Swiss-COBie: Development of a Design for Information Exchange Between Planners, Contractors and FM in Switzerland

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ABSTRACT

Purpose: To develop a prototype Swiss Construction Operations Building Information Exchange (COBie) suitable for information exchange between planners, construction and facility managers (FMs) in Switzerland. To support this aim three questions were investigated: 1) what information relating to assets/buildings do users need most? 2) when does, information need to be exchanged during the planning and construction process? and 3) how can facility management (FM) benefit from a Swiss-COBie?

Design/methodology/approach: Triangulation including; review of literature, Building Information Modelling (BIM) standards and industry best-practice in Switzerland, an analysis of data from three different company's Computer Aided Facility Management (CAFM) systems to establish the most common/important data and semi-structured interviews with the responsible FMs.

Findings: BIM for constructing new buildings is developing fast in Switzerland. However, there is a lack of established Swiss BIM standards and FMs have little or no BIM experience. Analysis of CAFM data highlighted essential COBie schema data fields and how existing COBie schema could be adapted to Swiss construction standards. FMs will benefit from improved handover of asset information from construction to operation helping to prevent long-term issues during the operational phase.

Practical implications: A Swiss-COBie will help FMs transfer relevant BIM data localised to the Swiss market for transfer into their CAFM systems.

Originality/value: This paper represents a first step in establishing a system for digital information exchange in Switzerland that could be trialled in practice.

Keywords: Facility Management (FM), Building Information Modelling (BIM), Computer Aided Facility Management (CAFM), Construction Operations Building Information Exchange (COBie), Switzerland

1 INTRODUCTION

The increasing trend towards digital planning and construction in Switzerland offers FMs new opportunities to improve the quality of building documentation at handover from construction to operation. Traditionally FMs receive information at the point of handover from construction to operation related to buildings, like room lists or technical facilities. This is a mix of digital and hard format but customers have still demanded hard copies. With the introduction of BIM, the trend is towards digitising all information with the aim of making the transfer to other systems such as CAFM more effective and efficient.

Today CAFM and BIM software tools are largely considered as separate systems with different functions. BIM software tools are used during the planning and construction phase of creating assets. while CAFM work-process management tools are used in the operation phase to manage the assets. In the near future, such systems will probably become much more integrated to allow a seamless transfer of data between construction and operation but for now a mechanism such as COBie is required to transfer data between the two. The BIM process enables the capture of a wealth of information, however, there are often difficulties to transfer the relevant information from BIM into a CAFM system. One possible reason is the different data formats of BIM and CAFM. For example, some software such as the BIM Revit software from Autodesk uses Industry Foundation Classes (IFC) or Portable Document Format (PDF) as an open data format, while CAFM systems mostly support excel spreadsheets (XLS) and 2D drawings. Although this is starting to change as CAFM suppliers see the potential benefits of systems which support IFC and PDF. Another key issue is that clients and FMs working in BIM projects need to consider if their CAFM tools can presently accept data from a schema such as COBie or if they are limited in this respect and can only partly take over BIM models and data from the planning and construction phase.

If there is lack of communication between planners, contractors, FMs and users without adequate planning with respect to the data transfer many of the advantages of BIM and COBie may not be realised. In Switzerland, today's many systems cannot transfer information easily to one another without a significant manual effort which can be costly and time consuming. There are currently no standardized procedures in Switzerland to regulate the information transfer between the planning, construction and operation phases of an asset. The aim of this paper was to create a first design of a standardized information exchange between planners, contractors and FMs/users in Switzerland. The design is based on existing COBie systems and the authors refer to it as "Swiss-COBie". A COBie is basically a digital tool (often an excel spreadsheet) which can be used to exchange data from one software to another.

