

Abstract

The digital transformation of existing construction processes is progressing ever faster. The BIM model as the central point of building data and information is at the core of this. The BIM methodology enables the continuous digital capture of building data across all phases of the construction life cycle. However, BIM is mainly used in the planning phase. In the following phases, the use has only been tested on the basis of pilot projects. Direct use of model-based data on the construction site is rare. On the construction site, work is still often carried out on the basis of 2D plans in printed or digital form. A major obstacle is the higher investment costs in software solutions, new processes and employee training, especially when introducing BIM in the company. On the basis of BIM, new technologies (z. B. Augmented Reality) can be integrated into the construction process in a modular way. In particular, the use of open standards in the form of openBIM (z. B. IFC, BCF) expands the possibilities considerably. This dissertation deals with the topic of augmented reality in combination with openBIM and the associated digital transformation of construction processes.

The cumulative dissertation consists of an introductory chapter, a basic chapter and five published specialist articles, which are summarized in chapters 3 Environmental Analysis, 4 Use Cases: Definition and Requirements and 5 Validation. The final chapter summarizes the entire thesis and provides a possible outlook for further potential research.

The introductory chapter describes the problem, the objectives of the thesis and the method. The basic chapter covers the topics of openBIM, augmented reality and IT project management. The next chapter describes possible applications of and requirements for Augmented Reality in construction. The survey was carried out on the basis of literature research, workshops and expert interviews. Based on these investigations, the tracking system was then analyzed in more detail for construction site suitability.

Based on the results, two use cases were defined, which were researched in more detail in research projects. The first use case deals with the use of augmented reality in the TGA acceptance by the local construction supervision. First, processes, features and mockups for the AR prototype were collected by means of expert interviews and workshops. The final step was the validation of the AR prototype by means of construction site tests. The second use case deals with the use of AR in the openBIM approval process. In the first use case, the actual process formed the basis for the development of an AR solution. For the second use case, the openBIM approval process had to be explored before the use and requirements of AR could be defined for this use case. Therefore, the definition of the openBIM approval process was the first focus for this use case.

At the end of this cumulative dissertation, the various results are summarized, proposals for digital transformation in construction are derived and an outlook for future research fields is given.