

EXPERIENCES OF IMPLEMENTING BIM IN SKANSKA FACILITIES MANAGEMENT

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ABSTRACT

The benefits of BIM (Building Information Modeling) in design, construction and facilities management (FM) are well documented. However, the adoption of BIM in the construction sector is slow, with BIM implementation in facilities services lagging even further behind. Several reasons have been offered for the slow uptake of BIM, such as issues with IT interoperability, lack of understanding of BIM and variable expectations of the system. Difficulties with clearly articulating FM BIM requirements and the inevitable changes to long-established work processes could be the key to the slow progress of BIM in facilities management. Detailed case-studies of BIM implementation in UK FM organisations are not forthcoming.

The facilities management team at Skanska has embraced BIM and this paper describes the challenges the team faced when it prepared the business for a 'BIM way of working', and some early benefits achieved from the fledgling BIM implementation. The paper highlights the importance of clarifying BIM aspirations and identifying and understanding information requirements before focusing on technology, and the importance of only selecting information that can be beneficially utilised. Once information requirements are agreed, identifying when in the building lifecycle the information should be made available requires careful consideration. These timing decisions require close collaboration with and an understanding of other participants, particularly in the design process.

The paper highlights the need to review existing work processes and the time dedicated to the task should not be underestimated. The paper also describes the inevitability of having to change existing work processes (not just in the FM team), the associated challenges and how these challenges were approached by the Skanska facilities Services team.

One of the benefits of BIM that is difficult to quantify is this greater co-operative approach and reciprocal understanding of each stakeholder's needs and constraints. Engaging with people first, adapting existing processes and then using IT systems intelligently are the keys to successful BIM implementation.

KEYWORDS: BIM; Building Information Modeling; Standards; Data; Information; Implementation; Benefits.

1. INTRODUCTION

The benefits of BIM (Building Information Modeling) in infrastructure design and construction are well documented, and in recent years, the potential wide-ranging benefits of BIM in facilities management (FM) have also been identified. Frameworks have been proposed for the consideration of FM during the design stages of projects (Wang *et al.*, 2013), and for the quality of handover data to operational teams (Whyte *et al.*, 2012). Teicholz (2013) offers some guidance on how to implement BIM in facilities management and highlights the importance of understanding the goals of linking BIM to FM before commencing with a BIM implementation. Arayici *et al.* (2012) discusses some of the challenges of implementing BIM in FM organisations such as IT interoperability issues, and the maintenance of BIM models during the operational phase to ensure models continue to be fit-for-purpose in supporting FM activities.

However, despite knowledge about BIM and its potential benefits, adoption of BIM in the construction sector has been surprisingly slow, with the application of BIM in facilities management lagging even further behind. Lindblad (2013) proposes various reasons why BIM uptake has been sluggish, citing reasons such as BIM tool interoperability and user knowledge and expectations. The author also raises a very important point about BIM implementation: 'The adoption of BIM is not only a change in technology; there is a need for substantial changes in work processes in order to make improvements to productivity'.

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Detailed accounts of BIM implementations in UK FM organisations are not forthcoming. Perhaps difficulties identifying how BIM can support FM activities, plus problems changing existing work practices are two of the obstacles that prevent widespread adoption of BIM in the facilities management sector.

This paper gives a first-hand account of the experiences of Skanska's facilities management division when it prepared the foundations for a 'BIM way of working' in the business. Focusing on the 'information' aspect of BIM, this paper highlights the time spent defining how BIM could potentially support day-to-day FM activities, identifying information requirements to enable the efficient transition from the 'as-built' phase to the operations phase, and the challenges faced when changes to existing work practices were required, both within the facilities management and the design and construct teams. The paper also highlights the benefits achieved so far with the fledgling BIM implementation.

1.1 Skanska

Skanska is a well-known construction and development company, with business units around the globe. Its UK division has operations in building, civil engineering, utilities, infrastructure services, piling, mechanical and electrical services, and facilities management.

In response to contractual requirements of private finance initiatives (PFIs), a facilities management function was initially created in Skanska UK's M&E operating unit. By 2008, the FM function became an operating unit in its own right and was called Skanska Facilities Services (FS). The operating unit employs approximately 650 operational and managerial staff. It provides technical building services in the healthcare, defence, education and commercial business sectors throughout the UK. In healthcare, FS manages the 'hard facilities management' for high profile PFI contracts such as St Bartholomew's and The Royal London Hospitals.

