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# ADVANCING THE FACILITIES MANAGEMENT PROCESS IN IRELAND THROUGH THE IMPLEMENTATION OF BUILDING INFORMATION MODELLING WITHIN THE PUBLIC SECTOR

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## ABSTRACT

It is widely accepted that it costs up to five times more to operate and maintain a building than to construct it. Despite this statistic the Irish construction sector has done little to move towards cutting edge technologies that will help in addressing this impact on life cycle cost. This is due partly to the fact that the Irish construction sector continues to operate in a depressed state. Despite this harsh reality Ireland must find a way to create a public sector that has a more energy efficient and enhanced physical environment in which to operate without sacrificing user thermal comfort. This paper outlines how Building Information Modelling can achieve this goal by ensuring that a more beneficial Facilities Management process can be realised. The data collation methodology included the use of a questionnaire survey that was designed and distributed in collaboration with the Irish Property and Facility Management Association. The outcomes of this questionnaire were compared with two international industry reports, as well as, how the UK BIM Strategy can be adopted in Ireland to advance the Irish AEC / FM sector. The research findings strongly advocate that BIM can ensure a unique FM approach which can reduce life-cycle costs for the Irish Government.

Keywords: building information modelling, facilities management, public sector, built environment, life cycle

## 1. BACKGROUND

The “boom to bust” development in the Irish construction sector over the past five years has been unprecedented, with public expenditure expected to continue to be restrained by the Government (DKM Report 2012). In addition to this there is a plan to bring Ireland in line with the Energy Performance of Buildings Directive (EPBD) which will ensure that Ireland meets strict EU regulations. To achieve these targets the Irish Government has implemented a number of frameworks, so as to ensure that Ireland’s future economic successes are not undermined by deteriorating

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environmental patterns and unsustainable energy usage (Lewis 2009). These include proposals to bring the Irish public sector in line with a number of proposed reforms that include the Capital Works Management Framework (CWMF) and the Public Service Reform Plan (PSRP).

The CWMF is a series of documents which collectively describe the operating environment, procedures and processes to be followed for the delivery of capital works projects in the Republic of Ireland. Within the CWMF, the Irish government published a new suite of public sector fixed price contracts, referred to as the Government Construction Contracts Committee (GCCC) forms of contract. The PSRP is further designed to reduce a number of problems within the public sector that include implementation of shared services models, evaluation of new business models for the delivery of non-core services, reform of public procurement processes and property rationalisation, addressing duplication and eliminating waste to support job creation. Though it is acknowledged that these reforms are a step in the right direction there are no key criteria detailed, in either plan, in regards to future and current Facilities Management (FM) regulation and procedures, so as to ensure that public sector estates are been maximised to their potential. It would seem, as outlined by McAuley et al (2012), that despite its potential benefits the FM profession still remains largely undeveloped and holds little recognition within the Irish Architectural Engineering Construction /Facilities Management (AEC/FM) sector. In order for Ireland to realise a smarter and better equipped public estate that can respond to growing energy demands, it is critical that a new dimension of FM be explored through Building Information Modelling (BIM). This new dimension of FM will involve the Facilities Manager playing a key role through the construction process and using the available BIM tools to ensure that a unique and interactive view is taken of the buildings life cycle.

The purpose of this paper is to explore a different methodology in regards to managing the Irish public sector, so as to ensure a more intelligent and functional estate. This new methodology can be realised through the re-engineering of the current FM process within Ireland, to be supported through the use of BIM. The authors conducted a literature review of journal papers, professional publications and research articles in regards to the application of BIM as a tool for managing public sector estates. The literature review focused on three main areas in order to establish the benefits of using BIM on public estate projects in Ireland.

### **1.1 Addressing the need to reform the current property management framework for public sector estates in Ireland**

Ireland needs a public service that can lead economic recovery and meet the needs of people in the years ahead (Wyatt 2012). It is now incumbent that the Government find a means to engage the public sector in a positive manner to deliver real reform of the service and to further ensure they remain committed, motivated and focused on service delivery, (Deloitte 2010). To achieve this it is imperative that the public sector has an enhanced physical environment to operate from. The physical environment can either enhance or impede worker productivity, therefore contributing to its bottom line profits and success of the organisation (Teicholz 2005).

