Sharing building information from planning to maintenance phases

Jing Sun
Dept. of Real Estate and Construction Management
KTH Royal Institute of Technology
Drottn. Kristinas väg 30,
SE-100 44 Stockholm,
Sweden.
jingsun@kth.se

Helen Eriksson
Lantmäteriet
Box 820
SE-981 28 Kiruna
Sweden
helen.eriksson@lm.se

Lars Harrie
Physical Geography and Ecosystem Science
Lund University
Sölvegatan 12
SE-223 62 Lund
Sweden
lars.harrie@nateko.lu.se

Anna Jensen
Dept. of Real Estate and Construction Management
KTH Royal Institute of Technology
Drottn. Kristinas väg 30,
SE-100 44 Stockholm,
Sweden.
abjensen@kth.se

Abstract

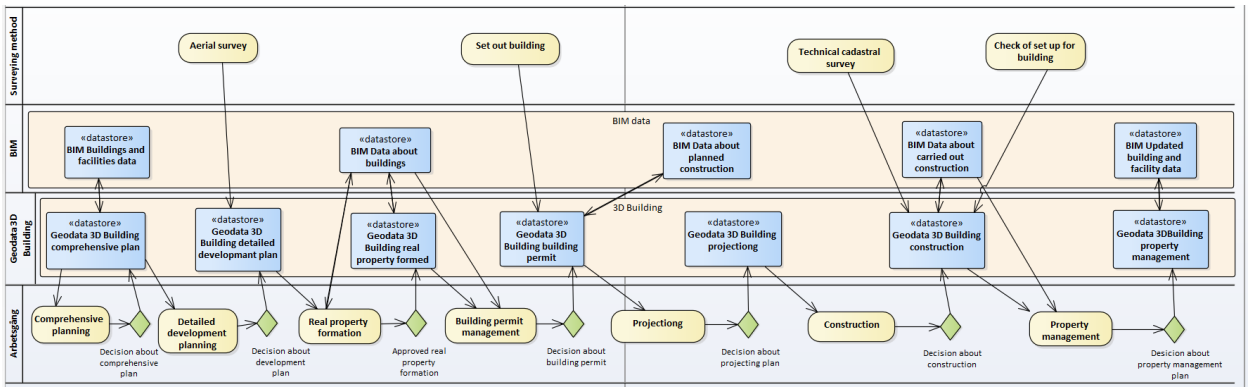
The sharing of digital information between phases in the planning and building process still have shortcomings. Our study is performed as a test case on a construction project in a municipality and focuses on two aspects of how the sharing of building information could be improved: 1) to get a more process oriented approach to the information flow. Here we will test if the ISO-standard Product Lifecycle Support (PLCS) can be used to enhance the lifecycle information for 3D geodata building data. 2) to evaluate the quality of the data to ensure that it is suitable to its purpose. The quality aspects need to be considered and evaluated both during data collection and through the whole construction lifecycle.
Keywords: Geodata, BIM data, data quality, lifecycle

1 Introduction

One shortcoming today for the digital handling of data in the built environment is that data are seldom shared between actors and between the planning, design, construction and management phases. There are several reasons for this shortcoming of sharing of information, including technical, legal and business reasons. In Sweden, the innovation and research program Smart Built Environment[i] was launched with one of the main incentives to improve the sharing of digital information. The program today finances, or has financed, around 50 projects; the study reported here is a joint work between two of these projects. This study is performed as a test case on a construction project in a municipality. Figure 1 shows the digital information flow in order to find out what kind of information is used in the different phases and how this information can be shared. Generally, the information can be divided into two parts: phase specific information and general information (i.e. information that is shared between different phases). In this study we are mainly interested in the general information and especially in 3D geodata description of the buildings.

The 3D geodata can be collected either by geodetic surveying techniques or by being derived from BIM-models (Donkers et al., 2016). The latter is increasingly important since e.g. 3D cadastre and building permits are likely to utilize BIM models in a near future. Therefore, we need a link between the more detailed BIM models and the 3D geodata, and also that this link is maintained through the evolution of the building. In this study, we concentrate on two perspectives of the sharing of building information, the modelling perspective and the data quality perspective.

