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BIM Maturity: The Second Generation

BIM adoption is spreading through public organizations and private companies in the AEC industries. The target is to benefit from BIM by creating a competitive advantage, and often in the public sector achieve more with less because of the pressure to make budget cuts. Adoption and BIM maturity is driven by organizations that develop both intra-organizational processes and set requirements to actors in the construction business value network.

Development taking place today ranges from drafting national BIM guidelines (or standards) to developing organization specific BIM guidelines in either public organizations or private enterprises. The target is common however. Once BIM guidelines and requirements are in use they must be followed.

This will mean that design suppliers will need to be able to provide their clients with the models they require, and invest in learning to model in a way which fulfills their needs and requirements. BIM will be the way to work, not unlike the time when a drawing skill used to be necessary for drafting structural details.

From the point of view of the AEC sector, there will be those who can, and those who cannot. For those who cannot, the inability to understand and execute within a BIM environment will limit the possibility to take part in construction projects, thereby diminishing the possibilities to attract new business.

Case Statsbygg: Public Construction and Property Management

Statsbygg is an administrative body in Norway, responsible to the Ministry of Government Administration, Reform and Church Affairs. Statsbygg follows standard business principles. Statsbygg acts as the property manager for the Norwegian government. Statsbygg also functions as a property manager and advisor in construction and property affairs. Statsbygg offers government organizations premises in new or existing buildings

In effect, Statsbygg is about public construction and property management. Statsbygg manages some 2.6 million m2 of floor space with a property portfolio consisting of government and cultural buildings, colleges and public administration buildings, and royal properties among others. Statsbygg is also responsible for organizing, planning and completing building projects, and offers consultancy services and assistance in civil engineering and technical matters to governmental organizations. An increasing important function for Statsbygg in the future

will be to develop vacated state-owned premises for alternative utilization.

The buildings must meet quality requirements pertaining to architecture, functionality and environmental concerns. This is where BIM comes in.

Statsbygg Building Information Modeling Manual Draft (herein SMB) contains Statsbygg's generic requirements for Building Information Modeling (BIM) in projects and at facilities. SBM is intended to describe Statsbygg's requirements for Building Information Models (BIM) in open Industry Foundation Classes (IFC) format. SBM categorizes requirements as mandatory, recommended, optional, or reversed (a requirement for something that must not occur). SMB describes both basic and generic BIM requirements, and generic model structure requirements.

All requirements are numbered. Requirement No. 4 states that *"A digital 3D building information model based on object based design (using objects with properties and relations) and using open BIM standards/formats is a main deliverable."* Requirement No. 6 states that *"The BIM authoring tool must efficiently support import and export in the open Industry Foundation Classes (IFC) BIM format"*. Both requirements are mandatory. A point worth noting is that Statsbygg requires OpenBIM to be used, permitting enhanced collaboration and flow of information between all stakeholders based on open standards. For example, requirements for spaces require that spaces shall be modeled with 3-dimensional space objects. As we can see, being able to perform only clash detection is totally inadequate.

Statsbygg as a client will in most cases provide a "Requirement BIM" that basically contains the spatial program's required spaces, functional grouping of the spaces, and any requirements that are defined for each space, group, or accompanying furniture, fittings & equipment. In addition to basic requirements, SMB specifies BIM design requirements by discipline and design phase from conceptual design to coordinated design.

Statsbygg Building Information Modeling Manual also specifies certain QA/QC requirements including consistency check, verification of design area, clash detection and coordination. Additionally, SMB outlines how to make a good model. In practice, SMB sets the standard for BIM, and defines what is expected from building information models, what is a good model and effectually defining how to build a BIM, advancing BIM maturity even further in Norway.

Based on the practical experience gained in Finland, it is probable that SMB will also be used by municipal organizations and applied in construction projects in the private sector. In effect, SMB is positioned to advance common culture and best practices for applying BIM in Norway in the whole AEC field.