This environment will be intimately linked to the Government's proposal for public reform and will assist the country in regaining a sustainable footing for the public finances. This reform in both current and future public sector assets will be driven largely by the procedures and protocol put in place by the CWMF and the PSRP. In examining both of these reforms there is no set policy in place for the on-going review and management of the public sector assets. The PSRP has been

welcomed by the Society of Chartered Surveyors of Ireland (SCSI) and the Royal Institution of Chartered Surveyors (RICS) but concerns were raised by the fact that there are no plans for a Public Sector Property Asset to quantify the State property portfolio. The then chairman of the SCSI, John Curtin, states that the first step in delivering cost efficiencies from State property is to quantify the number of properties that the state actually owns by establishing a public sector property asset register; such a register currently does not exist. Curtin (2011) further points to the UK, where a Public Sector Asset Register has been established and where £120m is being saved in relation to public sector property costs on an annual basis.

The realisation that the Irish Government does not have an asset register in place puts the public sector estate already at a disadvantage. This fact coupled with the uncertainty if the CWMF is producing sustainable facilities for a long term future in the public sector, suggests that a more cost effective and reliable method in managing the public sector estate. The authors advocate that methodology should include the use of BIM technologies given their ease of integration into a FM approach and the technologies capability in assisting in the reduction of life cycle costs. This unique approach involves the Facilities Manager being armed with the current BIM tools from an early stage, and complimenting these tools with their practical knowledge to help invest in materials and systems that can ensure a more enhanced lifecycle for the building

## **1.2 Advancing Ireland's current and future building stock into the future.**

Davies (2004) outlined that for every unit spent on capital cost, five units are spent on maintenance and that any savings developed through the life cycle costing can be dramatic over the operating life of the asset. This fact is further expanded on by Hallberg and Tarnardi (2011) who cite a National Institute of Building Sciences (2007) report, that a total of 3.8 % of improvements in productivity of the facilities of a building would be equal to the total cost of design, construction and operation of the facility. Operating and maintaining high performance buildings require a sophisticated organization with careful preparation and planning, taking care of these facilities requires a well-managed project delivery system, complex business processes and an expert operation and maintenance (O&M) team (Ruiz 2010). Though a number of software tools exist in the Irish FM sector at present e.g. CAFM, CAD, CMMS, etc., there is no FM software powerful enough to provide a complete FM package for the public sector. Such a complete FM package can be realised through BIM and its associated technologies, which can help in creating interactive FM capabilities in managing the Irish public sector estate.

BIM can be used as a tool to describe and display the information required for the design, construction and operation of constructed facilities. The process of BIM revolves around virtual models that make information sharing possible throughout the entire building industry (Reffat et al, 2012). The BIM model as stated by Autodesk can help understand details of how space is used and therefore can reduce vacancy and ultimately achieve major reductions in real estate expenses, as well as storing information about building equipment which can eliminate months of effort to accurately populate maintenance systems. The BIM model can provide a living model with better information about existing conditions which can further reduce the cost and complexity of building renovation and retrofit projects. The USA, Finland, Norway, Denmark, Germany, Singapore and Korea are all currently in the process of developing BIM guidelines. Closest to home is the 2016 BIM mandate by the UK authorities. The UK mandate includes the Government Soft Landing (GSL) strategy

which will maintain the ‘golden thread’ of the building purpose, through to delivery and operation. Their strategy has seen an engagement with industry and central government departments through a number of pilot projects. This ultimately must be Ireland’s over reaching goal as one moves forward in meeting the 2020 deadlines set by the EPBD. The addition of BIM in the maintenance phase has particular advantages for governments as BIM can contain all of the data concerning the components of a built asset, the condition of these components can also be entered and audited (Furieux and Kivvits 2008).

### **1.3 Integration of Facilities Management and BIM**

Facility Managers are continually faced with the challenge of improving and standardising the quality of the information they have at their disposal, both to meet day to day operational needs, as well as to provide upper management the reliable data for organizational management and planning (Sabol 2008). The author further adds that BIM can offer a new level of functionality for the management of buildings and the physical assets within them, as BIM provides a unified digital repository of all building components and as a full 3D model, it is capable of displaying views with a clarity that typically eludes users not schooled in interpreting standard 2D building drawings. Langdon (2012) outlines a number of benefits in the FM field when it comes to the BIM model including the;

- creation of an FM database directly from the project (as built) model;
- ability to perform FM costing and procurement from the model; and
- ability to update the model with real-time information on actual performance through the life of the building.

