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The impact of BIM on risk management as an argument for its implementation in a construction company

Aleš Tomek[a], Petr Matějka[a]*

[a]*Department of Construction Management and Economics, Faculty of Civil Engineering, CTU in Prague, Thakurova 7/2077, Prague 166 29, Czech Republic*

Abstract

This paper examines the impact of the Building Information Modeling (BIM) implementation on the construction market, where BIM is not common yet. As long as the client does not require using BIM, construction companies often struggle when trying to find arguments for BIM implementation, which would outweigh all obstacles encountered during the way. Several BIM benefits can be identified of which one of the most important is the BIM impact on risk management. The objective of this paper is to investigate the importance of risk management and BIM relations as an argument for implementation of BIM in a construction company. It focuses on the risks related to BIM implementation processes, i.e. processes related to implementing new systems in a construction company, and risks related to BIM application processes, i.e. processes related to actual BIM use in a construction company. Although there are serious threats involved in the first group, there are many opportunities emerging from the second one. Risk (threats and opportunities) identification in both of these groups and finding their correlation can then be used as a supporting argument for BIM implementation. The research methods are based on conducted surveys and literature research. These sources were analyzed and used for the case of explanation and for the identification of key risk and BIM related issues. The research reveals whether the topic of BIM related risks is mostly treated only on a common level and whether BIM regarding risk awareness of those who have not been using BIM is sufficient enough to evaluate all advantages and disadvantages of BIM implementation. In the end, the paper suggests a possible method to describe BIM related risks. The understanding of these risks and their connections allows construction companies to build arguments better when considering BIM implementation into their practice.

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Keywords: BIM; BIM Related Risk Awareness; Building Information Modeling; Implementation; Risk Management

* Corresponding author. Tel.: +420-607-803-814.
E-mail address: petr.matejka@fsv.cvut.cz

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1. Introduction

The Building Information Modeling (BIM) is a highly discussed topic nowadays. In some parts of the world, BIM has become common, usually by the means of some degree of standardization and government support. For example, such is the case of Finland [1], the United States [2] or Singapore [3]. There are other countries, like the United Kingdom, where there is a big BIM boom. In case of the UK, it means there is huge government support, aiming to use a certain level of BIM in all centrally procured projects by 2016 [4]. Then there are countries, especially in the southern and eastern Europe, which are starting to develop their interest in BIM. The usual propagators of this new technology are big construction companies (whose parent companies are already BIM ready or at least included BIM in their longer-term targets) and smaller young enthusiastic companies (because they are more flexible and more interested). Another very important part is played by government [5], which create an environment for BIM implementation (especially in the form of standardization and public contracts). They all need to ask these easy but very specific questions, which are not easy to answer:

- What are the benefits of BIM?
- What are the drawbacks of BIM?
- What will BIM cost me?

This paper targets issues connected with BIM implementation in construction companies on the market, where BIM is not common yet. It tries to provide a rough explanation of how the aforementioned questions can be partly answered by looking at risks during the BIM implementation process and actual BIM use.

1.1. BIM overview

BIM is a modern construction management process, which allows users to create object-based multidimensional parametric models as a tool for construction projects management during their whole life cycle. For this purpose, various tools and methods are being used. There are also procedural adjustments, aimed especially for collaboration, revisions and efficiency. Therefore there are the two main groups, which define the role of BIM in a project - tools and methodology [6]. Tools are not only software tools, although these are the most important. Heavy machinery, fabrication machines, computers, tablets, geodetic tools, visualization tools, GPS or microchips and RFID technology are also part of the tools group. Methodology group is much more complicated, since it defines how tools will interact, how they may be used by people and how people interact with each other. This second group defines the success of BIM implementation in a construction company nowadays.

The concept of BIM is not new. An object-based parametric modeling has already been used in different sectors, for example in chemistry, mechanical engineering or electronics [5]. It just took a little bit longer until these technologies found their way to construction industry, mainly because construction projects are unique, very complex and long-running. They also demand a very high amount of resources. Because of this nature of construction projects, the whole process of BIM adoption is not simple. BIM is a hot topic nowadays, spreading around the whole world, promising better, more efficient and higher quality construction projects with a positive impact in reducing whole life-cycle costs. BIM on the national markets differs a great deal and is based on a country's technological level and degree of government support.

BIM can be used during the whole project's life cycle. From programming, design phase, construction phase and operating phase, ending with demolition or renovation. During this cycle, BIM can be used in many different fields. These include a long list of different areas. This list includes current conditions modeling, budgeting and quantity takeoff, time planning, programming, and site analysis. Other areas that can use BIM are project review, certification and standardization, project design, engineer analyses, sheets and documentation creation, 3D coordination and planning, and site design. And lastly could include operational planning, digital fabrication, planning and management, as-built modeling, construction analyses, facility management, maintenance and