In 2008 Skanska's Chief Executive announced that Skanska would implement BIM on all new contracts where Skanska had an influence over building, civil engineering and infrastructure designs. The mandate was effective from 2009 and applied to all Skanska business units around the world. At the time there was no clear definition of BIM, or how or to what extent BIM should be implemented. It was left to each business unit to identify the most effective ways of implementing BIM that best suited their business needs.

A Skanska BIM Council, BIM Forum and BIM Expert Group were established to ensure best practice and knowledge sharing between countries. Roles such as BIM implementation managers, BIM champions and BIM coordinators were also created to translate the edict into practical management and implementation in the businesses.

2. BIM AS A CATALYST FOR PROCESS IMPROVEMENT

At the time of the mandate in 2008, Skanska Facilities Services had little understanding of BIM but it recognised the potential benefits of improved collaborative processes and operational efficiencies. The new BIM mandate meant FS would have to identify specific areas where BIM could improve efficiencies, and it was accepted that current operational procedures would have to be reviewed and new methods and technologies would need to be introduced. When early consideration of BIM principles was discussed with managers across the business, variations and deficiencies in operational processes across projects became apparent (see Fig. 1). If Skanska's facilities services team was to properly implement BIM, it would first have to rationalise and standardise key processes throughout the business.

3. ARTICULATION OF BIM REQUIREMENTS

To understand how BIM could be used by the business, FS first had to understand the information needed to help it:

- a) Mobilize its O & M (operate and maintain) contracts more efficiently
- b) Improve its operational activities (e.g. asset management)
- c) Provide building performance information to designers to help them design new buildings with enhanced levels of sustainability

