Title

Complete Title: „Lifecycle-related Management of Digital Building Information --
An Implementation Concept for a Technical and Organisational Solution in Building Authorities (Joint Project)"

Rationale

The public building sector has no sustainable concepts for the usability of digital information over the lifecycle of buildings. Digital obsolescence, the extreme heterogeneity of file formats and applications, the distributed responsibilities and functions, as well as a plethora of data are a grand challenge for the reuse of information, especially in the long term. This study shows an approach based on the ISO reference model OAIS (Open Archival Information System).

Subject of the Research Project

This research project focuses on the long-term usability (LTU) of digital building information, which, in addition to traditional archiving, has to support continuous and occasion-based updates of the underlying data. Having digital information available for long-term enables public administrations to fulfill formal requirements, to increase the efficiency of construction and operation, and to plan and perform emergency measures.

However, the nature of digital information involves risks and efforts for long-term usability. The requirements and constraints specific for the construction sector and for public administrations cause additional challenges. The widely accepted ISO reference model (RM) OAIS serves as a methodological framework for the development of a technical and organisational concept. The RM describes the responsibilities of a long-term archive and includes a conceptual model for functions and digital information. It also discusses the advantages and disadvantages of the most common preservation methods, i.e., emulation and migration. The OAIS information model defines so called information packages, whose components should guarantee interpretability, authenticity, integrity, confidentiality, and retrieval of digital objects. The abstract contents of this ISO standard are explained, and results of our own LTU-related research are added in the final report.

This study also includes a detailed analysis and assessment of projects that already addressed the digital LTU in the building sector and other technical domains. Another work package comprised the investigation of the initial situation and LTU-related activities within the building authorities. This analysis was supported by our project partner, the CAD-Stelle Bayern, which is a specialised unit within the public construction administration of the German federal state Bavaria. The results confirmed that the conditions for preserving digital information are critical despite first measures implemented by authorities. Particularly, the data management and the file formats for modelling buildings and infrastructure proved to be problematic. The data management does not consider the conditions in the public building sector and the needs required by the OAIS-RM. Especially, data structures and meta data that implement OAIS-conforming information packages and that enable their administration in the long term are missing. Moreover, file formats entail risks due to their variety, immaturity, short lifespans, and missing publicly available specifications. Therefore, this research project concentrates on the data management and formats.

The data management investigations include major general and construction-specific approaches, namely, shared files, document management systems, management systems for product data and product lifecycles, model orientation, product model server, collaboration platforms, and as an emerging technology, multi models and multi model container. A LTU-centred assessment of these approaches leads to an architecture with two core components, 1) a collaboration platform that supports the communication between project members and that secures the completeness and integrity of data mainly during the planning and construction processes, 2) a repository that conceptually corresponds to a document management system and that can manage OAIS-conforming information packages in the long term.

The file format investigations focus on the ISO-standardised format IFC (Industry Foundation Classes), which constitutes the core for a semantic modelling of buildings in the context of BIM (Building Information Modeling). Despite the shortcomings, as described in the final report, IFC should be preferred as a solution for LTU because the other preservation methods, i.e., migration, emulation, virtual computers, or computer museums, are not suitable as a general solution in the construction sector due to their risks of information losses or their extensive efforts.

Finally, this study identifies needs for further research and proposes the bridge building domain for a pilot project.

Conclusion

The aim was to develop a concept for implementing a technical and organisational solution that enables authorities to manage their information over the lifecycle of buildings. A major aspect for this challenge is the long-term usability of digital information. The final report contains a range of technical and organisational suggestions and illustrates an IT architecture comprising the major components for ensuring long-term reuse of information. The results provide a basis for a refinement and implementation that consider the specific needs of different administrations and offices. Moreover, the outcome can foster a structured discussion of the complex issues and contribute to a holistic view of BIM.

Basic Information

Short Title: Digital Long-term Usability

Researcher / Project Leader:

Contractor:
Universität der Bundeswehr München (UniBwM)
Werner-Heisenberg-Weg 39
85577 Neubiberg

Univ.-Prof. Dr. rer. nat. habil. Uwe M. Borghoff
Fakultät für Informatik
Institut für Softwaretechnologie
Professur für Informationsmanagement
uwe.borghoff@unibw.de
Tel.: 089 / 6004 2274, Fax 089 / 6004 4447
www.unibw.de/uwe.borghoff

Univ.-Prof. Dr.-Ing. habil. Norbert Gebbeken
Fakultät für Bauingenieurwesen und Umweltwissenschaften
Institut für Mechanik und Statik
Professur für Baustatik + Labor für Ingenieurinformatik
norbert.gebbeken@unibw.de
Tel.: 089 / 6004 3414, Fax: 089 / 6004 4549
www.unibw.de/baustatik

Project Leader:
AkDir Eberhard Pfeiffer
Fakultät für Bauingenieurwesen und Umweltwissenschaften
Institut für Mechanik und Statik + Labor für Ingenieurinformatik
Tel.: 089 / 6004 3417, Fax: 089 / 6004 4549

Total Costs: 220.900,00 €

Federal Grants Rate: 137.300,00 €

Duration: 24 months