2 LITERATURE REVIEW

BIM is increasingly used in Switzerland with respect to the construction of new buildings. Six years ago, only contractors of large buildings used BIM as their planning and construction tool. However, nowadays even small flats are being built with BIM (Hart, 2016). BIM is a method used during the planning and construction phase that works with a 3D model of the planned building. According to Abdullah, et al. (2013, p. 2), BIM can "enhance the cooperation between the various disciplines of work", such as architects, facilities managers, engineers, etc. while providing a working "platform" for everyone. They came to the conclusion that BIM can support FMs "successful and outstanding" creating a synergy between the planning and construction

phase as well as the operational phase. However, the so called successful support from the BIM process will only work properly, if FMs get the information needed for operating a building as early as possible.

Kassem et al. (2015) argue FM should be involved in the planning process from an early stage, or better, from the beginning, otherwise, FMs will not benefit from BIM for the operational phase. In addition, the information exchange between BIM and FM can be "incomplete and inaccurate" (Kassem. 2015, p. 5). Liu, et al. (2013) note that a BIM model "should hold information for different stakeholders at different phases of the facility's life cycle" (p.7) whilst Parsanezhad, et al. (2014) note that "insufficient interoperability issues among information systems in the building industry" result in a "considerable financial loss" (p.2). For BIM to be successful it needs to work with already established systems, like CAFM currently used by the FM industry.

Often there are issues between BIM and CAFM due to difficulties in exchanging data due to different data formats. It is possible to transfer the data from one system to the other but it comes with additional manual workload. To solve the information exchange problem, Patacas et al. (2014) suggest using COBie as an exchange tool. COBie was first developed by the US Army Corps of Engineers to help structure data of facilities and assets. It is compatible with several approved data standards, e.g. IFC and XLS. According to East (2016) before COBie FMs had to type in and review the data given by the contractors manually. This step could take months to complete. By using COBie the data can be filled up at every stage of the project, making sure that information is regularly updated and data transfer errors are addressed as they occur. Because COBie can use several data formats, CAFM systems need to be able to recognise and map data for transfer into the CAFM system.
The British Standards Institution (BSi) launched a Code of Practice BS 1192-4 (BSi, 2014) in which the use and structure of a COBie spreadsheet is described. The Swiss Society of Engineers and Architects (SIA) is aware of the increasing use of BIM and has held several national congresses for informational purposes to investigate BIM in Switzerland (SIA, 2013). In addition, they have initiated the production of the Swiss BIM guideline SIA 2051 "Building Information Modelling (BIM) – Grundlagen zur Anwendung der BIM-Methode" (basics for appliance of BIM method) as they recognise the need for BIM standardisation in Switzerland. However, there is a gap in knowledge with respect to the possible use of COBie. This research gap should be investigated to establish if a Swiss-COBie could help planners, construction, FMs and users in Switzerland.

3 METHODOLOGY

The methodology included; 1) a review of literature/industry best-practice in Switzerland with respect to BIM, 2) an analysis of data from three different company's CAFM systems to establish the most common/important data and 3) semi-structured interviews with the facility managers responsible for these CAFM systems.

Five organisations were invited to take part and 3 accepted. Two of the organisations declined the offer as they did not want to share their data due to confidentiality reasons. The CAFM data analysis was carried out in partnership with the IC Information AG Company[1] in Switzerland

[1] The IC Information Company website is https://www.ic-information.com/en

who are CAFM systems specialists. Data sets were analysed from three different types of organisation; 1) a hospital set in the north-west part of Switzerland with over 400 beds and 2000 employees, 2) a FM service provider with focus on energy solutions set in the west part of Switzerland featuring 20 locations and over 1400 employees and 3) a FM provider with focus on cleaning set in central Switzerland with 6'000 employees. An analysis was undertaken to try and understand which types of information were accessed and used most regularly by the organisations. (This helped to identify the degree of use of certain types of information). However, use is not necessarily a clear indicator of importance and so semi-structured interviews were held with the responsible facility managers to try and establish which data also was seen as useful and important.

