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BIM, Adoption, Implementation and Future

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ABSTRACT: Building industry becomes more and more competitive for all participants. Recent trends in building industry considering sustainability, material life cycle assessment, improving of building performance, building management system, changes in risk analysis and holistic integrative approach to design. Creation of BIM as a kind of process toll is in line of new demands and challenges.
Using BIM became synonymous to more efficient, better quality of work and better financial effects in all of activities related to the construction industry in general. Advantages of implementation of BIM are highly popularized, but in general BIM is adopting very slow and with visible precautions or even scepticisms. Only few countries in the world (USA, UK, Singapore and Australia) adopted BIM and developed it to significant level. Causes for such occurrence are various, depends on specific circumstances, defer from country to country.
This paper is analysis of relevant data in the aim to reach more complete understanding of complexity in implementation of BIM and to determine the actual minimum need for the usage of BIM. BIM methodology is simplifying and improving design process and construction procedures, reducing the costs and omissions, allowing better connection between client, designers, engineers on site and manufacturers of building materials. On the other hand implementation of BIM is still complex task for many participants in construction business, due to poor and appropriate legal frame, variety or lack of relevant standards, low financial capabilities or lack of interest in companies, unskilled or low level skilled participants in design process, usage of inappropriate IT technologies etc.
BIM is the way the architecture and engineering are or will following, albeit slowly but it is undoubtedly one of key elements of the future in construction industry.
Keywords: BIM, implementation, obstacles, legal framework, standards, future.

I. INTRODUCTION

1.1 Background

Leonid Raiz and Gábor Bojár from Hungary, developed ArchiCAD (1982), this later became the first BIM software that was made available on a personal computer. At 2002, Autodesk purchased the "Charles River Software" the company owned by Leonid Raiz and Irwin Jungreis and its software "Revit". Since 2003, the term "BIM" has been standardized as a common name for the digital representation of the building process offered under differing terminology by Graphisoft as BIMx (ex"Virtual Building"), Bentley Systems as "Integrated Project Models", and Autodesk as "BIM".

"The concept of Building Information Modelling is to build a building virtually, prior to building it physically, in order to work out problems, and simulate and analyse potential impacts. The heart of Building Information Modelling is an authoritative building information model. []

BIM is acronym derived from words building, information and modelling. BIM is a relatively new concept in construction industry. Very common is misunderstanding of BIM, as another 3D design software tool, what is simplified and not correct interpretation. Developing of project is complex process, essentially depending on precision and quality of information. BIM is helping in creation and managing all of the information of crucial importance for project, from very beginning. It is supposed that using of the advanced BIM software programs, can eliminate conflicts at a project and saving time and money on-site. Once BIM is implementing, it should be lot easier to follow every aspect of the built asset, before, during construction and after it.

However, it will be naïve to understand BIM as something final, universal or as ultimate solution. Developing of BIM is accelerating what can have negative consequence of potential mismatch between owners, designers and builders. In case of international business it is even more exaggerate, due to differences in political and economic systems, difference in laws and standards or even lack of it. BIM has a chance for future consecution. Prognoses are fully on side of BIM and potentially increasing of its influence on future of construction industry.

"Yet many early adopters are confident that BIM will grow to play an even more crucial role in building documentation."[]

1.2 Aims, objectives and research methodology

The paper aims to identify the status of implementation of BIM on global level and a possible path for further research that may lead to better understanding of obstacles and to define real minimum preconditions to implement BIM technology. In order to achieve this aim, the main objectives are:

1. Identify main characteristics of BIM;
2. Compare experiences in adoption of BIM;
3. Explore the issues in implementation of BIM technology;
4. Projection of future of BIM implementation;

II. BIM ADOPTION OBSTACLES

Due to its complexity, its influence on and dependence on economy, construction industry is usually very inert to any changes. Global issues as are sustainability, climate changes and fluctuations in economy made the necessary

momentum to changing the way of understanding construction business. Best-practice innovations, as is BIM, within those interrelated issues have and will have more transformative influence on the future of the industry worldwide.

Adoption and implementation of BIM worldwide is still "long shoot". Report from European BIM Summit, under sponsorship of AUTODESK, held in Barcelona on February 13th, 2015 is very indicative. Majority of Asia, South America and Africa are without any activity regarding adoption of BIM, Europe is on an early stage of it, even economic powers as China and Japan are very restrain about it, (see Figure.1).

