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The Effect of Rumors on BIM Implementation Processes in Saudi Architectural Engineering (AE) Firms

Aljawharah A. Alnaser

Assistant professor, Department of Architecture and Building Science, College of Architecture and Planning, King Saud University, Riyadh, KSA

aaalnaser@ksu.edu.sa

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Abstract: The construction industry in the Kingdom of Saudi Arabia (KSA) currently faces significant challenges related to project delays, cost overruns, and insufficient collaboration with project stakeholders, all of which have impeded the government's agenda. In response, Building Information Modeling (BIM) has recently received considerable attention as an appropriate innovation by a range of stakeholders in KSA. However, despite BIM's numerous advantages, its full benefits have not yet been realized. Because of this, an extensive body of literature supports the importance of BIM in architectural engineering (AE) firms by focusing on the challenges and benefits of BIM, as well as its success factors. In spite of this, a study on how rumors may have affected the BIM implementation process is still in its infancy. For this reason, this paper aims to explore the influential role rumors play related the to the challenges and potential benefits of new technology (i.e., BIM) on the implementation process of such technology in AE firms. In doing this research, a literature review was conducted across two sets of literature—BIM and rumor studies. In parallel to this, theories such as cross-profession collaboration theory (Amabile et al. 2001), rumor-spread motivation theory (Bordia and DiFonzo 2005), and 'The basic law of rumor theory' (Allport And Postman 1947), were also reviewed. Following this, a case study approach was adopted and conducted in two stages. A pilot study was conducted from which five case studies were selected among leading Saudi AE firms. Data were collected from 42 semi-structured interviews with a range of professionals, and a thematic analysis demonstrated the significant impact that rumors had on the success of BIM implementation. This is mainly due to three themes: a lack of awareness, an ineffective role of decision-makers, and a lack of client demand. Importantly, these findings support the results of previous studies on a set of key challenges faced in BIM implementation. In addition, this study contributes to the literature by providing new insights into the effect of rumors on the success of BIM implementation in Saudi AE firms. Moreover, the effect of rumors extended to either delaying or entirely canceling the concept of BIM implementation in some AE firms. Contrary to expectations, the utility of BIM increased with the COVID-19 crisis. As a result, more research on the current topic is recommended.

Keywords: BIM, rumors, implementation processes, Saudi architectural engineering firms.

1. Introduction

The Fourth Industrial Revolution and the Internet of Things (IoT) are accelerating worldwide. The British Chartered Institute for IT described the Fourth Industrial Revolution as a synthesis of advances in artificial intelligence (AI), robotics, the IoT, and 3D printing. At the same time, the Kingdom of Saudi Arabia (KSA) has achieved significant progress in its communications and information technology sectors. In 2020, the Saudi Press Agency (SPA 2020) reported that the Kingdom has advanced 40 places in its digital infrastructure sub-index to rank 27th worldwide and 8th among G-20 participating nations. Moreover, as of 2019, 81% of Saudi companies had implemented IoT

systems (Saudi Gazette 2020). However, despite this progress, the Communications and Information Technology Commission (CITC n.d.) recently reported that the reach of the IoT has been limited in the construction industry, which may explain some of the sector's ongoing challenges, such as delays and cost overruns. This has drawn attention to the importance of building information modeling (BIM) as one of the most promising approaches to addressing this situation. In parallel, there is a strong focus in Saudi studies and the global BIM literature on exploring the challenges that hinder the success of the BIM implementation process. However, in Saudi Arabia, this implementation process is still years away.

A review of the literature found that the dissemination of rumors is a common and routine practice in many organizations (Michelson and Mouly 2002). This study uses Michelson and Mouly's (2002, p. 341) definition of rumor as 'informal communication transmitted to another person or persons, irrespective of whether or not the communication has been established as fact'. However, many management and business researchers consider the presence of rumors within organizations to be a harmful phenomenon (Michelson and Mouly 2002; Sudhir 2018), largely due to their negative effects, specifically with respect to phenomena such as organizational change, ambiguous conditions, or crises (Sudhir 2018).

In terms of the construction literature, it largely considers BIM to be a socio-technical system (e.g., Sackey et al. 2014; Liu et al. 2016). From the perspective of this literature (e.g., Haron 2009; Barlish and Sullivan 2012; Liu et al. 2016) and cross-profession collaboration theory (Amabile et al. 2001), human characteristics are a key determinant in its adoption. This has led to inquiries into whether the effects of rumors, including hesitance or anxiety, can result in delays in implementing BIM in AE firms.