To help understand how a Swiss-COBie might work in Switzerland three research questions were investigated: 1) what information relating to assets/buildings do the users need most in operation? 2) when does, the information need to be exchanged during the planning and construction process? and 3) how can FM benefit from a Swiss-COBie?

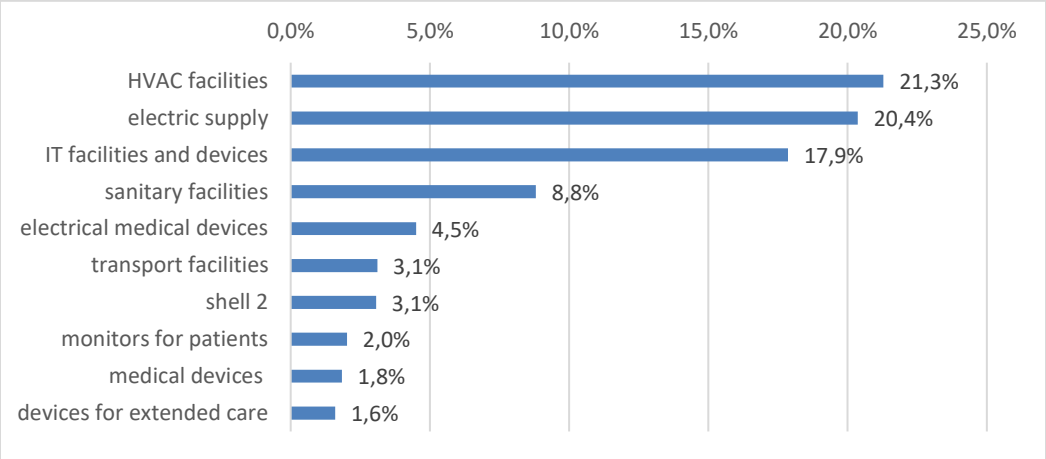
4 RESULTS

The following results address the first research question: "what information relating to assets/buildings do the users need most in operation."

All data sets provided by the companies were last updated in May 2016. Because the newest system was implemented in 2011 and to get data from complete years, the research timeline was set between 2011 and 2015. In total, 767'698 data entry records were analysed. The data was categorised into two sections: 1) classes and 2) attributes. For the purposes of this paper, classes refer to categories of equipment, e.g. HVAC facilities, sanitary facilities, etc. Attributes are descriptions related to a specific facility in a category. So, for example building facilities, such as elevators or doors are categorised into different classes. The class structure is based on the Swiss construction costs standard BKP 2001.

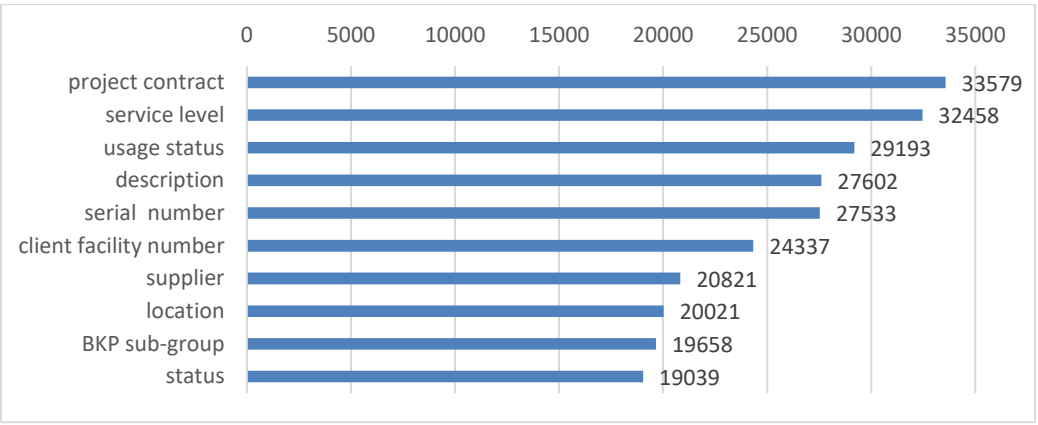
The top 10 classes used by all companies are shown ranked in terms of usage in figure 1. The HVAC facilities, with 21.3%, were the most used class followed by the electric supply (e.g. high voltage facilities, power supply) with 20.4%. IT facilities and devices were ranked 3rd with 17.9% and sanitary facilities 4th with 8.8% to. The top four ranked classes combined equate to 68.4% of the total data. The following classes had less than 5%; electrical medical devices, transport facilities, shell 2 (windows, doors, outer façade), monitors for patients, medical devices and devices for extended care.