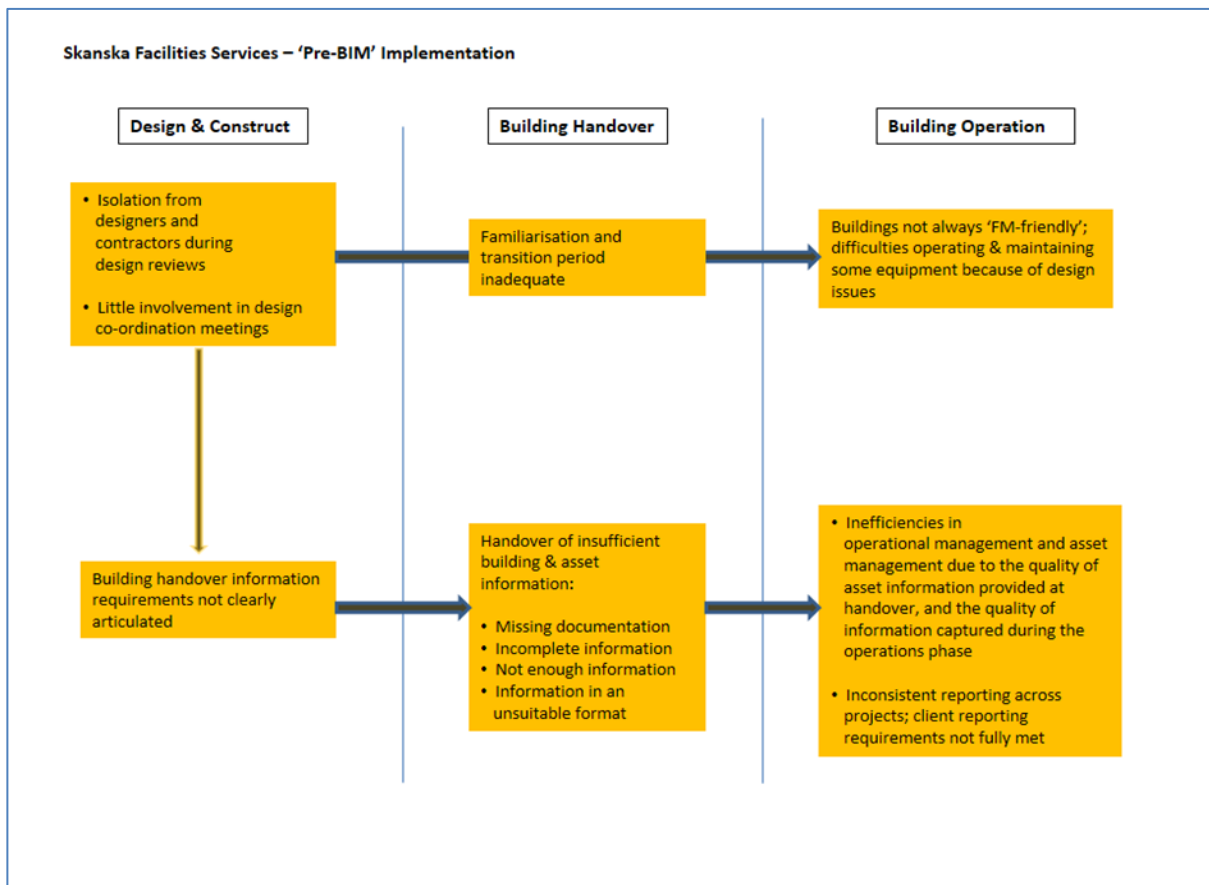


Fig. 1: ‘Pre-BIM’ process deficiencies

The aspirations were relatively easy to define. What proved more challenging was how to translate these aspirations into practical requirements that could be understood and agreed upon throughout the business. The next challenge was establishing how to articulate these requirements in a format that could be understood and accepted by other stakeholders involved in the design and construction process. This was important as these stakeholders were (and still are) addressing their own challenges around the adoption of BIM. The work done by the facilities services team to improve their own internal processes has certainly impacted upon the deliberations and adoption of BIM by the other stakeholders.

Two projects were undertaken to establish FS’ BIM requirements:

- A data & information management project to establish requirements to help improve the transition of building projects from construction to operation, and to improve operational/asset management activities after projects transition to the operate and maintain stage
- An IT improvement project to overhaul the existing IT platform in the business to accommodate the new data and information requirements, and to create a robust IT architecture on which new BIM technologies can be easily integrated

The success of these projects depended on continuous support from senior management in the business – this is an essential element in the development of a ‘BIM-friendly’ environment.

One of the key issues raised during deliberations about BIM was the timing of the input of FM requirements into the design process (to ensure facilities management was properly considered in the building design). Stakeholders like FS who had traditionally participated in the latter stages of a building project, would now have to articulate their requirements (and have a more influential role) in the early stages of the project. This earlier engagement would result in closer collaborations (particularly with the designers of mechanical and electrical services) and more in-depth discussions about building system requirements would ensue. There would also be

earlier provision of information requirements. On Skanska's Woodlands School contract² for example, the mechanical and electrical team were given early access to FS' information standards (e.g. asset register template, asset categorization and coding systems) to ensure information supplied to FS at handover would be in the correct format for the smoother commencement of FM activities.

4. BIM AND THE GOVERNMENT CONSTRUCTION STRATEGY

In May 2011 the Government Construction Strategy was launched which specified that all publically procured projects would achieve 'Level 2' BIM by 2016.

The implementation of BIM is not particularly prescriptive and the 'how' (to implement BIM) is currently being defined with assistance from the Government BIM task Group. The proposed protocols include PAS 1192-2 2013 '*Specification for information management for the capital/delivery phase of construction projects using building information modeling*'.

The Government is strongly recommending PAS 1192-2 but it is not mandating it. The relevant clause under the heading: "Fundamental principles for Level 2 information modeling" in PAS 1192-2 is:

"e) provision of a single environment to store shared asset data and information, accessible to all individuals who are required to produce, use and maintain it – see Clause 9;

Construction Operations Building Information Exchange (COBie) is a requirement of PAS 1192 -2:

NOTE 2 One of the key Level 2 requirements is the exchange standard of COBie and PDF, as well as copies of the native files."

Another document that is likely to be relevant (and is currently under development) is PAS 1192-3 (FM standards).

5. PRACTICAL INTERPRETATION OF GOVERNMENT BIM PROTOCOLS

Skanska has had to interpret the PAS 1192-2 protocol and translate it into a process flow chart which identifies the roles and responsibilities for the production of information and management of the process. The flow chart helped to identify where standard protocols exist. Where gaps were found, Skanska has had to fill these with its own protocols and standards.

