European Commission

European Construction Sector Observatory

Policy measure fact sheet

Finland

coBIM Requirements

Thematic Objective 3

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Implementing body:	The Building Information Foundation (RTS) as project coordinator; 10 public and private organisations involved in drafting coBIM
Key features & objectives:	Common National Requirements for Building Information Modelling (coBIM) was set up in response to a strong demand of clients / building owners to define a common standard for BIM-use for building in Finland
Implementation date:	2010-2012
Targeted beneficiaries:	Entire value chain of construction lifecycle incl. construction companies; architecture offices
Targeted sub-sectors:	Construction; engineering; architecture & design
Budget (EUR):	250,000 provided by 24 funding organisations; roughly equal amount provided by in-kind contributions by the writers

In a nutshell

Although use of Building Information Modelling (BIM) in Finland dates back to the 1980s, it was not until the turn of the millennium when the Funding Agency for Technology and Innovation (Tekes) drove forward the concept of BIM. Thanks to Tekes' VERA funding programme, Finland became a major player on the international development and standardisation of integrated BIM[1]. By 2002, the Finnish building industry had already recognised the central role of ICT and BIM to improve productivity, quality and processes in the design and construction of buildings[2].

At that time, increasing demands for the use of BIM in construction projects from clients / building owners led public and private organisations to develop their own BIM guidelines. Not only Senate Properties[3], a government owned enterprise that owns and maintains state owned buildings, had developed their proprietary BIM guidelines, but so had ATT, the housing company of the City of Helsinki, and Skanska, the world's fifth largest construction company[4].

The wide use of Senate Properties BIM guidelines from 2007 and pressure from industry to update the guidelines' contents resulted in the set-up of the Common National Requirements for Building Information Modelling (coBIM) R&D project in 2010: A coalition of public and private enterprises to extend Senate Properties' guidelines by transforming them into national BIM guidelines.

The coBIM project was developed during a period of approximately 2 years comprising 10 drafting organisations and 24 funding organisations. It set out to involve the entire value chain throughout the whole lifecycle of the construction sector including research organisations, construction and software enterprises, building owners, architecture offices and consulting companies. The coBIM project established a steering committee (SC) within RTS composed of its financial contributors. Since its creation in 2013, coBIM is hosted, monitored and coordinated by BuildingSMART Finland, founded as a working committee of RTS, today referred to as a collaboration forum for BIM of many different stakeholders[5].

Today, the coBIM requirements are commonly referred to in the appendices of public and private construction contracts. Next to the Finnish original, the coBIM requirements are available in English, Estonian and Spanish.

General description

The main impetus to develop coBIM came from Senate Properties. Instead of refreshing its outdated 2007 guidelines, it approached the Building Foundation (RTS) to gather all relevant actors and produce a set of national guidelines, instead of each player developing, publishing and maintaining their own. RTS was intentionally selected as a neutral coordinator, since the

coordination of a client organisation or the contractors' federation would have decreased the acceptance of coBIM of the project participants.

Before coBIM's implementation, Senate Properties requested a pre-study conducted by Prof. Arto Kiviniemi, University of Liverpool, serving as a baseline for the project. All in all, a total of 30 contracts, 24 with funding partners, and 6 with the various writers were set up embracing the most relevant players in construction, including Skanska and ATT whose guidelines were incorporated into coBIM[6].

Originally the coBIM Requirements comprised the following 13 series: i.e. individual chapters ranging between 20 to 40 pages:

- **Series 1: General part** - basic principles, requirements and concepts to be followed in BIM-based projects; definition of general targets to be supervised by a selected BIM Coordinator
- **Series 2: Modeling of the starting situation** - existing building and building site modeling as a source of information to design and construction needs; description of requirements for measurements and other information
- **Series 3: Architectural design** - architect's BIM is mandatory for all the design phases; requirements for architects are divided into 3 levels, but the details need to be adjusted according the different purposes of the Models
- **Series 4: MEP design** - specifies the contents of the building service (BS) design tasks that are performed BIM based
- **Series 5: Structural design** - Scope of modeling, precision and schedule-based level of details determine the usability of the structural BIM; broken down into planning different design phases, each containing a list of BIM tasks and description of level of detail
- **Series 6: Quality assurance** - self assessment done by the information producers, mostly designers, before delivering the information to other parties for use as initial information, of coordination of information during design, and of final check of the information model of certain phases; contains practical guidelines about how to avoid problem point as well as check lists for each party for a more profound assessment
- **Series 7: Quantity take-off** - describes essential BIM requirements and guidelines for quantity take-off; Measuring quantities manually from drawings is replaced by computer assisted measurement from a BIM
- **Series 8: Use of models for visualization** - The key advantages of utilizing the BIM-based visualizations are the quality assurance of the design, easy comparison between different design alternatives, improved communication and support for the development and marketing
- **Series 9: Use of models in MEP analyses** - describes possibilities brought into BS analysis by modelling; examples of various analyses have been added and differences between lighting calculation and lighting analysis
- **Series 10: Energy analysis** - describes tasks during design and construction that are essential from the viewpoint of management of energy efficiency and indoor climate, as well as use and maintenance
- **Series 11: Management of a BIM project** – deals with project management, and utilizing BIM from the client's point of view; BIM tasks of project management are described as procedures as well as planning, implementation and control measures
- **Series 12: Use of models in facility management** - describes the information management process throughout the whole construction value chain, and it sets minimum requirements for the update and quality assessment methods of BIMs for the use phase
- **Series 13: Use of models in construction** - describes the BIM requirements and the utilisation of BIM during the construction phase, and tasks for the contractor to deliver information for the as-built model

