

## Requirements for Developing BIM Governance Model: Practitioners' Perception

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### Abstract

The construction industry is highly fragmented and highly regulated, involving intensive activities across supply chain and lifecycle. Construction projects have become very complex, including varying activities and processes, and requiring inputs from a wide range of disciplines. However, massive amounts of data are generated because construction projects involve multi-discipline, multi-actor collaboration during a building project's lifecycle. The generated data are sensitive with high concerns related to access rights, ownership, intellectual propriety and security. Until now, dealing with this information raises several issues such as data inconsistency, different data versions, data loss etc. Even though Building Information Modelling (BIM) offers a means of solving such problems, there is practical evidence to show that a governance model is needed to facilitate BIM management across the construction project supply-chain and lifecycle. A comprehensive survey was conducted with the aims of identifying construction industry practitioners' requirements for developing a non-proprietary BIM governance model. Informed construction practitioners in the UK were the main contributors to this study. The findings of the survey reveal a need to develop a BIM governance model with its underpinning cloud infrastructure storage solution.

**KEYWORDS:** BIM, BIM Governance, Cloud Computing, ICT, Collaboration, Construction Industry

## **1. Introduction**

Construction projects have become very complex, encompassing varying activities and processes, and requiring inputs from a wide range of disciplines. Thus, vast amounts of data are generated during a construction project which need to be coordinated and kept up-to-date and relevant through the whole lifecycle of the project (Hooper and Ekholm; Rezgui and Zarli, 2006; Anumba et al., 2008 ; Succar, 2009). In 2010, the UK government set a target for the UK construction industry, namely that it must adopt building information modelling (BIM) in the form of a collaborative 3D BIM as a minimum requirement by 2016 (Government, 2011). This policy brings new challenges to current research and development, incentivizing both BIM researchers and construction industry practitioners to overcome traditional methods of collaboration. However, there is practical evidences show that there is a need for a BIM governance model for facilitating BIM management across the construction project. Therefore, the overall aim of this study is to identify the need for developing a non-proprietary BIM governance model in line with the following objective; identify construction practitioners' requirements for developing a non-proprietary BIM governance model.

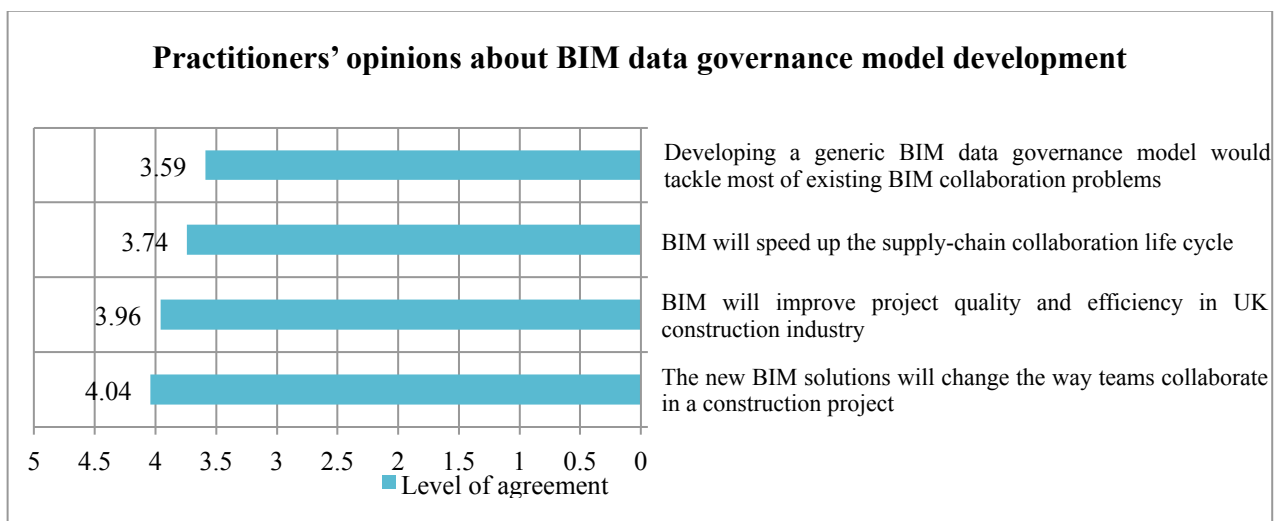
## **2. Methodology**

A questionnaire survey was chosen as an appropriate mechanism. Therefore, the authors decided to conduct a wide survey targeting AEC professionals in the UK construction industry, with the aim of answering the stated questions in greater detail. The survey design was based on methods discussed by (Fink, 2009; Oates, 2005). The researchers have decided to choose AEC professional practitioners in the UK according to the following three criteria: sufficient practical experience of BIM; adequate knowledge of data management; and willingness to participate. With the assistance of key experts in this field as well as the LinkedIn professional network (LinkedIn, 2013), the panel of practitioners was assembled. The total number of the expert panel was 100 AEC UK practitioners. Survey monkey (Surveymonkey, 2013) was the tool used to design and distribute the survey. The distribution stage lasted nearly one month, from 16 April 2013 to 10 May 2013. Overall, 42 positive responses were received, a response rate of 42%.

