЧНИЙ АНАЛІЗ БІБЛІОТЕК ІНФОРМАЦІЙНОГО МОДЕЛЮВАННЯ БУДІВНИЦТВА (BIML)

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Основними країнами, що отримують користь від підтримки BIM, є такі країни, як Фінляндія, Норвегія, Данія, Велика Британія та США. Підтримкою BIM є створення бібліотек інформаційного моделювання (BIML). Ця стаття представляє розробку BIML на основі параметричних моделей з параметрами. Бібліотека BIM, наприклад? Національна бібліотечна бібліотека NBS, містить тисячі загальних і спеціалізованих BIM-об'єктів від провідних та світових виробників. Об'єкти BIM – це інформація про будівельний продукт, представлену у форматі 3D. Кожен об'єкт BIM створюється за стандартами промисловості відкритого типу (ifc) або іншим відкритим форматом. Основною метою уфїжї дослідження стане огляд щодо використання бібліотеки побудови інформаційного моделювання в параметричному проектуванні та будівництві будівель. У статті буде описано основи використання методів моделювання BIM в різних країнах та використання бібліотеки BIM.

Ключові слова: бібліотеки інформаційного моделювання, BIM проект, бібліотека NBS BIM.

Introduction In economic terms, the building sector is equivalent to 16 times the automobile industry and 300 times the aeronautical market; therefore to exert any influence on it can have major repercussions [1]. The European Parliament adopted recommendations for all member states on 15 January 2014 to modernize BIM procurement and transport procurement rules (BIM – Building Information Modelling) [2]. The new measures were approved in order to promote what is known as “value for money” [1]. All recommendations were for public contracting to open up public tenders to smaller companies, because the big contracts are not accessible to them. As far as general simplification measures are concerned, self-declarations will primarily benefit SMEs (Small and medium-sized enterprises) [3]. One of

the most outstanding parts of the project documentation is building budgeting. Building Information modeling is methods of new access to create a virtual building with parameters, like cost parameter, but assign price parameter to virtual model is a difficult task. The biggest problem in assigning the price parameter is connection between virtual model and price database from estimating application. This issue was dealt with by several authors like Juan Franco [5], Amir Fagherinejadfard [6], Dr. Peter Smith [7] and other authors about interoperability with IFC (industrial foundation classes) exchange format like Song Wu [8], Seul-Ki Lee [9] and Ma Zhiliang [10].

Building Information modeling. Building Information modeling (BIM) is already part of the construction process. European Union created the document about Building construction – Organization of information about construction works ISO 12006-2:2015 part 2: Framework for classification. This document defines a framework for the development of built environment classification systems and identifies a set of recommended classification table titles for a range of information object classes according to particular views, e.g. by form or function, supported by definitions [11]. This document applies to the complete life cycle of construction works. The others documents that define the BIM are ISO 16739:2013 Industry Foundation Classes (IFC) for data sharing in the construction and facility management industries, ISO/TS 12911:2012 Framework for building information modelling (BIM) guidance, ISO 12006-3:2007 Building construction – Organization of information about construction works – Part 3: Framework object-oriented information and ISO 29481- 1:2016 Building information modeling – Information delivery manual – Part 1: Methodology and format [12].

BIM in Slovakia BIM in Slovakia is not yet as widespread as in foreign countries, and only one of the ten construction companies in Slovakia, makes use of the so-called “information model” in its work. A full 66 % of companies planned to work with the system in the next five years or term. According to the latest analysis from the quarter of the Slovak construction industry Q4\2015, which periodically preparing analytical Research company CEEC in cooperation with cement factory Ladce. [13] In the fourth quarter 2015 a quarter of the companies confirmed that this system solution knows, but it does not use.

When looking for a company the size and focus of the situation is slightly different. While the big companies do not intend to work with BIM in 31 percent of cases, medium and small companies do not want to introduce into buildings information system business process throughout the 71 % of the cases [13]. In the big companies like Skanska, Strabag or Doprastav use the BIM in every state contract.

BIM in abroad. Situation with using BIM construction in abroad is different. The most experience with BIM has north Europe, USA and Great Britain. One of the first countries benefiting and supporting BIM is Finland, which requires BIM for offers for public administration [14]. Similarly, it is in Norway where BIM is used in addition to public procurement mainly for building management. In Norway, Finland and Switzerland has been a demand for the preparation of standards in the EU, which are currently being prepared at CEN 442 [2].

In the United States began a national program already in the year 2003 [14]. Later the USA introduced the obligation to spatially coordinate the WFD divorces on project in 2007. As the BIM methodology is being promoted in the United States, particularly with regard to building management [2].

In 2008 the world's first electronic transferring system for the BIM model was presented in Singapore [2, 14]. In Dubai (SAE) has to by every buildings with over the 40 floor projected in BIM. Also every hospitals, schools and more extensive projects with more then 300 000 square feet (approximately 27 850 m²) [2, 14].

Austria in the end of summer 2015 introduced series of standards ÖNORM A 6241-1 – BIM – Level 2 and ÖNORM A 6241-2 – Level 3 – iBIM [2]. In the private sector have already carried out a number of projects in BIM like Universty of Economics in Vienna. In Austria until 2016 are all projects on public buildings in BIM thanks to the Organization BIG (Bundesimmobiliengesellschaft).

Germany and France, which have been planning to invest some millions of euros in BIM implementation for three years, want to introduce BIM for public projects from 2017. In 2018, they will be joined by the Spaniards and, on the basis of available information, the Czech Republic [14].

