PROJECT MANAGERS AS INVOLUNTARY POLICY IMPLEMENTERS? THE CASE OF IMPLEMENTING BIM

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Public procurement has the potential to drive change in the construction industry. In this process project managers play an important as change agents and system integrators. This paper explores how public client's project managers translate BIM through procurement. The purpose is to develop better understanding of the public project manager's role as change agents and system integrators in the implementation of systemic innovation such as BIM. Findings are based on a case study of the BIM implementation initiative at the largest public infrastructure client in Sweden and interviews with construction project managers tasked with implementing BIM in their projects. The analysis is based on the theoretical perspective of sociology of translation. Findings show how project managers struggle with translating BIM when procuring and that there is a hesitation among project managers in accepting BIM policies. Project managers do not prioritise BIM and do not request BIM when procuring. In order words, they are not enrolled in the change process. Findings are important for research on project managers in their role as change agents, and on research systemic innovation such as BIM.

Keywords: innovation, BIM, procurement, project manager, translation

INTRODUCTION

Building Information Modelling (BIM) is described as systemic innovation (Cao *et al*., 2017) that will substantially change the construction industry (Azhar, 2011). BIM is described as "a set of interacting policies, processes and technologies generating a methodology to manage the essential building design and project data in digital format throughout the building's life-cycle" (Succar, 2009, 357) that supports multi-disciplinary, collaborative and integrated work processes (Hartmann *et al*., 2012) that contributes to the development of business processes (Eastman, 2008). Following this rather normative view, BIM is expected to impact most actors associated with the construction and maintenance of a building. However, while studies show initial benefits of BIM (e.g. Azhar, 2011), widespread BIM implementation is yet tentative (Smith, 2014). Implementing and BIM-usage pose difficulties, for example "BIM's seven deadly sins" (Holzer, 2011) and there is research needed exploring challenges related to BIM implementation (e.g. Bosch-Sijtsema *et al*., 2017; Dainty *et al*., 2015).

Client organisations are suggested as drivers for industry change in construction (Lee and Yu, 2015). In particular, public procurement is suggested as a "catalysts" for

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change (Grandia, 2015, 119). Porwal and Hewage (2013) also pinpoint public procurement as important for BIM implementation. Public clients have the position to demand BIM in procurement and they have the greatest potential benefit from wide BIM implementation (Elmualim and Gilder, 2014). This argument is further developed by Linderoth (2010), who claim that the discussion around BIM will change as soon as clients and regulatory authorities demand BIM in procurement. According to Linderoth (2010), the discussion will no longer be about if to use BIM or not, but to promote more advanced BIM-use.

There are a number of public client initiatives driving industry change by implementing BIM; for example Sweden (SOU 2012:39), Hong Kong (HKCIC, 2014) and the US (GSA, 2007). However, to use technology to drive organizational change is not easy and previous research in information systems (Ciborra, 1997; Holmström and Stalder, 2001) and organizational studies (Czarniawska-Joerges and Sevón, 1996) show that such initiatives often drifts away from the initial intentions. Hence, initial intentions of implementing BIM, for example industry change, may very well result in something else. This drift is indicated by Vass and Karrbom Gustavsson (2017) studying BIM implementation at the same large public client in Sweden. Their study identified a potential mismatch between expectations and outcome and that there is a need for more in-depth studies on the public client´s role and possibilities in driving change by implementing BIM.

As client's representatives, project managers are expected to play a vital role in BIM implementation, especially during procurement of design and construction. The aim here is to explore how project managers translate BIM. Findings are analysed based on sociology of translation (Callon 1984) and provide better understanding of how project managers interpret and translate policy directives on BIM when procuring. The findings contribute to research on the public client´s project manager´s role in change processes, in particular implementing systemic innovation such as BIM.

LITERATURE OVERVIEW

Innovation in Construction

Client organizations are acknowledged as key actors introducing innovations to the construction industry (Blayse and Manley 2004; Loosemore 2015). In particular, clients are found to important in the implementation of systemic innovations such as BIM (Azhar, 2011; Lee and Yu, 2015). Also in situations where the client organization does not have direct need for the systemic innovation, they can benefit from its implementation as this might fulfil other needs (Singh, 2014).