Each Skanska project now starts with a BIM Project Directive which effectively directs the project to adopt PAS 1192-2 as the basis for BIM delivery. We currently have projects piloting the development of BIM Execution Plans, COBie drops and other recommendations of PAS 1192-2. We are aligning our BIM strategy, which was in development prior to the release of the Government Construction Strategy. This work will inform the process and identify the challenges with the implementation of the so far generally untested government protocols and recommendations.

6. MAIN CHALLENGES IN THE PREPARATION AND IMPLEMENTATION OF BIM IN SKANSKA FACILITIES SERVICES

In our work to prepare the business for BIM, we found that the proportion of effort was approximately 70% people, 20% process and 10% technology.

We had to be clear about our aspirations for BIM and understand our requirements (particularly in the form of information) that would help us achieve those aspirations. This resulted in in-depth studies of existing work

² Woodlands School is a £26 million Skanska design, build and operate contract, with Skanska Facilities Services providing FM services from 2014.

processes and gap-analyses of information that was being produced. Once it was clear what was needed for a successful BIM implementation, it was crucial to develop a BIM implementation plan.

Core IT systems used by the business had to be upgraded to complement the new information standards and to enable integration of BIM technologies. This was a fairly straightforward exercise on new projects that had just entered the mobilization phase; retrospective upgrades of existing IT systems on established projects proved more complex.

Support and ongoing leadership from senior management is crucial to successful BIM implementation in the business. We had to develop strategies to communicate the benefits of BIM among the 650-strong workforce in a manner that would engage and maintain their interest in BIM. Key influencers in the business were also identified and they became local BIM champions after they were convinced of the potential benefits of BIM. When changes to existing work processes were required, we had to communicate these changes to the workforce in a manner that persuaded them that the changes would improve their personal way of working. Some changes to design and construction work processes were also needed; closer engagement with these teams has resulted in a better understanding of our operational processes and an appreciation of our new information requirements. The issue of credible material (i.e. new information standards) to these stakeholders was essential before they would commit to altering their existing work processes.

7. BENEFITS OF BIM REALISED SO FAR

Figure 2 illustrates the anticipated benefits of BIM. BIM implementation in Skanska Facilities Services is still in its early stages, but already the business is seeing benefits.

The data & information management project produced a suite of new standards which have been implemented on all new operate and maintain contracts since 2011. An FM BIM requirements protocol was also created for use on all new projects where BIM is used. The IT project resulted in the standardization of a core business IT package (CAF3) and an upgrade of the IT platform to accommodate future BIM technologies.

Anecdotal evidence indicates that since 2011, mobilization of new operate and maintain contracts have been quicker and smoother, and this been attributed to the implementation of the new data and information standards and the new standard configuration of CAFM systems. One example of improved mobilization is the import of asset registers into the CAFM system which is now done in-house rather than by a third party supplier, saving time and cost. Application of the standards has also resulted in an improvement in the quality of operational data captured by the FM teams following mobilization of the contract.

The organization's FM data & information requirements were incorporated in BIM models that were developed for the Woodlands School project. Earlier involvement on the project has resulted in better understanding and teamwork between FS and the mechanical and electrical services team. Some information best-practices have also been shared among teams. Engagement between FS and the design and construction teams has been very positive on projects where BIM is applied.

Quantifiable benefits achieved so far include:

- Savings in third-party costs for CAFM set-up: since 2013, all aspects of CAFM implementation are managed in-house, with anticipated savings in the region of 1-3% (of annual contract value) on each new FM contract.
- Reductions in staff training time and costs – staff already trained on the company's standard CAFM system can be quickly deployed on new contracts, with little (if any) additional training. Since 2011, typically 5 days' training (per member of staff deployed) has been saved on new contracts, with cost savings in the region of 0.5% (of annual contract value).

³ CAFM – Computer Aided Facilities Management: an IT application used to manage FM operational activities.