The series 1-9 were adapted from the Senate Properties Guidelines 2007, whereas series 9-13 were drafted from scratch. In addition to a completed 14th Series on BIM based building permits, an additional chapter (Series 15) titled "GEO works" is currently developed.

While the project started using the term *guidelines* initially, all participants agreed to use *requirements* for coBIM's outcomes. Another interesting detail is that there was no funding provided by Tekes; instead, all finances were raised from the project partners individually.

Comparable to the execution of a research project, the coBIM's implementation foresaw work packages for the drafting of each of the 13 series.

Achieved or expected results

The principal outcome of coBIM is the series' large use as appendices to construction contracts, in the form of a national standard. Today, 99% of BIM projects are estimated to use coBIM[7]. As a result, coBIM clarifies not only what architects and engineers are expected to deliver, but also helps contractors as well as clients gain a better understanding of the final product. In addition, coBIM can serve as a basis for the development of production management software/ERP systems/portfolio management systems through better anticipation of what the construction value chain will deliver.

Table 1: Website traffic of BuildingSMART Finland, the portal hosting the coBIM requirements (2012-2016)

Combined total of FI and EN traffic	**337,000**
Finnish version of the website	270,000
English version of the website	67,000
Estimate of users looking for coBIM	40,000

Source: BuildingSMART Finland[8]

An additional advantage of coBIM lies in providing a flexible framework. In practice, this means that construction projects can focus on certain contents - even extend them - in line with the needs of the client and those of the project[9]. Given that individual series vary in the level of detail provided, e.g. architectural design, is very detailed, coBIM facilitates agreements on different levels of details between architects, engineers, contractors and clients.

The positive feedback and ample use of coBIM has encouraged the development of more specific BIM requirements in building related fields. These fields include requirements for infrastructure (Common InfraBIM Requirements)[10] and concrete structures[11].

Table 2: Building permits and turnover for the building sector in 2015 (BIM related data are estimations)

Average of building permits per year in Finland	**31,928**[12]
Average of construction projects using BIM	500-600
Total turnover of building sector (in billions)	22
Turnover related to BIM projects (in billions)	2.2

Sources: Statistics Finland[13]*; BuildingSMART Finland*[14]

Perspectives and lessons learned

From the **perspective of RTS, the project's coordinator**, the particular design of coBIM allows for manifold lessons learned. COBIM was designed intentionally free of ownership and charge giving all participants full IPR rights to benefit from the project's results and use them as they wish. The reason was to avoid lengthy discussions related to the results' ownership which would have slowed down the project's implementation.

Next to work packages related to the series, an extra work package on coordination was put into place. The extra work package improved the implementation of coBIM as it defined specific responsibilities, processes and deliverables. Retrospectively, two additional work packages should have been drawn up for coBIM's implementation: one for the editor and another one for dissemination and training in order to have coBIM unfold its maximum impact.

One aspect which today would be done differently is coBIM's financing. Individual funding from the participants turned out to be a weary process and future amendments will likely require additional funding. Hence, any similar project elsewhere is strongly recommended to make use of public funding[15].

From an **industry perspective**, the coBIM requirements show the importance of clients' impetus to define a common standard for the use of BIM. Despite existing benefits of BIM use in construction projects, e.g. more efficient procurement, faster roll-out, builders and architects may not always see immediate results. Unless obliged by the clients, the majority of builders or architects would have not made use of common BIM guidelines.

According to industry, a core value of coBIM will likely lie in enhanced communication between the various parties involved in a construction project, particularly between designer and contractor. Insights into the BIM plans of the designer allow the contractor to know more about the clients' motivation. This information may also result in the project's end result being more focused on the needs of the client[16].

From a **Senate Properties perspective**, the main value of coBIM lies in their harmonising effect on modelling activities in the Finnish building industry. According to Senate Properties, the benefits relate to clash detection of construction projects, thus improving constructability, the possibilities for to develop strategies for cost estimation and quantity take-off as well as for project and financial management[17].