Arayici et al (2012) warn that there is still lack of clear evidence of whether and how BIM could benefit decision-making in FM task by task. BIM can be used as a FM tool in specific relation to public estates as outlined by Furieux and Kivvits (2008) below, who reference a number of sources:

- BIM can be used to integrate “digital descriptions of a built asset with all the elements that contribute to its on-going function and describe the relationship between each element e.g. air conditioning, maintenance.
- BIM increases performance, utilisation and financial information in the maintenance phase, as all the design and built asset information is still present in the single BIM model. BIM could also be used to include security, emergency evacuation and fire simulation.

The authors add that the Government’s application of BIM in their built asset projects can ultimately achieve a return 5-10 times higher on the investment. Perhaps most encouragingly from an Irish FM perspective is the use of the BIM model to drive down carbon criteria, with a growing number of stakeholders, as stated by Samsó et al (2012), especially owners and operators, now focusing in on implementing BIM to support the FM and operations phase with an emphasis in improving energy efficiency of their facilities. BIM enables a whole life cycle approach, through its unique access to a combination of energy analysis tools that complement the BIM process. This approach offers a much greater value for money to the client as it addresses their needs over the structures life. One of the schemas available for the extraction of important information from the model is the COBie schema, which provides an open framework for the exchange and delivery of construction handover information. The Construction-Operation Building Information Exchange (COBie) is been used by the UK as the standard method to capture and

recorded project handover data. The COBie format facilitates the delivery of building information during planning, design, construction, and commissioning for delivery to facility owners and operators.

## **2. METHODOLOGY**

The author's primary data collation methodology involved an extensive survey that was designed and distributed in collaboration with the Irish Property and Facility Management Association (IPFMA), in order to gauge the level of support for the introduction of BIM to assist in managing the public sector estate. An online questionnaire was created with 15 questions, which was originally piloted by its Board of Directors. After a number of changes were incorporated, it was then distributed to the IPFMA member database, as well as posting the survey link to a number of Irish FM and BIM working group webpages. This generated a total of 38 company responses from a mix of small to large enterprises. These responses provide a snapshot of the current Irish FM sector and the technologies that are now commonly in place within the private and public sector. This will provide the platform for the authors' recommendation of advancing the Irish public sector estate through the implementation of BIM.

The survey results were compared with the results of two industry reports prepared by the authors from a current suite of Construction IT Alliance (CITA) Technology workshops in 2013. These workshops are the result of a unique collaboration between CITA and a number of AEC representative institutions within Ireland, who have come together through the commissioning of ten Technology Workshops in 2013, with the intention of promoting ICT Technologies within the Irish AEC/FM industry. There was over 150 leading professionals involved within these workshops in which a number of questions were addressed in a round table discussion. These workshops will help further enforce the papers research objective by exploring the area of BIM within the public sector and highlighting a number of barriers that currently exist.

These two different forms of research methodologies will then be triangulated, as this will further increase confidence in data collated and add further evidence in proving the authors research aims.

## **3. PRIMARY RESEARCH**

### **3.1 Irish Property and Facilities Management Association BIM Survey**

The function of the first part of the survey was to ascertain the company respondent's opinion attitude towards the earlier involvement of the Facility Manager in the design and construction process. Only 12 % of the respondents had routinely seen early Facility Manager involvement in the design and/or construction phases of a project, with 56% claiming that there was none too little involvement of the Facilities Manager. Despite this, 59% believed that if the Facilities Manager was involved from an early stage, that he/she could play a major role in improving sustainable construction potential, as well as providing a new cost focus for the building life cycle. Some of the ways highlighted within the survey in which the Facility Manager could make a major or minor contribution to the design and construction phases, include advice on user behavior and requirements, supplying alternatives to issues that may arise from the project and ensuring that the systems installed are not only functional but are easily maintained and understood. Early involvement of the Facility Manager could help streamline the design briefing process and therefore provide early detailed client requirements to minimise costly design changes later down the track.

The purpose of the second part of the survey was to investigate the importance of ICT as a future tool to support FM services not just at the handover stage but

throughout the entire project lifecycle. There were 81% of respondents who still used traditional paper based or a digital copy on a CD or DVD to provide O&M information to their company, with only 18% using WebFM or O&M system. There were a number of companies that cite BMS as the main source of transferring information and spreadsheets. The most advantageous methods stated included Multi User PM system for managing agent activity and integrated Plan Build Operate solutions. Despite this, 83% of the respondents reported that they were aware of the current interest and debate in respect to BIM, with 27% having experience in using a BIM model for Facility Operation and Maintenance. Some of the responses include the use of BIM to model structural alterations in existing buildings to ensure that existing utilities can be maintained or diverted where necessary, and the use of CMMS system to control schedule and maintain the Building and subsequent equipment.