Construction innovation typically happens in projects (Harty, 2008; Winch, 1998) and they happen as a response to client's demands or by the implementation of innovations developed in other industries (Harty, 2008). As the client's representative in projects, project managers are identified as key actors in the innovation processes. The project manager is a possible "systems integrator" (Winch, 1998; Tylor and Levitt, 2004), linking actors together and supporting change towards use of systemic innovation. However, for project managers to be successful as system integrators they need to be convinced of the merits of the innovation. They also have to have the necessary skills to be able to integrate the specific innovation into the system (Nam and Tatum 1997; Winch, 1998). More specifically, Slaughter (1998, 228) states that these individuals have to be "able to exercise the technical competence and project responsibility and control to achieve coordination cooperation across the system(s)".

Hence, the ability for a 'systems integrator' to adapt to the circumstances in the particular project is an important factor. Further, large degrees of freedom have been shown to be important among systems integrators, as this enables them to adapt to the preconditions in the specific case (Singh, 2014). However, to limit the degrees of freedom for other actors within the project is also important, as this might otherwise enable them to disregard the implementation process.

A strong systems integrator can effectively steer and manage the implementation process and such efforts can be viewed as relatively bounded (Harty, 2008). However, when the innovation extends beyond the control of a strong system integrator the same patterns do not follow and the innovation is viewed as relatively unbounded. Harty (2008) show how systems integrators can have problems in influencing actors within the loosely-coupled construction industry (Dubois and Gadde, 2002). Relative boundedness supports understanding of systems innovation and the fact that systems integrators are not as influential as initially thought. Instead the perspective of relative boundedness argues for tracing networks of association (Harty, 2008), i.e. to follow connections in which one actor strives to influence others, a process which can be understood as a process of translation (Callon, 1984).

THEORETICAL FRAMEWORK

Innovation as a Process of Translation

The diffusion model is common in technology innovation research. An alternative is the theory of sociology of translation (Callon, 1984), which takes its departure in the people involved in the change process (Latour, 1984). Sociology of Translation describes how actors try to impose themselves and their understanding of a situation onto other actors and tie these actors to an Actor-Network (Callon, 1984). Sociology of Translation builds on Actor-Network theory (ANT) and its description of actors partaking in a translation process. ANT is a well-used method, or tool, to understand organizational change following the implementation of information systems (Walsham, 1997). Studying the implementation of BIM as the creation of an Actor-Network provides an opportunity to map activities taken in order to tie actors to the network as well as different actor's needs and motives for being enrolled into the network (Linderoth, 2010).

In the creation of an Actor-Network the desired program of actions can be inscribed into specific artefacts linked to the Actor-Network (Latour, 1990). Inscriptions refer to how artefacts can be used to lead actors towards deserted programs of use, guiding and restricting the use of said artefact so that the program is followed (Monteiro, 2000). In the case of technical artefacts, for example BIM, the initiator tries to define the potential user and thereby inscribe the requested program of use into the artefact (Linderoth and Pellegrino, 2005). Such inscriptions can, for example, consist of instruction manuals, requests, demands or the design of the artefact itself. But programs of use can also be inscribed in other, non-technical artefacts. Procurement documents are filled with inscriptions, influencing actors which are in some way associated with procurement.

Inscriptions are not absolute; they possess varying levels of strength and flexibility. While strong and inflexible inscriptions guide the use of the inscribed artefact, making it difficult to follow anything but the intended program, weak or flexible inscriptions open for less clear guidance (Linderoth, 2000). The strength of an inscription, the degree to which it must be followed or if it can be avoided, depends on the level of

irreversibility of the Actor-Network in which it is inscribed (Hanseth and Monteiro, 1997). The flexibility of inscriptions refers to how much the inscription influence the patterns of use. Flexible inscriptions only have a limited influence, while inflexible inscriptions dictate the patterns of use to a large degree (Hanseth and Monteiro, 1997).

