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Project management

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Initial Position

In Germany, 90% of architectural and engineering companies employ less than 10 employees [Destatis 2014]. The profit generated there is often insufficient to exploit the cost-intensive BIM software solutions of commercial IT companies [Braun 2015]. While there are already various cost-free tools developed in research and community projects, there is currently a lack of systematic investigation and practice-oriented assessment of such tools.

However, there are free BIM tools that are developed in research and community projects but also offered by IT companies. This research project evaluated such tools.

Object of the research project

The identification, process-related analysis and assessment of freely available BIM tools is the subject of the research project.

The research project was divided into the following steps:

- Identification of relevant BIM processes and development of usage scenarios
- Search for free tools and derive software classes
- Definition of evaluation criteria
- Test and evaluate the tools
- Assignment to usage scenarios
- Prepare the results for the public on a website

It turns out that by far more sources had to be searched, than free tools were found. During work preparation a wiki system has been set up, which could prevent redundant searches.

The BIM processes as well as the evaluation criteria were developed based on our own knowledge and they relate to process descriptions in current literature such as BIM guidelines and standards.

An important document in this context was the Delivery Manual Method [Wix 2010]. Although it was not possible to derive relevant processes directly from this, it underlined that the data exchange is essential for every BIM process. Other sources such as the BIM Guidelines for Germany [Egger 2013], the BIM Reference Process, and [Scherer 2014], [Tautsching 2014], [Borrmann 2015], [Hauschild 2010], [Hausknecht 2016] provide arguments for BIM by showing potentials and objectives.

However, there were no practical usage scenarios, which could be applied directly to the target group. Based on [Hausknecht 2016], six scenarios were developed and formalized in BPMN notation, also taking into account our own expertise.

The search for the tools was essentially done online and included scientific publications databases. For the selection, investigation and evaluation of the found tools, criteria were defined regarding functionality, ergonomics and reliability. In addition, a considered tool ...

1. ... had to be available free of charge and without license fees commercially available.
2. ... did not have to be limited in time.
3. ... could request a registration for use.
4. ... had to run on a current operating system.

According to these criteria, about 70 tools could be identified. They were assigned to 14 software classes and written down together with a short description in the wiki system. From this set, about 20 tools were selected and evaluated according to a criteria catalog.

For the selection of these tools, the possibility of data exchange played a substantial role. A tool has only been evaluated in detail if it has some form of meaningful data exchange with other free tools, since the greatest value added by the BIM method is the reduction of manual inputs [Both 2012].

The other criteria describe the usability and functionality of the tools. There are a total of 30 criteria, which, however, differ depending on the software class and degree of complexity.

It was possible to make general statements on the quality of tools from commercial suppliers, from research prototypes and community projects. Thus on the commercial side, mainly viewers without functions for model enrichment were found. The research prototypes were underrepresented and rarely functional. Especially in the non-direct BIM context, the selection of tools from community projects was very large. There, tools could be identified that allow modeling and have a good usability.

For the preparation on the website, a model was developed that allows the formal assignment of the tools to the usage scenarios. The form of the website was thus separated from the content and divided into three views. A welcome page on which the underlying motivation and a brief description of the structure of the website is phrased. For each usage scenario, a description is displayed together with the BPMN diagram with which the tools are linked. In addition, an ideal and a supported process are described based on the process description. For each tool, its list of evaluation criteria and the complete review is displayed.

Conclusion

The information obtained here is intended to help small companies not fall behind with the introduction of BIM in their planning process. Initially, research prototypes were expected to be a viable source of such tools. Unfortunately, this could not be confirmed because these tools are either not available or are not commercially available and are often hardly usable. In return, the community projects demonstrated transparency and quality assurance measures to ensure that free tools are also feasible and useful in the context of BIM processes. The results are published on the website <https://bimtoolsoverview.building-lifecycle-management.de>.

Basic Data

Short Title: BIM Tools Overview

Researcher: Steffen Wallner

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Federal Grant: 49.915,00 €

Duration: 14 month

Images

Image 1: merge.png

BPMN for usage scenario "Zusammenführen"

Image 2: interaction.png

Overall process via tool interaction

Image 3: associated.png

Usage scenario with associated tools

Image 4: blender.png

Screenshot of Blender's profile

Image 5: scenario.png

Screenshot of a usage scenario on the website

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