### 3. Results

#### 3.1. Implications of BIM and the need to develop a BIM governance model

The majority of practitioners agreed that the new BIM management solutions will change the way teams collaborate on a construction project. Also, they agreed that BIM will improve project quality and efficiency in the UK construction industry. BIM will speed up the supply-chain collaboration lifecycle. However, the majority neither agreed nor disagreed that developing a generic BIM data governance model would tackle most existing BIM collaboration problems; but nearly 18% strongly agreed on the value of BIM governance model development. One practitioner added the following comment: “The BIM collaboration problems are very complicated. There is no single solution for those, but a good data governance model can improve the situation”. This statement emphasized the need to tackle issues related to team collaboration by designing a good BIM governance model.



*Figure 1 Practitioners' opinions about BIM data governance model development*

#### 3.2. Practitioners' requirements for developing a BIM governance model

The results from the survey show that addressing socio-organizational and legal requirements is more important than addressing technical requirements when developing a BIM governance model. Table 1 shows strong agreement on the first requirement category, namely, socio-organizational and legal requirements for developing a BIM governance model. This category includes: improving communication among disciplines, defining clear roles and responsibilities for stakeholders across disciplines through the lifecycle, and standardizing overall data management lifecycle policy. Developing a variety of protocols for governing BIMs is another important requirement, in addition to raising awareness about

BIM governance and providing help and support, with side-by-side intensive training in the use of the BIM governance model.

The same table shows that the level of agreement on the second category, namely, technical requirements, is lower than the level of agreement on the category of socio-organizational requirements. This second category includes: allowing sharing through a common model, providing a notification system to inform other participants of changes being made on the model, providing a real-time mechanism with which team members can share/exchange information, establishing a central repository for storing data online, viewing and printing models online via the web, providing security checks when uploading, downloading and transferring models, and providing a secured log-in with access rights.

***Table 1 Practitioners' requirements for developing BIM governance model***

<b>BIM governance model requirements</b>	<b>Mean</b>	<b>Std. Deviation</b>
<b>First Category: Socio-organizational and Legal requirements</b>		
Help and support	4.04	0.706
Intensive training	3.93	0.829
Awareness raising	4.11	0.801
Development of protocols	4.30	0.775
Define clear roles, responsibilities for stakeholders across discipline through lifecycle.	4.33	0.620
Standardised overall life cycle data management policy	4.00	0.707
Provide real-time mechanism for sharing/exchanging information	4.12	0.909
Improve the communication among disciplines	4.37	0.742
<b>Second Category: Technical Requirements</b>		
Sharing through a common model	3.81	1.111
Secured log-in with access rights	3.85	0.818
Security checks for uploaded/downloaded and transferred models	3.96	0.759
User interface customization	3.54	0.948
Use web for online viewing and printing models	3.81	0.849
Central repository for data storage online	4.04	0.774
A notification system to inform team members of updated data	4.23	0.652

<b>Other Requirements from practitioners</b>
Facilitate/federate/link different BIM model together
Add more dimension in a modelling package
Enable owners of data to decide when they publish their data
Support working with live data, rather than dumb data
Ability to coordinate at the same time as modelling

#### **4. Discussion and Conclusion**

The BIM governance model still requires further development, as can be seen by considering the various BIM adoption barriers, current ICT practices and BIM governance requirements. The authors, however, argue that developing a BIM governance model with its cloud computing infrastructure will play a crucial role in addressing the above issues. Moreover, practical evidence (Beach et al., 2013) suggests that utilizing the BIM governance model with the support of cloud computing for data processing and storage capabilities will positively minimize BIM collaboration issues.

The findings from this study demonstrate the strong need to develop a BIM governance model in order to tackle most of the BIM data-related issues that construction projects suffer from. There is a general agreement on most of the selected requirements for developing a BIM governance system. One practitioner stated, “*The BIM collaboration problems are very complicated. There is no single solution for those, but a good data governance model can improve the situation*”. Another argued that there could not be a common model, because BIM is consistent and must incorporate several domain models with clear ownership, due to the varying responsibilities and data needs to be dealt with. However, there is an issue related to the way these models are facilitated/federated/linked together. A well-structured model server would be a good solution on the conceptual level of the model, but not on the level of an integrated model consisting of several sub-models.

A number of requirements for developing a BIM governance model have been classified within two categories: (a) socio-organizational and legal requirements, and (b) technical requirements. The first category includes: improving communication among disciplines, defining clear roles, establishing responsibilities for stakeholders across disciplines through the project lifecycle, standardizing overall data management lifecycle policy, developing a

variety of protocols for governing BIMs, raising awareness about BIM governance, providing help and support, and offering intensive training in the use of the BIM governance model. The second category includes: allowing data sharing through a common model, establishing a notification system, providing a real-time mechanism through which team members can share/exchange information, maintaining a central repository for storing data online, viewing and printing models online via the web, providing security checks when uploading, downloading and transferring models, and providing a secured log-in with access rights.

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