Understanding change as process of translation, and not as diffusion, has an impact on how the concept of power is understood. From the perspective of translations, the obedience to an order will require alignment of the interests of the actors affected by the order. Following Latour (1984, 269) "power is always the illusion people get when they are obeyed". There are reasons why actors follow orders given by someone in a position of power. Hence, power is nothing in itself. Therefore, to view a change process as a process of translation is to understand power as a consequence, and not as a cause of collective action (Latour, 1984). This view is in line with the concept of "relative boundedness" (Harty, 2008) and the underlying assumptions when describing the construction industry as loosely-coupled (Dubois and Gadde, 2002), i.e. as an industry in which no actor have perfect influence over the industry.

METHOD

This paper draws on a case study of the BIM implementation process at the Swedish Transport Administration (STA). A case study is appropriate when understanding social practices in complex organizational contexts (Flyvbjerg, 2006). STA is the largest public client of infrastructure in Sweden. The case study gives the context in which project managers are influenced by BIM implementation. The case study covers the period between 2014 and 2018, and was supplemented with participant observations at meetings and workshops in order to serve as contextual background. The main data in this paper consists of interviews with project managers at STA. The BIM implementation process is analysed as a process of translation (Callon, 1984). This provides "a language to describe how, where and to what extent technology influences human behaviour" (Monteiro, 2000, 5). In this process, several policy documents were developed on how project managers were to procure BIM. These documents have also been analysed to give insight in the ways in which BIM has been translated at the STA.

To fulfil the aim of this paper, eight one-to-two hour semi-structured interviews with project managers at the STA have been performed. The interviewees are project managers for small to mid-sized projects. The project managers have been selected as individuals with no direct connection with the BIM initiative, instead only influenced by the new BIM policy documents. Focus during the interviews was on exploring how the BIM guidelines were interpreted when developing requirements in procurement.

FINDINGS

BIM Implementation Initiative at STA

Based on suggestions made in a Swedish government official report (SOU 2012:39), the general director of STA decided to implement BIM at the whole organization. This decision was made in 2013 and it resulted in the initiation of a BIM implementation project. This specific project had objectives to make STA more efficient and to insure that all project managers from 2015 an onwards demand BIM when procuring.

Construction project managers at STA work as a link between STA and the construction industry. They have the responsibility to interpret specifications made by the planning and facilities management departments at STA and reformulate them into a request for proposal (RFP) document. Project managers use standardised procurement templates when reformulating specifications into RFP. The procurement templates include references to numerous guidance documents expressing further specifications on the project. This way, the guidance documents reflect STA policies on how projects shall be procured. Such policies relate to, for example, sustainability goals, worker safety etc.

A deliverable of the BIM implementation initiative is the creation of BIM-related guidance documents. These documents specify demands on BIM, demands which shall be included in the RFP when procuring projects. In June 2015, the procurement templates are updated to explicitly refer to two BIM related documents. These two documents are: The current procurement template (UB-mall 10.0, 2017), which specifies how information models shall be created in line with the demands for 'Object Oriented Information Model' (TDOK 2015:0181) and the 'Digital Project Management' (TDOK 2012:35). These two documents specify how digital models shall be produced and managed. They also specify other technical specifications, file-formats etc. Further, the documents specify that it is the main contractor who is responsible for the development of a coordinated information model, including all relevant project information. It is also specified that it is this model that shall be available for the client at project meetings. In addition, the supplier is responsible for designating a BIM coordinator to projects.

The Project Manager's Perception of Their Role in Procurement

The project manager's role at STA varies. A BIM expert linked to the BIM implementation project expressed that:

> Project managers do not understand for what they should use BIM, therefore they exclude demands for BIM when procuring

Project managers are seen to have large degrees of freedom when formulating the RFP documents and therefore are able to exclude demands they find risky or costly for their respective projects.

