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The Role of Identity in Adopting Building Information Modeling: A Comparative Study

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Abstract

BIM is a modeling technology that allows architects and builders to visually create, analyze, and share building models. BIM is gaining a growing importance which may be reflected in the increasing number of owners who demand BIM use. However, despite the perceived uptick in demand for BIM, an industry wide adoption has not yet been reached. Likewise, the adoption of BIM enhanced business practices within both design and construction has been limited. While there are multiple barriers to BIM use, resistance to change has been identified by scholars as a major restraining force. Indeed, BIM prompts for substantial changes in the ways architects and constructors think and work which may question their performance and challenge their identities as competent workers. In this research, we address these dynamics, we use identity theory to gain an understanding on how identity accounts for acts of resistance and adoption of BIM in AEC industry.

Keywords

BIM, information systems, identity, adoption, resistance.

Introduction

Building Information Modeling (BIM) is one of the most promising technological venues in the architecture, engineering and construction (AEC) industry. BIM is a modeling technology and a set of associated processes that allow architects, designers and builders to visually create, analyze, and share building models (Azhar, 2011; Eastman, Teicholz, Sacks, & Liston, 2011). The digital representation of the building helps the project's stakeholders to make better decisions and improve the process of delivering the facility (Associated General Contractors of America, 2005).

BIM has gone far from being a buzzword with a handful of early adopters to the cornerstone of AEC information technology assets (Eastman et al., 2011). By improving processes throughout the stages of design, construction and operation of a building, BIM provides far-reaching impacts and benefits, not only for the construction industry but for society as well, as better buildings are built that consume fewer materials and require less labor and capital resources and that operate more efficiently (Eastman et al., 2011, p. xii).

BIM has become the catalyst of a significant change in the AEC industry. This new approach drives a fundamentally different way of creating, using, and sharing building information. Indeed, BIM moves the industry forward from electronic drawings and paper-based work toward an integrated and collaborative IT-based work environment that simulates and manipulates building models.

BIM is gaining a growing importance which may be reflected in the increasing number of owners who demand BIM use (Krygiel & Nies, 2008). To gain a better understanding of this increasing trend, many researchers studied the drivers of BIM adoption, some have focused on the institution level (e.g. Andy, Francis, & Abid, 2011), others were interested in the organizational level (e.g. Aranda-Mena, Chevez, & Crawford, 2008; Guillermo, John, Agustin, & Thomas, 2009), while another group of researchers have focused on the technological level (e.g. Underwood & Isikdag, 2011). However, despite the perceived uptick in demand for BIM, an industry wide adoption has not yet been reached. Likewise, the adoption of BIM enhanced business practices within both design and construction has been noticeably slow and limited (Eastman et al., 2011). Indeed, there are still numerous obstacles that hinders BIM use, these include technical barriers, legal and liability issues, regulation, inappropriate business models, and the need to educate large numbers of professionals (Eastman et al., 2011). Resistance, too, has been identified as a major restraining force to BIM adoption (Arayici et al., 2011; Khosrowshahi & Arayici, 2012). Indeed, BIM alters the essence of how architects, designers, and contractors perceive their professions, which would, naturally, cause fear and anxiety and ultimately triggers resistance acts.

The transition to BIM is not a systematic progression from pencil-based and computer-aided drafting techniques. BIM introduces a dramatic shift into how building drawings and visualizations are created and alters the key processes of putting a building together (Eastman et al., 2011). To take advantage of BIM, designers and contractors are required to change their skills and redefine their work relationships with peers. Furthermore, BIM prompts for substantial changes in the ways architects and constructors think and work. This may affect their roles and challenge their professional identities which would ultimately account for their acts of resistance – or adoption-. Curiously enough, no study to date, to our knowledge, considered examining the role of identity in BIM adoption behavior of AEC actors. BIM is merely about the technology, it is about the social actors who use it and work, before all else, to maintain a positive view of themselves as competent professionals. Going beyond technical and technological considerations is essential to gain a better understanding of adoption behavior of BIM. This study addresses this issue, it aims to provide an answer to the question “**How professional identity accounts for acts of adoption and resistance of BIM in AEC industry?**” We believe that ignoring the identity in the examination of BIM adoption and resistance, a number of processes of BIM adoption will remain obscured, which would be only hindering BIM knowledge progress. This research is a step further towards filling this gap.

Why identity?

Theorists understand identities as internally stored information and meanings that provide contextually appropriate answers to the question “**who am I?**”. According to Burke (2000), identity is the set of meaning that define **who one is** as a **person** (e.g. trusty, honest), as a **role occupant** (e.g. nurse, sales representative) or as a **group member** (e.g. Canadian, union member). Identity involves not only who or what people believe themselves to be but also how they should respond to social experiences and be regarded by others (Lutgen-Sandvik, 2008). Interest in the examination of identity has grown exponentially in the last few decades in many organizational disciplines. Scholars have acknowledged this concept as a potent means to explore and explain a range of social and organizational phenomena. Thus, identity has been used to explain organizational processes and behaviors such as motivation, commitment, organizational change, dynamics of control and resistance, to name just a few (Sveningsson & Larsson, 2006).