Figure 1: The top ten categories for class in terms of percentage



The top 10 most used attributes are shown in figure 2 combined are equal to 33% of the total data. Compared to the classes, the differences are significantly smaller. The most used attribute was "project contract" followed by "service level". Both were used more than 30'000 times during the 5-year period. Third goes to "facility usage status". All three were used only by the FM service providers. The forth most used attribute "description" was the first one used by all 3 investigated companies as well the remaining six "serial number", "client facility number", "supplier", "location", "BKP sub-group" and "status".

Figure 2: The top ten most used attributes



The following paragraphs summarize the key findings from the interviews to help try and answer the research questions 2) when does, the information need to be exchanged during the planning and construction process? and 3) how can FM benefit from a Swiss-COBie?

The interviewees were all aware of and commented on the general lack of standardisation with respect to BIM in Switzerland. They noted also the lack of a standardised information exchange process which could be used in Switzerland such as COBie. They were in agreement that such a system would be very useful not only for FMs but also during the whole planning and construction process. However, they were of the view that market demand will finally decide, if digital construction and thus the use of tools such as COBie will become the norm as they felt many people would resist change.

They all agreed it is the responsibility of FMs to better inform themselves about BIM and to try and make the contractors aware of the importance of good quality information exchange and how this might have a significant affect during the operational phase of assets. However, during the interviews and research as it was very difficult to establish a clear answer to question 2 as there are not currently few well documented BIM case studies in Switzerland and none of the interviewees had any direct experience of BIM. At present the authors felt unable to answer the question in detail based on the interviews other than to note a given answer was that information was normally exchanged in line with the current requirements as laid out in the Swiss standard SIA 112 *Nachhaltiges Bauen – Hochbau* which addresses sustainable building and the stages for the planning, construction and handover of assets.

Both of the FM providers had a high level of request for information related especially to their technical assets, while the hospital prioritises the medical equipment and the non-medical processes. All of the interviewees agreed that if digital planning and construction is used increasingly to construct new assets then the associated data management will become one of the most important issues. They indicated that they believe most companies in Switzerland are not currently adequately prepared for the increased digitisation of asset data. Although they could provide feedback of what data was needed (which was broadly in line with CAFM analysis) they were not able to provide detail on when data should be exchanged other than shortly before the point of handover. Although an exact answer to the "what information, and when" was difficult to answer they made reference to the Swiss standard SIA 113 *FM-gerechte Bauplanung und Realisierung* which addresses FM-compliant construction planning and realisation.

With respect to question 3 all the interviewees felt FM stood to gain from the introduction of a Swiss-COBie aligned with the Swiss construction standards. However, they could not quantify or qualify specifically in what way. An interesting finding was that although the responsible FMs work with their CAFM system every day, they knew little about the CAFM's structure, functionality and how the data is organised. When asked about the possible structure of a Swiss-COBie, they were in agreement that it should be based on the new Swiss construction costs standard e-BKP-H which takes the structure of the old (BKP2001) but goes into more detail. However, legacy issues exist and many companies still work with the old BKP system.