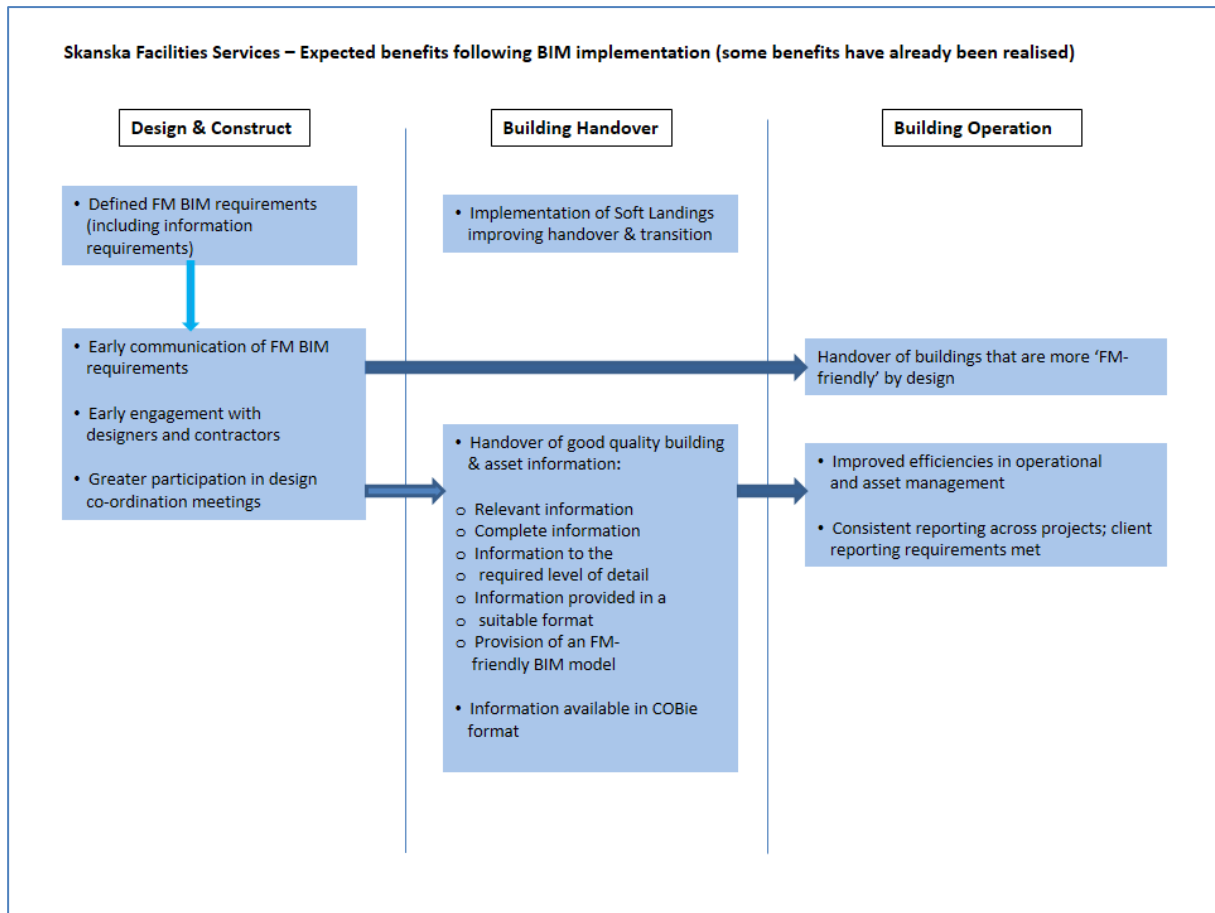


Fig. 2: Anticipated and experienced benefits of BIM implementation

8. CONCLUSION

Skanska Facilities Services invested a lot of time to prepare a robust platform for successful BIM implementation. As the business continues to learn more about BIM, we acknowledge that further work is required to ensure we can fully exploit the benefits of the system.

Successful BIM implementation depends on having a strong implementation strategy, together with continuous support from senior management, and ongoing and evolving communications with all stakeholders.

A robust BIM implementation strategy can only be developed when there is:

- A clear understanding of how BIM can benefit the business
- A clear articulation of BIM aspirations
- Clear definition of BIM information requirements needed to achieve the aspirations
- A clear explanation of what needs to be done to implement BIM on projects.

Inevitably, some existing work processes will have to be modified to accommodate a ‘BIM way of working’ and some resistance to change should be expected. To mitigate this, ‘BIM implementation wins’ should be achieved as quickly as possible and communicated effectively to stakeholders. Sustained engagement with stakeholders throughout the entire BIM implementation process cannot be over-emphasised.

9. REFERENCES

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