A project manager describes the work as:

> My task is to interpret the specifications made by the planning department; the planning department act as an internal client for me, and then I create the RFP documents. However, this is not as straight forward as it sounds, often planning is not sure what they want, and want to have help from suppliers to suggest a solution.

Due to uncertainty, RFP document are often developed in collaboration with suppliers, in what can be understood as a collaborative process. This makes the project process more efficient and saves time. This way of working has resulted in situations when the internal client's perception of what is procured does not always correspond to what is actually procured.

One of the project managers express that they are not well informed about the numerous references to the policy documents in the procurement templates. Another project manager explains this further:

> There are a lot of 'TDOKs', however they are not always relevant for the specific project and I'm not knowledgeable in many of them.

To handle the circumstances in their respective project, project managers make individual adjustments to the procurement templates when creating RFP. It also happens that suppliers disregard requirements when budding. A project manager explained:

> Suppliers want to win the contract, therefore they to optimise their offer and disregard demands they know we often do not ask for, demands which are part of the standardised procurement template. It can be problematic in projects where we actually want to follow up on such demands.

As project managers do not prioritise all issues in the policy procurement templates, some issues are not followed up on and this is well known among suppliers.

Project managers often perceive BIM to be difficult to understand. Therefore, some of the project managers exclude parts or all references to BIM in their RFP:

> The procurement templates currently say a lot about BIM, but I remove it. I don't know which demands to specify. I have far too little knowledge about BIM and did not know how to use it.

The role as change agent and innovation supporter is not prioritised by project managers themselves. A project manager explains why:

> As project manager I´m evaluated on two main parameters: if the project is on time and within budget. I can see the point in promoting change from a client perspective, but I have too many things to take care of and not the right expertise to promote BIM

Several of the interviewed project managers also said that it was difficult to gain enough BIM-expertise in a project to be able to control and evaluate the BIM-use that was demanded in the BIM-guidance documents. Therefore, project managers found it hard to follow up on BIM demands, and this included BIM demands that included in the procurement process.

The project managers see a potential in BIM but at the same time they perceive they have a lack of BIM-competence. It also turns out that BIM is not something they want for their own projects. Instead, all of them claim that BIM is probably better in other projects with other characteristics.

> My project is quite simple; we are building a relatively short railway passage enabling trains to meet. In more complex projects I definitely see the value in BIM but in my project, it is not needed, it would only increase the cost with no substantial gain.

DISCUSSION

STA is actively trying to influence the industry to use BIM. They do this by initiating a BIM implementation project and by establishing a BIM policy including a mandatory BIM requirement when procuring. In this process, STA aims to take on the role as change agent, or innovation champion (Kulatunga *et al*., 2011) and influence the loosely coupled construction industry (Dubois and Gadde, 2002). STA is not a homogenous, but rather a complex client with several sub-organisations and departments, making both intra-organizational and inter-organizational change challenging. Implementing BIM, as a systemic innovation (Cao *et al*., 2017), by establishing a demand for it in procurement, will not only influence the industry, but also the internal roles, processes and procedures at STA. Thus, translating BIM-use means translating it intra-organizationally (within STA) and inter-organizationally among a multitude of actors active in construction projects.

The strategy for implementing BIM, both inter- and intra-organizationally, has been the attempt to inscribe BIM-use as requirements in procurement templates. However,

earlier research has shown that there is currently no clear framework or support for procuring BIM (Porwal and Hewage, 2013). Instead, BIM is often viewed as an administrative issues and generally not the first priority for clients. Thus, specifying demands for BIM is not a trivial task but rather connected with several difficulties, further discussed by for example Holzer, (2011).

Earlier research has emphasised the role of systems integrators in the implementation of systemic innovations (Winch 1998). At STA, the system integrator role is given to the project managers procuring projects. This role is assigned by making changes to procurement templates and use of new policy documents, thus trying to inscribe (Monteiro, 2000) it into the project management process. The new and changed documents express how the project manager should include demands for BIM when preparing RFP documents. This strategy of implementing BIM-use assumes that the strength of inscriptions in guidance documents is strong enough to enrol project managers into the BIM Actor-Network. However, as Latour (1984, 269) explains: "The obedience to an order given by someone would require the alignment of all the people concerned by it", as such a situation is very improbable, and orders are often modified as they are interpreted by the actors they are supposed to influence. As presented in the findings of this paper, this has happened in the translation of BIM. Project managers interpreted the intentions behind the BIM related inscriptions and try to adapt them to the circumstances in their projects.