They noted a key general issue with the introduction of BIM in Switzerland is the current total lack of specific Swiss BIM standards. This leaves most people unsure of what to expect from a BIM project and they are not sure how to engage with a project that intends to use the BIM process. They believed the new SIA 20151 standard will be a big step in the right direction and indicated that a specific Swiss-COBie might be a valuable addition and help improve transfer information into their CAFM systems, especially within large assets.

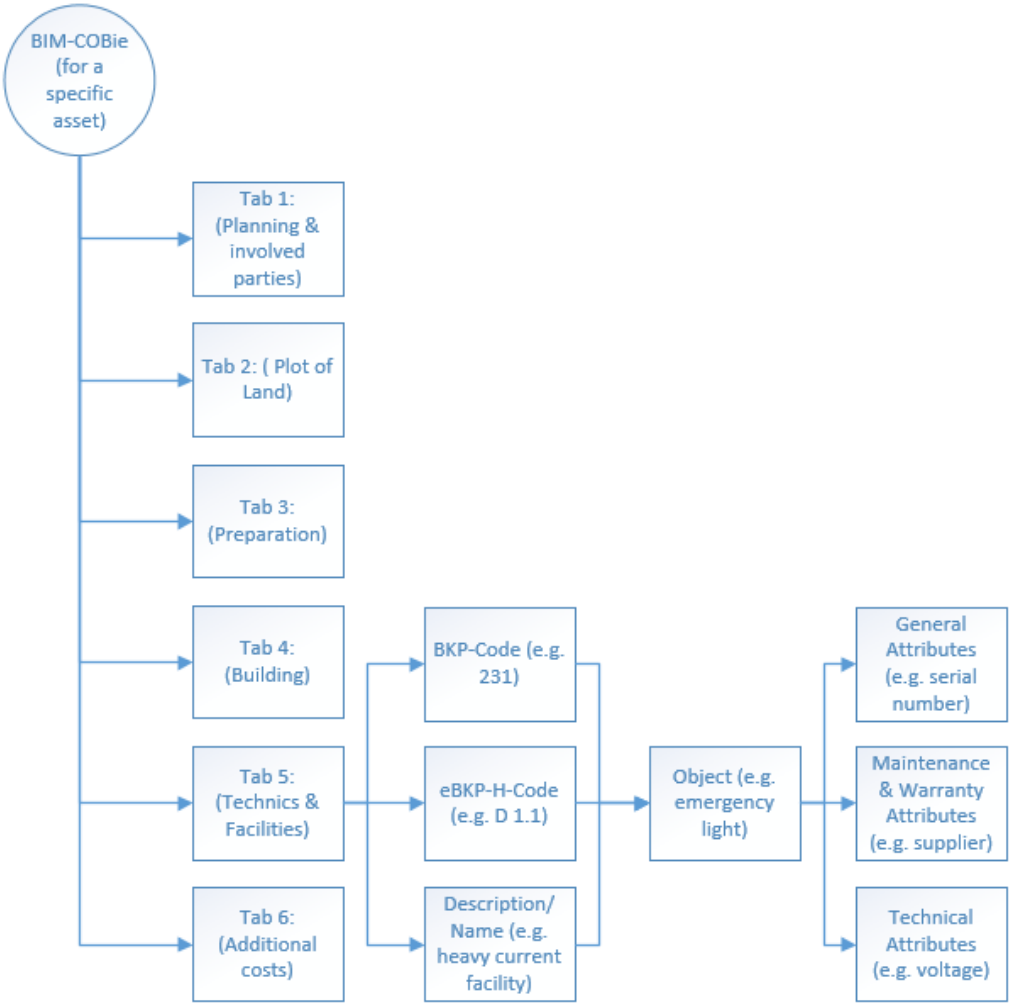
5 DISCUSSION OF RESULTS

It was not a surprise that HVAC was seen as the most important of the classes as most commercial buildings are equipped with HVAC, water supply and electric supplies as part of their mechanical and electrical (M&E) systems and these systems make up a significant element of the capital and operational cost of assets. Therefore, it was expected that these classes would be often used by FMs in practice. The class IT facilities was also used often by FM when compared to other classes. The authors believe this reflects the increasing importance of IT in the workplace over the last couple years. As mentioned in the methodology section, the results do