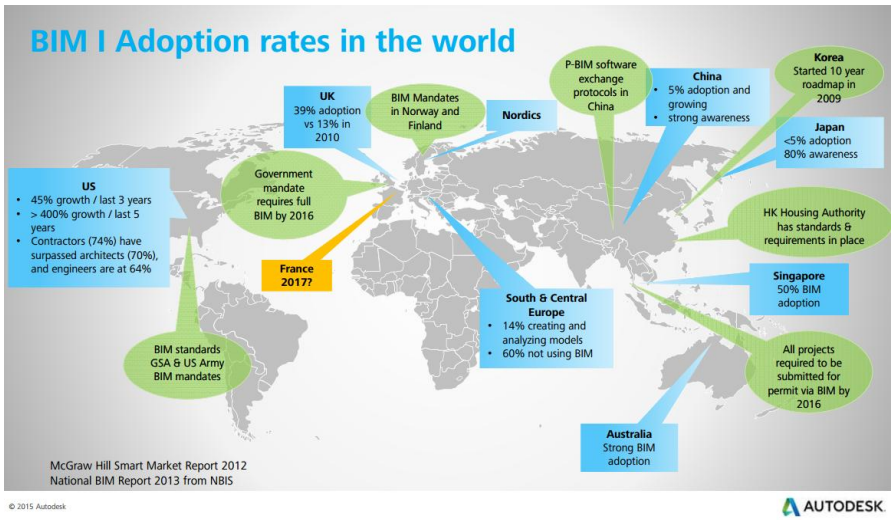

Fig.1 Adoption of BIM – I, worldwide, McGraw Hill, 2012 and NBIS, 2013

BIM Level mark	Description of level characteristics
0	No collaboration, 2D CAD drafting only, output and distribution is via paper or electronic prints.
1	Mixture use of 3D CAD and 2D, electronic sharing of data, no collaboration
2	Collaborative working – all parties use 3D CAD models, possible working on a shared model, common file formatting for share data, combining data, federated BIM model.
3	Open BIM". Full collaboration, single shared project model, centralized repository, option to modify same model, no conflicting information, copyright and liability resolved by robust software originator
4D	This equates to the use of BIM data to analyse time
5D	Includes cost management
6D	For facilities management (FM) purposes

Table. I Classification of BIM by NBS []

2.1. OBSTACLES

BIM is not self-supportive and cannot generate necessary space for its further developing. Adoption of BIM is demanding and need reaching of certain preconditions. Without wide support by industry and by establishment, it is almost impossible to adopt BIM. Even in developed countries adopting of BIM is not going so smooth, regardless its capability. Main obstacles in adoption of BIM:

- Weak economy means no space for development
- Low support from government
- Resistance to changes in industry
- Insufficient IT base
- Accelerated developing of BIM is counterproductive
- Developing of BIM have to be legally supported
- Complicate, unclear or overlapping standardization

III. BIM IMPLEMENTATION, BENEFITS AND OBSTACLES

3.1 Benefits of BIM

BIM captured the attention of the building community on large scale, what opened a valuable space for marketing. A promotion of BIM as a something what is advanced and what can create better product has direct influence on higher outcome. Reducing issues as are errors and reworking, time saving, better work efficiency and total cost savings are also expectable benefits of BIM. Nevertheless, it is still too early to derive any conclusion about it. Common benefits of well implemented BIM can be as follow:

- Better design coordination
- Better efficiency in work
- Higher level of details and information
- Improved design

- Clarified instructions for contractors
- Improved constructability and documentation assembling
- Efficient management of the building after handover
- Effective ROI (return of investment)

3.2 BIM implementation obstacles

BIM is in its core a toll created for designers, but capacity of BIM is to cover overall process in construction. If we try to simplify understanding of BIM, we can observe it as an instrument simultaneously used by investor, designer and contractor, under condition of full levelling of technical capabilities of all participants. Experiences are indicating occurrences of technical and legal issues in BIM implementation on projects, as are following:

- Design team use BIM, but contractor use different level or not use BIM at all
- Participants are using different software or low level hardware
- Insufficient IT literacy
- Legal framework is not appropriate or can't cover some issues which can occur
- Difference in standards, lack of standards or using "imported" standards

The major negative sides of BIM are almost impossible to make a unique and universal database and long initial time.

III. PRECONDITIONS TO ADOPT BIM

Countries, leaders in BIM adoption, developing BIM in accordance with own capability and needs. Way of BIM adoption cannot be simply reproduced or transferred from on country to another. Adopting of BIM is far easier and more prospective in developed countries. Undeveloped countries have low capability to develop own BIM system, but it is not always disadvantage, in some aspects it is quite opposite. Experiences from other countries are priceless and good pathway to avoid mistakes in adoption of BIM. In some undeveloped countries are evident individual initiatives to use and implement BIM, on low level and very limited, essentially it is positive but cannot induce a solution. From crucial importance in adopting of BIM are establishing of legal and technical bases followed by wide action on the state level to stimulate adoption of BIM. It is in fact the most difficult part of adopting BIM.Developing of relevant standards and procedures is another significant step, with respect to local specificity.

IV. CONCLUDING REMARKS

This paper has presented balanced observations of BIM in effort to distinct its marketing highlights from real values. The main strength of BIM comes from the concept of creating a central virtual building model for retrieving information and to generating associative documentation from the model. BIM passed its premature phase of development, but still there is a lot of job particularly on, equalization and simplification of related standards on local and international level. Sustainability, ecological footprint, life cycle assessment are contemporary issues of influence on standards in construction industry. Thus, BIM is yet to develop substantially, to become more holistic and more integrated.

However, working with BIM will become mandatory method of work for everything related to construction industry. To be passive observer of developing and rising importance of BIM is mistake which can lead to losing of credibility in business, as a negative marketing signal of lag in prosperity or weakness of company. It is highly recommended enhanced use BIM as an important part of future of construction industry.

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