Although coBIM's rather imprecise tone has driven continuous development by forcing most to take stance on those points they leave open to interpretation, Senate Properties supports to replace coBIM one day with a more rigorous set of requirements. This should be done by replacing coBIM piece by piece by concise task specific instructions in order to avoid recurring flaws with BIM protocols which overemphasise the general process description. The reason for this tendency is most likely a lack of in-depth understanding of the new design process and its deliverables. However, once the new way of working is internalised by all, the process descriptions will become less relevant.

From the **perspective of the Finnish Transport Agency (FTA)**, coBIM has served as a basic structure to develop the BIM requirements for infrastructure in 2015, commonly referred to as YIV. While coBIM's structure is applicable to some areas, infrastructure projects are still different from those of buildings. The differences could have been integrated better from the start. YIV requirements focus on those areas where FTA had most experience, notably a detailed design and construction phase[18].

According to FTA, one area which was delicate relates to the description of the early design phases of infrastructure/civil engineering elements. While this description is kept lightly, doubts emerged in relation to demonstrate impacts in models and to define sufficient accuracy levels. A missing area concerns the life cycle of the projects which have been excluded due to significant difficulties to draft guidelines for that aspects. One part to be further strengthened in the future is to integrate the views and

experiences from large cities to greater degrees, since they have many big infra investments.

From the **perspective of BuildingSMART Finland,** one reason for coBIM's wide spread use lies in its rather general, guideline character with flexible use of contents. At the same time, this general character is also a weakness: Although a harmonised data structure is currently provided through coBIM, there is an additional need for harmonised data, as achieved by the UK's BIM Task Group.

Further, coBIM participates in the EU BIM Task Group[19] which is presently developing a handbook containing the common principles for public procurers and policy makers to consider when introducing BIM to their public works or strategies. In this context, BuildingSMART Finland will be able to further develop its transition towards greater data harmonisation of coBIM.

Endnotes

[1] VTT (2009). Scientific activities in building and construction 2008:

http://www.vtt.fi/files/download/scientific_reports/building_construction_scientific_activities_2008.pdf

[2] Kiviniemi, A. (2015). Presentation on Experiences from the BIM-Adoption in Finland and UK – Clients as the drivers of innovation. Available at:

http://gridd.etsmtl.ca/publications/atelier-bim-education-research-016/presentations/Arto%20Kiviniemi%20-%20BIM%20adoption%20experience%20in%20Finland%20and%20the%20UK.pdf

[3] Senate Properties is controlled by the Finnish Ministry of Finance owning approximately 10,800 buildings in Finland with a rentable floor area of approx. 6.5 million m^2 (source: Building Smart Nordic (2013). Senate Properties' BIM projects.

[4] Finne, C. (2010). Presentation on coBIM: Common National BIM Requirements. Available at:

http://virtual.vtt.fi/virtual/b3/Seminaari%2012.1.2010/Finne_BIM%20requirements_2010_01_12.pdf

[5] For more information see:

http://www.en.buildingsmart.kotisivukone.com/1

[6] Information exchange with Christer Finne from RTS.

[7] Provided during telephone exchange with Tomi Hentinnen, Director of Bulding Smart Finland.

[8] Ibid

[9] Ibid

[10] http://www.infrabim.fi/en/requirements-and-guidelines/

[11] Henttinen, T. (2012). Presentation on COBIM 2012 COMMON BIM REQUIREMENTS.

[12] Provided during telephone exchange with Tomi Hentinnen, Director of Bulding Smart Finland.

[13] http://pxnet2.stat.fi/PXWeb/pxweb/en/StatFin/StatFin__rak _ras /009_ras_tau_105.px/table/tableViewLayout1/?rxid=15925b0e-77ac-4910-a1fe-ad8a69fc20f2

[14] Provided during telephone exchange with Tomi Hentinnen, Director of Bulding Smart Finland.

[15] Information exchange with Christer Finne from RTS.

[16] Information Exchange with the Finnish National Construction Federation – Rakennusteollisuus.

[17] Provided in e-mail exchange with Juho Malmi from Senate Properties.

[18] Provided in e-mail Exchange with Tiina Perttula, Finnish Transport Agency.

[19] The EU BIM Task Group was set up in 2016 as a European initiative comprising national representatives from public clients and the public sector. The Task Group is provided with 2 years of funding from the European Commission in order to create a common European network charged with aligning the use of Building Information Modelling in public works. The main output will be a handbook explaining the common principles for public procurers and policy makers to consider when introducing BIM to their public works or strategies. Contents will include procurement measures, technical considerations, cultural and skills development; and the benefits case for BIM and 'going digital' for policy makers and public clients.