When the BIM Initiative tried to inscribe the role of systems integrator into the project management system, what they actually tried to translate was the willingness to continue the translation of BIM. That is to say, the translation became sequential: first enrolling the project manager into understanding the importance and benefits of BIM-use and then making them continue the translation to the Actor-Network of their project. However, successful systems integrators have been shown to need several specific characteristics in their role. First they need to be convinced of the merits of the innovation (Winch, 1998), which the findings question as it is indicated that project managers perceive BIM as being connected with costs and risks to their project. Secondly systems integrators should be able to exercise the needed technical competence, however several project managers expressed that they did not have the needed expertise and how it was difficult to acquire BIM experts in projects. Further the findings of this paper indicate how project managers at STA primarily view BIM as an innovation relevant for other actors in the industry, not STA. Project managers view BIM as a tool, which can help actors in their projects given the right circumstances, in complex projects for example. The findings further shows how project managers view BIM as an innovation introducing new risks into projects (Porwal and Hewage, 2013), risks connected with extra costs (Vass and Karrbom Gustavsson, 2017).

By analysing how BIM is implemented at by STA, it is possible to study how a new and changed role is inscribed to influence project managers. However, findings argue for how these inscriptions have been lacking in strength and possessed too much flexibility. An open demand for BIM gives the project manager the ability to adapt its use to the specific circumstances in the project, which has been shown to be desirable for systems integrators (Singh, 2014). However, as several project managers have not been enrolled into the BIM Actor-network, this flexibility has been used to limit the inscription's influence over projects. While not being enrolled, project managers view new policies as guidelines which might be relevant but which can be disregarded based on the circumstances. Implementing policies through procurement is thus not

easy and seems to make project managers take on the role as involuntary policy implementers rather than engaged systems integrators.

CONCLUSION

Client organizations are argued to play a vital role in enhancing performance and increasing productivity in the construction industry. By using their influence, they are further argued to be able to take on the role of innovation champions and demand the use of systemic innovations such as BIM (Azhar, 2011; Elmualim and Gilder, 2014). However, this view disregards difficulties linked to procuring BIM which has been shown and it takes a clear departure in the diffusion model of innovation (e.g. Lee and Yu, 2015).

When analysed as a process of translation, the findings in this paper shows challenges in establishing demands for BIM in projects. The translation process has become sequential; first, trying to enrol project managers into taking on the role of systems integrators and then continue the translation of BIM in their projects. Trying to inscribe new demands for BIM into the templates used in procurement has been the main strategy in this translation process. However, the findings argue that the inscriptions have been too weak to enrol project managers into the BIM Actor-Network. Instead of taking on the role as system integrator and continue the translation of BIM, project manager has actively used the flexibility of the inscriptions to minimize or totally remove demands for BIM in procurement.

Degrees of freedom among project managers and a large amount of flexibility in inscriptions have made it possible for project managers to disregard the translation. The findings show how project managers are currently not enrolled into the BIM Actor-Network, therefore they use this freedom and flexibility not to benefit the BIM implementation but rather their interests in regard to project performance. In order to achieve better results in the translation of BIM, the strength of inscriptions needs to be increased, achieving more irreversibility in regards to BIM-usage and enrolling project managers to the BIM Actor-Network. Un-enrolled project managers take on the role of involuntary policy implementers, using the flexibility in the inscriptions to minimize the policy's influence on their project.

Findings contribute to research on BIM implementation, in particular on the need to better understand the role of the projects managers. In addition, this research also pinpoints the procurement process, more specifically the RFP, as important to BIM implementation and more research on procurement of BIM is needed.

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