BIM and National BIM Library. Designing in a BIM environment is a challenging process, especially in terms of interoperability between individual software applications. The most critical point to design a BIM model is to provide important information for all participants in the construction process. And this is the reason to create a database which can be provide all information between participants. This database with all information call BIM Library. But to make this database could be used for all participants in a particular country than has to be created separately for each country. And this is reason for creating National BIM Library (NBS).

NBS is the fastest-growing BIM library in the UK, with an extensive collection of both generic and manufacturer BIM objects ranging from building fabric systems to mechanical and electrical objects [15]. This library contains thousands of generic and manufacturer BIM objects which require an internationally recognized NBS BIM Object Standard. Each BIM objects are construction product in 3D format and is free of charge with authorization by NBS technical experts. NBS derive the information based on your product data sheets and other technical information. BIM objects that contain industry-leading properties also include relevant environmental and other performance data [16,18]. Every BIM object are available on website and every company can embed live BIM objects on their own web pages. The BIM objects have direct connectivity with the important BIM design tools [16] and can be used with all participants.

NBS National BIM Library also has an extensive range of mechanical and electrical generic objects. There is a free plug-in which links directly to NBS Create specification software which has been built for BIM. [15] Another program that was created is the NATSPEC – non-profit organization. This organization created another set standards for Australia.

In order to use BIM objects, it is necessary to create standardized content. There are already some BIM providers but there are few institutions that offer in one formal online BIM object where this format is specified as a standard and can be used by anyone [17]. While there are some BIM providers on the market, there are only a few institutions that offer a single and consistent online library. This external library has their own classification system like OmniClass™ Table 21 Elements / OmniClass™ Table 22 Work Results / OmniClass™ Table 23 Products / Uniclass2 Table Ee – Elements / Uniclass2 Table Ss – Systems / Uniclass2 Table Pr – Products / Leistungstext-inhärente Klassifikation.

Under the British Government's initiative, by 2016, BIM level 2 will be implemented in all its building projects, which will give Cobie a supporting role as a data format. That is why COBIE in NBS BIM is so important. [17] To simplify the building design was created International Framework for Dictionaries / buildingSMART Data Dictionary, with clearly identified features, so that communication is facilitated – even across software boundaries.

The National BIM Library is a free online library consisting of generic and proprietary BIM objects such as walls, windows, doors, foundations, cladding, roofs in IFC format and formats for use in Autodesk Revit, Bentley, ArchiCAD, Vectorworks and Teckla. The creation of these BIM objects in the National BIM Library in IFC format have been developed by using the xBIM toolkit as the main underlying technology. [18]

Here is the step-by-step process of how the BIM objects were created using xBIM:

- using an open & neutral format like IFC
- parametric information are named in standard and content from industry experience
- every information are entered into a spreadsheet (database)
- A user can then upload (“feed”) the spreadsheet into an in-house application called “xBIM National Building Library Converter”.
- The converter can convert the information on the spreadsheet into standard IFC files. This application uses The xBIM Toolkit as the underlying technology to map the information on the spreadsheet into appropriate IFC properties.
- Apart from creating a standard IFC file, there is an option to create a Revit-specific IFC file
- The files are available free on the NBS National BIM Library.

The BIM library has a lot of countries and companies. One of the consortia are Saint-Gobain. BIM Library from Saint-Gobain covers design solutions based on the products of four brands [19]:

- ISOVER

- Rigips
- Weber
- Saint-Gobain Glass.

This library is accessible for everyone as free and have 240 Passivehouse Insatute, Darmstadt (Passivehouse Insatute, Darmstadt) details and third party constructions also include 144 other construction tracks. Downloads are also available for certificates and technical sheets for individual products. The content of the database is constantly updated and supplemented. There is only one condition you just have to register.

BIM Software libraries and web libraries. Designing Among the most important software companies that provide BIM libraries are Autodesk SEEK, RevitCity and oder portal like ARCAT. Autodesk SEEK portal is as a service provided by Autodesk to its customers with an Autodesk account. There is space for specific manufacturers to provide their products in digital form in different formats but the content of this product database is very unbalanced [20]. For example there are currently 3033 revitalized light models. Other website is RevitCity which has an easy orientation in it has three types of libraries. One of these libraries are RevitCity.com tree partitioning Tree. This libraries has a lots of elements and the page is quick and easy to navigate and everything it's free, just register. The risk is just one, the fact that it is the community portal and the elements are created by the users [20] and every elements can be with errors or not. Other sources are commercial portals for free for example ARCAT. Such portals are working on a business model for free users and paid to producers who have give their specific elements in a variety of formats [20]. One of the fact is that the manufacturer put on any model, that does not mean it is automatically in the portal revite quality. But the other extreme model is often happens that is due to the manufacturer, which is too detailed and thus a greater project sometimes unusable. The largest group consists commercial portals like Formfonts, Little Details Count, Turbosquid, RevitBay. These portals provide a lots of digital models or you have the opportunity to apply to the production of specific models you need. A particular subcategory is the so-called Content Builders. These companies act as a service engineer for designers – making families to order. They work in a more direct relationship than just the web format, the classic demand-offer-order-delivery schedule. It's hard to talk about prices and terms, it's totally individual, it depends on its content and scope. These companies include: <http://andekan.com>, <http://www.sumexdesign.com>, <https://www.bimstore.co.uk>, <http://inviewlabs.com> [20].

Conclusion. The main goal from this paper was a review of study of Building Information Modeling Library in the parametric design and construction of buildings. The article describes the basic use of BIM modeling approaches in different countries and using BIM library. In the next research we will deal with the specific use of BIM elements for the creation of the construction budget.

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