The BIM literature also shows strong consensus regarding key challenges encountered in the implementation of innovations such as BIM. However, while rumors have received considerable attention in the organizational studies literature (Michelson and Mouly 2002) and have been found to bring feelings of hesitance and anxiety (Sudhir 2018), no studies have yet explored the effects of rumors on the implementation of BIM in AE firms.

To address this gap, this study explored this question with professionals in Saudi firms. The researcher reviewed BIM and rumor literature to understand the effects of rumors in AE organizations, explore the challenges that might affect BIM implementation, and investigate the role that could be rumors played in this process. Applicable theories such as cross-profession collaboration theory (Amabile et al. 2001), rumor-spread motivation theory (Bordia and DiFonzo 2005), and 'The basic law of rumor theory' (Allport And Postman 1947) were also reviewed.

This paper was organized into several sections. Section 1 introduces the topic and Section 2 presents the findings of the literature review. Section 3 outlines the research method and data collection techniques and Section 4 presents the case study results. Finally, the discussion and conclusions are presented in Sections 5 and 6.

This paper addresses the question if rumors assist, impede, or otherwise affect the BIM implementation process in Saudi AE firms. Further, the study explored how professionals react to such rumors, and if they have considered withdrawing or postponing BIM implementation as a result. Finally, the study investigates the driving factors behind the spread of rumors and strategies for reducing or eliminating such behavior.

Thus, this study investigates the spread of rumors about the implementation of new technology (i.e., BIM) in Saudi AE firms. This work contributes to the literature by exploring the potential influence of rumors on the BIM implementation process.

2.Related Work

The benefits associated with the use of BIM are well documented in the literature. For example, Ghaffarianhoseini et al. (2016) list several types of benefits of BIM that are common in the literature, including 1) technical; 2) knowledge management; 3) standardization; 4) diversity management; 5) integration; 6) economic; 7) planning and scheduling, and 8) decision support. However, despite these benefits, the construction industry lags in implementing BIM, particularly in the KSA. For this reason, many BIM researchers study this phenomenon by exploring the challenges and benefits of implementing BIM as well as the factors that influence its adoption. However, to date, efforts to investigate the role that rumors may play in this process remain in their infancy.

2.1 Work related to the Saudi Construction Industry

Saudi Arabia's construction industry is one of the largest in the Middle East and is the country's second-largest industry. After the Kingdom's launch of its Saudi Vision 2030, the construction sector has seen significant growth. However, despite this growing demand for construction services, the industry faces several obstacles that have been documented in the literature. In line with this, the findings of most Saudi studies (e.g., Assaf and Al-Hejji 2006; Alsuliman 2019; Alshihri et al. 2022; Alajmi and Ahmed Memon 2022 and Alenazi et al., 2022) are consistent with these challenges, including cost overruns and project delays.

Consequently, many researchers have explored the factors that influence these challenges, including a general absence of scheduled meetings (Al-Kharashi and Skitmore 2009), a lack of accuracy in detail, and inconsistencies in design documentation (Arain et al. 2006; Assaf and Al-Hejji 2006; Arain 2008; Al-Kharashi and Skitmore 2009 and Alshihri et al. 2022), insufficient communication among project stakeholders (Arain 2008; Al-Kharashi and Skitmore, 2009; Mahamid, 2016 and Alshihri et al. 2022), insufficient collaboration among designers and contractors (Arain et al. 2006 and Alajmi and Ahmed Memon 2022) and inadequate coordination among parties (Arain et al. 2006; Arain 2008 and Alshihri et al. 2022).

Other factors include delays in producing documentation and the inherent complexity of the design process (Assaf and Al-Hejji 2006 and Alshihri et al. 2022), lack of staff (Assaf and Al-Hejji 2006; Alzara et al. 2016; Alsuliman, 2019 and Alshihri et al., 2022), delays in payments to contractors, insufficient contractor performance (Mahamid, 2016 and Alshihri et al. 2022), material delivery issues (Khatib et al. 2018), bid systems (Alshihri et al. 2022), delays in revising and approving design documents (Alzara et al. 2016 and Alajmi and Ahmed Memon 2022), material delivery issues (Alzara et al. 2016 and Khatib et al., 2018) company and client resistance to change, low IT infrastructure capacity, no guarantees in return on investment, and a preference for paper-based systems (Sidawi and Omairi 2010).