not necessarily tell us, why this information was used most. Therefore, the responsible FMs were asked during the interviews to provide some answers that might help explain the findings in more detail. Surprisingly, the interviewees could not give answers to most of the author's questions in this respect. Many general aspects, like COBie or attribute description remained unknown by the responsible FMs. The BIM process requires COBie to transfer data from BIM to CAFM, however, although FMs may have heard of the term COBie they were not aware of how this would work in practice which caused some difficulty in answering questions during the interviews. They understood the need but the knowledge of how COBie could be implemented was unclear, as it has barely been used in Switzerland according to their knowledge.

Based on the findings from the data analysis and interviews, the authors concluded that a proposed Swiss-COBie needs to be based on the local standards common to Swiss market, e.g. eBKP-H. A proposed system might be influenced by guidance from other international COBie standards such as BS 1192-4:2014 (BSi, 2014). However, the BSi is almost over-detailed to be implemented directly in Switzerland. A key issue is how the costs are structured in Swiss construction projects. These are not directly compatible with those stated in the BS 1192-4 as the sheet system gives the user a good orientation but there are a lot of separate sheets. The eBKP-H gives a better overview without neglecting the details and is an accepted standard in Switzerland. The challenge for the authors was therefore, to find a "good mix". Even a brief look at the design of the spreadsheet can be daunting to those not used to COBie. It can also become more complex if the complexity of a building demands it. To conclude, the Swiss-COBie should be viewed as a standard but also give contractors and FMs the freedom to adjust it according to their needs. One project/building is not the same as another and the same goes for the attributes because operators may have very different needs, buildings and different attributes for their specific CAFM systems. This explains why the medical classes are in the top 10 even though only one company uses them. Therefore, it should be up to the planners and facilities managers to decide which attributes they consider important. But the whole information exchange process using the Swiss-COBie will only work if the facilities managers are active in the planning and construction process. Due to the size of the Swiss-COBie the authors cannot implement it into the paper. Below is a schematic view of its structure:

Figure 3: Structure of the Swiss-COBie



6 CONCLUSION

According to the interviewees, the local Swiss FM industry should be more engaged or as one of the them said, "pushier" towards the planners to drive them to produce information that meets the end needs of clients and FMs.

Today a lot of information related to assets during construction is maintained in spreadsheets. The information contains the same sort of attributes as that in a COBie although the intention of the manufacturers is not to exchange information but to keep control of the information correctness and costs. However, these could be easily implemented into a COBie by simply copying the data or by combining all the spreadsheets into one COBie. Based on the interviews, there are currently no standards for spreadsheets but a COBie can replace them and let manufacturers work better together based on the same standard. However, this will only be possible if the Swiss-COBie gets accepted by the leading Swiss construction institutions.

Even though the analysis and interviews could not answer directly the research question *when does the information need to be exchanged during the planning and construction process?* literature review showed that the exchange should happen regularly and not at a single point. If

this is the case, FM will undoubtedly benefit from a Swiss-COBie by getting the data they really need and having a smooth transition from the planning and construction process to the operational phase. For that, FMs need to make sure that they get the most useful information by the users, according to the results as early and accurately as possible. The conclusion answers the question *How can FM benefit from a Swiss-COBie?* The results of the analysis show the most used information and the interviewees confirmed its importance. Both answer the first research question *what information relating to assets/buildings do the users need most?*

7 FURTHER ANALYSIS

The research could be extended to include more companies' data for analysis which would give a better picture of the current information FMs need most. In addition, a collaboration between recognised Swiss institutions should be conducted to look deeper into the Swiss construction market and clarify the need for a Swiss-COBie and what it might take to implement it as a standard.

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