Identity can also explain acts of adoption and resistance in information systems context (Nach & Lejeune, 2009; Whitley, Gal, & Kjaergaard, 2014). Indeed, resistance to IT can be interpreted as an **identity struggle** in which an individual resists a perceived threat to his person, role or group identity. To fit in a new IT environment, users are often prompted to develop new skills, behaviors and attitudes and dismiss others that are, in many instances, central to their positive view of themselves. By altering the way they work, IT may not only redefine their roles and role expectations but may also disrupt the social and psychological processes underlying identification through which they come to understand **who they are** (Lamb & Davidson, 2005). Very often, using a technology that brings considerable, sometimes radical changes to the workplace causes anxiety and undermines one’s identity as the reference point for identity construction becomes illusive. Tensions between old and new skills call for answers to the questions “**Who am I, what do I stand for and how should I act?**” These tensions also prompt the individual

to take steps to deal with the identity threatening situation and resolve the problem by **acts of resistance**. These acts are intended, consciously or not, to provoke substantive change and to make a symbolic declaration of one's identity (Ashforth & Mael, 1998). We believe that identity has an important, but not yet well studied, role to play in helping scholars and managers understand resistance to information technology particularly in BIM context. This research aims to shed light on this role providing, thus, an original framework for theoretical advances in the field and actionable recommendations for addressing BIM adoption and resistance.

Research method

Research sites

For this research, we intend to conduct two field studies in two different settings. The first setting is in Quebec while the other is in Finland. In Quebec, the construction industry and consulting engineering firms master perfectly the knowledge related to project management, but are not succeeding with BIM which resulted in a significant loss of competitiveness (Forgues & Staub-French, 2011). The limited use of BIM in Quebec would provide insights on the implication of identity in BIM's lack of adoption. In the other hand, Finland's AEC industry is considered as world leader in the adoption of BIM. The Finland's context would provide a fertile ground to examine how identity reshapes and is reshaped by BIM which may help gain an understanding how identity supports or restrains BIM adoption. By comparing the two contrasting settings, we aim to explain the success and failure in BIM adoption.

Theoretical background

In this research, we use critical realism as a philosophical perspective (Sayer, 1992). Critical realism is rapidly emerging as a viable paradigm for research in social sciences. The paradigm connects positivism and interpretivism. Like the positivist ontology, critical realism recognizes that the world has an objective and independent existence, and like interpretivist epistemology, critical realism assumes that our knowledge is a social construct and, as such, is fallible. Critical realism approach is gaining a growing importance in the information systems community and proved to be value able to uncover mechanisms that can explain social events (Strong & Volkoff, 2010).

This research is interdisciplinary and intersects with the field of social-psychology, management and information systems with theoretical and practical relevance for the AEC industry. Burke's groundbreaking work introducing Identity Control Theory (ICT) is of a particular interest to this investigation as it addresses the internal dynamics that operate within the self when a person claims an identity (P. Burke, 2007). The theory has the potential to explain aspects of the relationships between person identity, role identity and group identity, on one hand, and social behavior (including adoption and resistance), on the other hand.

Data collection and analysis

In this enquiry, we intended to interview 24 professionals working in the AEC industry, 12 in Quebec in the others in Finland. Our informants are mainly architects and contractors who are reported using BIM or have been reluctant adopting BIM. We will use semi-structured interview guide with open-ended questions. Interviews are expected to be conducted on-site at the person's office. Interviews will be all tape-recorded and transcribed verbatim so that the raw data could be systematically analyzed. Data analysis will be conducted by *data reduction* and then by the *construction of chains of evidence* as suggested by Miles and Huberman (1994). Each interview will generate a cognitive map (Langly, 1999) allowing the comparison of concepts and relationships between concepts. Emerging concepts will be analyzed and incorporated into the model as and when the advanced search. These comparative analyzes will aim to make a pattern emerge and allow the team to make proposals on the identity dynamics that might explain the observed difference in the deployment of BIM in Finland and Quebec.

Conclusion

This project aims to produce knowledge that has strong implications at the theoretical and practical levels. At the theoretical level, this project seeks to understand the role of the identity in BIM use in a project that involves a group of inter-disciplinary workers. By adopting an identity perspective, the research is expected to shed light on resistance and adoption related behavior that were thus far overlooked in BIM literature. Through our project we aim to increase knowledge in the field of professional identities and open a way to studies of more organizational character in the field of construction. The construction industry is a relatively new field that is opening to the social science research. Interactions between disciplines of engineering construction and social sciences will provide a fertile ground for the development of innovative and agile approaches adapted to the changing nature of the construction industry. At the practical level, we expect to derive an actionable framework that helps managers, particularly in AEC industry, to address resistance issues when implementing BIM technology.

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