

Exchange and Exploitation of Data from Asset Management Systems using Vendor Free Format



Project Summary

The aim of the AMSfree project is to develop a new approach based on information containers to combine asset management systems and BIM. Therefore, the processes and procedures existing within asset management systems as well as the related data flows were analysed and described by using process and data flow models. Three typical use cases were identified, and their data exchange was described. The interoperability and the connection with already existing databases or information systems are considered. Based on the example of a road section and a bridge, the consistency of the BIM concept and the implementation of rights of use are demonstrated. It is shown how existing national data formats (e.g., OKSTRA) for the management of road and bridges are linked to the IFC format during the entire life span. The approach differentiates between data that is directly contained in BIM and data that is linked to external databases.

Introduction

Planning, construction, operation, and maintenance of infrastructure require a significant commitment of both economic and human resources. For a targeted allocation of financial resources determined according to objective criteria, asset management systems (AMS) are used. One of the key aspects of asset management covered by most of these road authorities is the condition evaluation of assets and the assessment of related risks. While the condition-related data and data on inventory and traffic are stored in national asset management databases, data on materials from the maintenance planning and construction phase are often included in BIM models, documented as PDF or hosted in external databases. The exchange and update of these data are often time-consuming and error-prone. To combine the advantages of AMSs and BIM, a methodology based on standardized information containers was developed and tested.

Methodology

Based on the previously described potential to combine AMS with BIM, concepts for the integration of data from AMSs into BIM are introduced. First, the stakeholders within the context of asset management and its processes are described by using a process map. Three relevant update steps were defined on which an asset manager interacts with external contractors such as a inspector, a tender preparation team and a construction team. Based on the process analysis, the related data that needs to be exchanged at each update step and the national data formats are analyzed. The approach involves linking and transferring different data sources, models, or formats. This challenge cannot be solved in a universally valid way. The SWT is used to define ontologies for the description of domain-specific semantic information and link data from different data sources. It is shown how existing national

shown how existing national data formats for managing road assets during the whole life span are linked with the IFC format. The approach was tested and validated in the context of use cases.

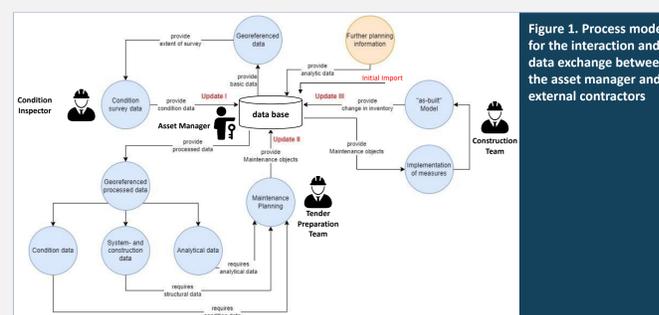


Figure 1. Process model for the interaction and data exchange between the asset manager and external contractors

ICDD Container

A prototype was developed to evaluate the proposed concepts of sharing, exchanging and visualization of data between the asset manager and external contractors by using information containers. The ICDD provides an environment for capturing and linking data from different formats. File-based documents can be linked in this information container. Figure 2 shows the idea of using standardized information containers for the data exchange between an asset manager and external contractors.

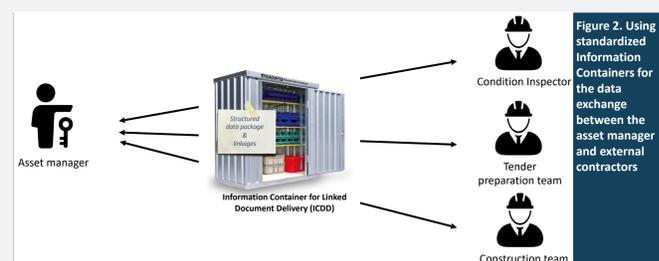


Figure 2. Using standardized Information Containers for the data exchange between the asset manager and external contractors

Use Cases

Assignment of the 3D Geometry to the Structure Elements

It is essential to consider the finest granularity of the asset management database to be able to link BIM with the different data models. For instance, Germany's ASB-ING's object classification is a hierarchical catalogue with a huge number of object type categories. The model is disassembled, and each bridge element and sub-element is associated with the corresponding ASB-ING catalogue type. The IFC entity types are exemplary shown in Figure 3.

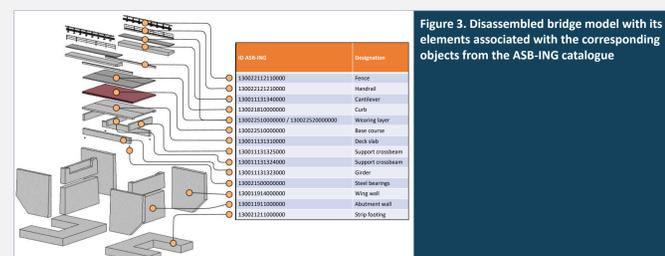


Figure 3. Disassembled bridge model with its elements associated with the corresponding objects from the ASB-ING catalogue

1. Inspection

As part of the structural inspections for engineering structures, condition changes to the infrastructure objects are recorded in the asset management database. Update 1 as shown in Figure 1 includes the implementation of results of visual inspections into BIM. The condition of the infrastructure objects and their individual elements can be integrated into BIM.

2. Maintenance Plan

Update 2 includes the implementation of results of maintenance planning into BIM. One can then access specified data for type of maintenance measure, the timeframe, estimated costs and the cause for maintenance activity. Also, bundles of measures, which contain several assets, can be combined and exported together for the program planning and processed correspondingly.

3. Maintenance Measures

Update 3 includes the implementation of an updated "as-built" model into BIM. As a result of the documentation of the construction work achieved, it includes all properties of the maintained elements of a bridge/road section.

Conclusion

In this project a new approach based on information containers was presented to combine AMSs and BIM. The processes and procedures existing within AMSs as well as the related data flows were analyzed. Afterwards, typical use cases were identified, and their data exchange was described. The interoperability and the connection with already existing databases or information systems were considered. Based on the example of a road section and a bridge, the consistency of the BIM concept is demonstrated. It is shown how existing national data formats for the management of road and bridges are linked to the IFC format during the entire life span. The approach differentiates between data that is directly contained in BIM and data that is linked to external databases. The benefits of connecting asset management processes with BIM are enormous. The combination and visualization of material related data within BIM its temporal classification and precise localization offer the possibility for a multitude of new analysis.

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