Figure 1 Digital information flow between phases in the planning and building process



2 Methodology

2.1 Modeling building life cycle data

When general information is shared between phases in the planning and building process, additional information, such as lifecycle information, versioning information and unique identifiers, are needed to get a more process oriented approach to the information flow. Specifications for geodata do not usually include much lifecycle information, and the information included often concern transactions in the database, not real-world objects. In this study, we will test and evaluate if the ISO-standard Product Lifecycle Support (PLCS) can be used to achieve a more process oriented information flow, an approach that already has been tested with BIM data.

In the study, we will use 3D geodata and BIM data from several phases in a construction project. The BIM-data will be simplified into 3D geodata (LOD2-3). This implies that we will have several 3D geodata representations of the buildings, both measured with surveying techniques and simplified BIM-models. All the building geodata will be transformed to the Swedish building specification for *Svensk geoprocess* (somewhat simplified – a Swedish profile of Inspire building theme). Both the original BIM-data and the 3D building geodata will be mapped to ShareASpace[1], a data collaboration environment that implements the PLCS standard. The use of shared storage for the BIM- and geodata will facilitate e.g. joint spatio-temporal analyses and visualisation.

2.2 Quality aspects of sharing building information

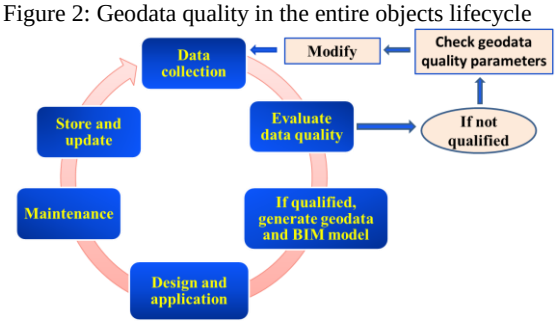
The integration of BIM-data and building geodata needs to pay more attention not only on data models and platforms, but also on data quality issues (Liu et al., 2017). When exchanging and sharing geodata within a planning and construction process it is important to evaluate the quality of the data so it is suitable to the purpose of the application.

Geodata quality aspects are to be considered both for the data collected with geodetic surveying techniques and the data generated from BIM-models in the whole lifecycle of the objects, see Figure 2. Evaluation of data quality is an essential step where it is decided if the existing data has sufficient quality or if new data needs to be collected. According to international and national standards, geodata can be evaluated as to whether the data is qualified or not using geodata quality parameters such as completeness, logical consistency, position uncertainty, thematic uncertainty, temporal uncertainty and usability (ISO, 2013).

Good quality of building models can provide accurate information on the different layers of e.g. wall, floor, and roof during the design and construction phases. When the model has been applied over several years, if buildings need to be reconstructed or used for other purposes, the quality of the models must be maintained and updated (Figure 2).

[1] http://www.eurostep.com/products/shareaspace/

Figure 2: Geodata quality in the entire objects lifecycle



3 Expected result

Having lifecycle information on real-world objects (e.g. buildings) is a prerequisite for a continuous digital information flow in the built up society. It is expected that the mapping of 3D geodata building information to the PLCS standard will improve lifecycle information for buildings and thereby also enhance the information sharing. By utilizing national standards for geodata quality, as well as quality evaluation principles, we will check that the data shared has sufficient quality for its use in the different processes.

In the future, we hope that the result of our projects will improve the sharing of information between actors and between the planning, design, construction and management phases. And also that the improved data will facilitate better spatio-temporal analysis for use within the built environment processes.

References

Donkers S., Ledoux H., Zhao J. and Stoter J., (2016). Automatic conversion of IFC datasets to geometrically and semanticaly correct CityGML LOD3 buildings. *Transactions in GIS*, 2016, 20(4): 547–569.

Liu, X., Wang, X., Wright, G., Cheng, J., Li, X., and Liu, R. (2017). A State-of-the-Art Review on the Integration of Building Information Modeling (BIM) and Geographic Information System (GIS). *ISPRS International Journal of Geo-Information*. 6. 53. 10.3390/ijgi6020053.

ISO, 2013. ISO 19157 (2013), Geographic information - Data quality.

[i] Smart Built Envinronment is a program supported equally by the Swedish government and the built envinronment sector in Sweden, and the project supports several ongoing research and innovartion projects http://www.smartbuilt.se/in-english