In response, these obstacles have galvanized both scholars and practitioners to study the causes and factors driving this phenomenon and to find and evaluate solutions. As a result, one of the most frequently mentioned responses to these challenges in Saudi studies is the adoption of information communication technology (ICT) approaches (e.g., Sidawi and Omairi 2010). However, factors such as resistance to change, lack of IT infrastructure, few guarantees of return on investment, and preference for paper-based systems appear to have hindered the adoption of ICT (Sidawi and Omairi 2010). To address this situation, Sidawi (2012) endorsed the adoption of BIM technology, and since then BIM research has commenced to identify and explore the challenges, advantages, and risks of implementing this technology in the Saudi construction sector. Here it is worth noting that the findings of Saudi studies (e.g., Sidawi 2012; Alenazi et al., 2022 and Alghamdi et al., 2022) also identified the aforementioned challenges, which suggests that the Kingdom's BIM implementation experience tracks that of other countries. Thus, the factors and drivers of the challenges indicated in previous studies including resistance to change, preference, ineffective leadership, and lack of competent teams are comparable to those found in global studies.

2.2 Research on Building Information Modeling (BIM)

A review of recent BIM studies revealed a number of challenges to BIM implementation, including ineffective leadership (Dossick and Neff 2011), conflict processes (Hooper and Ekholm 2010; Rowlinson et al. 2010; Dossick and Neff 2011), organizational culture (Dossick and Neff 2011), team culture (Rowlinson et al. 2010; Dossick and Neff 2011), resistance to change (Rowlinson et al. 2010; Dossick and Neff 2011; Eadie et al. 2013), lack of trust and communication among parties (Liu et al. 2016), and lack of professional knowledge and experience (Goes and Santos 2011; Eadie et al. 2013). Moreover, additional factors have been found specific to delays in implementing BIM in organizations, such as lack of organizational expertise (Eadie et al. 2013), lack of project expertise (Eadie et al. 2013), and lack of client demand (Brewer and Gajendran 2010; Linderoth 2010; Eadie et al. 2013).

In line with these organizational challenges, some researchers have attributed the failure to implement new technologies in the construction industry to technical rather than social factors (e.g., Griffith 1999; Whyte et al. 2002), lack of technical expertise and support systems (Griffith 1999;

Table (1). Key themes and factors that influence the success of BIM implementation

Themes	Factors	Author (s)
Processes	1. Conflict processes	(Rowlinson et al. 2010) (Dossick and Neff, 2011) (Hore and Mcauley 2013)
	2. Lack of communication among parties	(Dossick and Neff, 2011) (Barlish and Sullivan 2012) (Eadie et al. 2013) (Liu et al. 2016)
	3. Costs of BIM adoption/lack of financial support (including investment, setup, maintenance, and training costs)	(Goes and Santos 2011) (Eadie et al., 2013) (Ahuja et al. 2020)
	4. Return on investment (ROI)	(Geng 2011) (Khosrowshahi and Arayici 2012) (Hore and Mcauley 2013) (Eadie et al. 2013) (Abubakar et al., 2014) (Zakari et al., 2014) (Abbasnejad et al. 2020) (Ahuja et al., 2020)
People Characteristics	5. Resistance to change	(Rowlinson et al. 2010) (Dossick and Neff 2011) (Eadie et al. 2013) (Zakari et al., 2014) (Liu et al. 2016) (Abbasnejad et al. 2020)
	5.1 Resistance at the operational level	(Sebastian, 2011) (Eadie et al., 2013) (Zakari et al. 2014)
	5.2 General reluctance of team members to share information	(Dossick and Neff, 2010) (Sebastian, 2011) (Eadie et al., 2013) (Abbasnejad et al. 2020)
	6. Attitudes and behavior	(Liu et al. 2016)(Liu et al., 2017) (della Torre and Pili, 2020)(Anderson and Ramalingam, 2021)
	7. Lack of trust	(Liu et al. 2016)(Li et al., 2019) (di Giuda et al., 2020)(Al-Ashmori et al. 2020)
	8. Lack of professional knowledge and experience	(Goes and Santos 2011)(Barlish and Sullivan 2012) (Eadie et al., 2013) (Abubakar et al., 2014) (Zakari et al., 2014) (Liu et al. 2016) (Abbasnejad et al. 2020) (Ahuja et al. 2020) (Al-Ashmori et al. 2020)
	9. Lack of client demand	(Brewer and Gajendran, 2010) (Linderoth, 2010) (Rowlinson et al., 2010) (Khosrowshahi and Arayici 2012) (Eadie et al., 2013) (Zakari et al., 2014)(Ghaffarianhoseini et al. 2016) (Ahuja et al. 2020)
	10. Lack of training and education courses	(Goes and Santos 2011)(Zakari et al., 2014) (Son et al.2015) (Sackey et al., 2015) (Liu et al. 2016) (Abbasnejad et al. 2020)
	11. Preference	(Coates et al. 2010) (Sebastian 2011) (Zakari et al., 2014)
	12. BIM compatibility skills	(Son et al. 2015) (Liu et al., 2016) (Ghaffarianhoseini et al., 2016) (Abbasnejad et al. 2020)
	13. Lack of awareness	(Khosrowshahi and Arayici 2012) (Hore and Mcauley 2013) (Zakari et al., 2014) (Ahuja et al. 2020) (Al-Ashmori et al., 2020)
Environmental Characteristics	14. Organizational culture	(Rowlinson et al., 2010) (Dossick and Neff 2011) (Ghaffarianhoseini et al. 2016)
	15. Ineffective leadership skills	(Dossick and Neff, 2010) (Dossick and Neff, 2011) (Zakari et al., 2014) (Liu et al., 2016)
	16. Role of contractual agreements	(Ku and Taiebat 2011) (Ahuja et al. 2020)
	17. Lack of top management support	(Rowlinson et al., 2010) (Attarzadeh et al. 2015) (Son et al. 2015) (Ghaffarianhoseini et al., 2016) (Abbasnejad et al. 2020) (Ahuja et al. 2020)
	18. Insufficient company infrastructure	(Dossick and Neff 2010) (Liu et al. 2016) (Pavan et al. 2020)
	19. Lack of legislation	(Zakari et al. 2014) (Abbasnejad et al. 2020) (Ahuja et al. 2020) (Guzzetti et al. 2020)
	20. Lack of motivation/ recognition/incentives (including absence of government incentives and support for BIM adoption)	(Abbasnejad et al. 2020) (Ahuja et al. 2020)
	21. Lack of technical support	(Ghaffarianhoseini et al. 2016) (Liu et al. 2016)