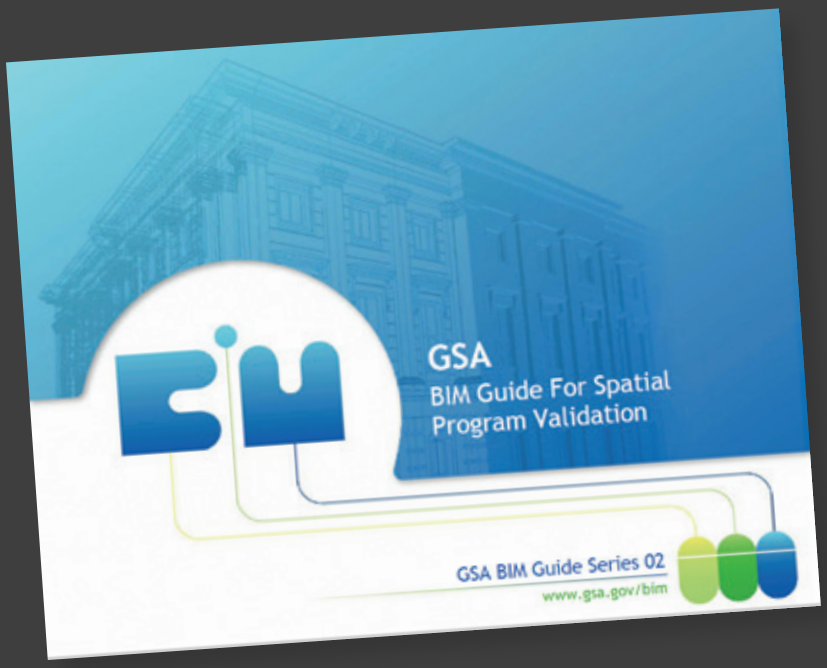
Case Finland: National BIM Guidelines

Senate Properties is a government owned enterprise under the Finnish Ministry of Finance. Senaatti is responsible for managing the Finnish state`s property assets and for leasing premises. In 2010, the property portfolio included 11,700 buildings, totaling an area of 6.6 million m^2 and valued at EURO 5.2 billion.

Senate Properties provides services related to premises. The primary customer is the state administration. Senaatti's services include leasing premises, investments, and the administration and development of the property portfolio. Senate Properties finances its own operations and is independent of the state budget. The property portfolio comprises cultural, office, university, research, and other buildings.

Senaatti already published BIM Requirements and Guidelines in 2007. Since then, they have been adopted and used widely, influencing BIM adoption not only on the project's related to maintaining and developing the state property portfolio, but also on municipal BIM adoption and practices implemented in the private sector. For several years, Solibri Model Checker has included Rulesets for checking model conformance with Senaatti's requirements.

The industrial problem which Finland faced was that while modeling was adopted at an increasing pace in the construction value chain, several actors, such as major construction companies had created their own guidelines while others, such as major cities and building owners were in the process of preparing their own. At the same time, many realize that they need to move to-



ward modeling, but did not know how. Also authorities need to improve the handling and processing of building permits.

The solution to the above industrial problem was that, because Senaatti's modeling guidelines needed to be updated and taken further, Senaatti's present requirements would form a baseline. This process would be elevated to the national level. Today Finland is in the process of creating The National BIM Requirements. They will be completed in the near future.

The target is to have one unified approach for BIM projects and a large national acceptance. National requirements enable high market penetration and more information rich models. Also better models lead to enhanced information transfer within the construction value chain, and to a higher BIM maturity on the national level.

Case US: GSA

The United States General Services Administration (GSA) provides and maintains workplaces through the Public Buildings Service (PBS). PBS maintains an inventory of more than 370 million square feet of workspace for 1.1 million federal employees. PBS acquires space on behalf of the federal government through new construction and leasing. In effect, PBS is the landlord for the civilian federal government in the US. One key business function PBS performs is the planning, design, and construction of new and modernized border stations, courthouses, office buildings, and other facilities.

As early as 2003, GSA established the National 3D-4D-BIM Program through the PBS, Office of Chief Architect. GSA pointed out very early that "*Critical to successful integration of computer models into project coordination, simulation, and optimization is the inclusion of information—the "I" in BIM—to generate feedback.*" GSA also pointed out very early that 3D, 4D, and BIM technologies represent three separate ways in which computer technologies can aid building owners, such as GSA, to manage their facilities throughout the whole lifecycle. Building Information Models include, in addition to 3D geometric models, specific information on the building elements and systems within a building.

Examples of the information include wall types, spaces, air handling units, spatial information, and circulation zones. It is not enough that information is included in the building. It must be possible to takeoff information from BIMs, safely. Information to be used for decision-making must be correct so business decisions are based on reliable information, which reduces data-based risks, such as incorrect rentable area information or building component quantities, affecting cost estimates or investment decisions. The approach GSA has taken is very much in the heart of BIM. Building Information Models are used for spatial validation, accessibility, egress and circulation analysis, and also for financial estimates. The information quality is paramount. Models must be checked for quality.

Solibri Model Checker v7

Solibri is actively participating in several projects that relate to QA/QC solutions and processes. In the US, the FIATECH sponsored AutoCodes project is an example of Solibri's commitment to delivering consistent quality to the global building code checking and review process (Please read the related selection in this magazine). In Korea, the Solibri Model Checker has been used for evaluating BIM quality for proposals in design competitions. For the European AEC community, Solibri has implemented support for the upcoming Statsbygg BIM Guidelines and the Finnish National BIM Guidelines being prepared. When these Guidelines are put into use Solibri Model Checker v7 will include support for BIM QA/QC processes and best practices for BIM on a large scale.

National, government level, and company level BIM guidelines are being adopted and used widely by the AEC community. This is the second generation of BIM. Already supported by Solibri.