The final part of the survey aimed to explore current views in respect to the Facilities Manager and ICT / BIM in helping better manage both new and existing public sector facilities and structures. A total of 70% of the respondents claimed that the Irish government should take a similar stance to the UK and mandate the use of BIM. A total of 23% of the respondents have experience working within the public works sector in regards to facilities or property management of existing government assets. Some of the inefficiencies within Irish public sector facilities identified in this section of the survey include decisions based on short term costs and not life cycle, as well as, a lack of coordination between designers, constructors and operators.

The results from the survey show that there is little involvement of the Facilities Manager during the early stages of construction, despite a strong claim to the significant benefits that they would bring to the construction team. There has been little move towards cutting edge technologies from the Irish FM sector in order to streamline maintenance and further enhance lifecycle management. Encouragingly there are signs of the use of BIM tools been used to advance the FM process and a strong call for the mandating of BIM on public sector projects. There was also support for use of BIM tools to help Facility Managers reduce environmental impacts and operating costs. There is strong evidence to suggest through the literature review and survey findings, that the application of BIM can provide the platform for the Irish public sector to embrace a more efficient FM approach and therefore smarter and better equipped public estate. The next section examines some of the areas within the public sector projects that need to be addressed in order for this to become a reality, as well as how Ireland can follow in the UK's steps of mandating BIM.

### **3.2 CITA Technology Workshops Roundtable Discussion**

There is a fear at present that the Irish governments are afraid that mandating BIM will involve spending already limited funding. The Irish governments are seeing low tender returns through the current GCCC forms of contract, though these prices are not sustainable and are a result of the economic downturn. The Irish Government must follow suit with the UK and appoint a Construction Advisor, in order to move towards a more rewarding process. This could result in the chance for the Irish construction sector to become a driver internationally and export their skills to the UK market. There is still a concern that a large portion of the industry fails to understand the potential of the BIM process and what it can mean for the maintaining of future building stock, with senior company stakeholders viewing BIM as a drafting package, in which is simply an advancement from CAD. The sector needs to be further educated, in order to understand the advantages and risks with the BIM process. To achieve this there must be understanding and vision from BIM policy makers with a review of case studies from other countries. Without direction from government, serious consideration of BIM will not be taken by the rest of the Industry. The current

form of contracts must be amended to further promote collaboration in which sustainability is practiced much earlier. There is a concern that the GCCC does not allow for early collaboration with the contractor and it is unlikely that integrated forms of contract will happen in the short term except for design and build. There must be an improvement in interdisciplinary trust in order to create an effective collaborative environment between design/contraction teams.

In answering the authors research objectives there is strong evidence to suggest that BIM could provide the catalyst for much needed change within the Irish public sector. To achieve this there must be further deliberation and promotion, in which must ultimately lead to a redrafting of the GCCC contracts.

#### **4. CONCLUSION**

The triangulation of the primary research findings shows strong evidence that BIM could help significantly improve the management of assets within the Irish public sector. The Irish public sector needs to put efficient management frameworks in place to ensure that it has a more energy efficient and enhanced physical environment in which to operate. The application of BIM can help achieve this as it streamlines the whole design process and ultimately commissions a more sustainable and functional asset that can further enhance worker productivity. The move of the UK to demand that all public assets are handed over in a COBie format is now pushing the Irish AEC/FM sector to reevaluate the way in which they commission and ultimately manage their assets for day to day operation. Despite the proximity of this initiative, progress is slow in Ireland, with a lack of early FM involvement and a reluctance to move to cutting edge technologies for the handover of documentation. The opportunities of moving towards a BIM platform are evident but the recent suite of changes to construction contracts within the Irish public sector has now paralyzed the government into implementing any more change. In order for the authors suggested methodology to become a practiced reality, there must be changes in government policies alongside a cultural shift in the mindset of operating practices if Ireland is to fully embrace a more rewarding FM process. This can only happen through the ongoing promotion and continuing push of BIM from professional institutes. The authors will continue to promote BIM as a method of advancing the FM process in Ireland within public sector estates. At present there is a public sector pilot project in place in which BIM is been used as a tool to demonstrate to the client the efficiency potential of the technologies. The authors have been tasked with the responsibility of establishing and measuring a number of key performance indicators (KPI) within this pilot. Some of these KPIs will measure areas from the early stage of design into post occupancy, as they pass through the whole BIM process. This research can be used to establish a set of further KPIs's that can be used in conjunction with public sector projects to help measure and guide early Facility Manager involvement within the BIM process.

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