Whyte et al. 2002), the difficulty of the approach itself (Griffith 1999; Whyte et al. 2002), lack of professional knowledge and experience (Goes and Santos 2011; Eadie et al. 2013) and lack of communication and collaboration among project parties (Isikdag and Underwood, 2010). In addition, interoperability problems, lack of demand, and cost barriers are considered the most prevalent causes for delays in BIM uptake (Ghaffarianhoseini et al. 2016). And while some studies have shown that technical issues have a greater impact on the success of BIM implementation, Son et al. (2015) found a positive correlation between the level of architectural education and training in terms of utility, efficacy, and simplicity of BIM adoption. The authors also identified factors that influenced acceptance by architects in their behavior toward adopting BIM.

With respect to organizational challenges, a literature review of 80 studies was published between 2004 and 2019 by Abbasnejad et al. (2020). This study revealed 27 factors related to BIM uptake in AEC firms. For example, found organizational challenges to be the leading cause of the lack of delivery of BIM benefits, and also that BIM implementation typically requires fundamental structural changes in organizational business structures and construction industry processes. In addition, the authors stated that the most common enabling factors identified in the literature included management support, education and training, BIM implementation in strategic plans, and BIM competencies. Finally, they also endorsed the findings of Sackey et al. (2015) and Liu et al. (2016) that successful BIM implementation requires a sociotechnical system approach.

Moreover, several studies have reported three factors common to successful BIM implementation: processes, people, and workplace environments (e.g., Haron 2009; Barlish and Sullivan 2012 and Liu et al. 2016). These themes are also found in the cross-profession collaboration theory developed by Amabile et al. (2001). In this study, the authors proposed three determinants of successful cross-professional collaboration: 1) team characteristics, 2) environmental characteristics, and 3) processes. Given this commonality, this study drew on these themes, which were then grouped to develop an analytical framework to facilitate the design of the interview questions and data analysis method. Table 1 illustrates these key themes and the factors influential in the success of BIM implementation.

The results discussed above suggest that even though BIM may operate in a socio-technical context, ambiguity exists in at least one social respect, i.e., the spread of rumors. And while the effect of rumors has been extensively researched in the organizational studies literature, no studies have explored how rumors may influence the uptake of BIM in AE firms in general, and in Saudi firms in particular. This gap in the BIM literature is not limited to domestic studies but rather extends globally in terms of understanding the effects the spread of rumors, as routine practice and social behavior, have on BIM implementation processes. To address this gap, this research investigates this phenomenon in the context of Saudi AE firms.

2.3 Related work in Rumor Studies

Rumors were first formally acknowledged as an academic concept in the 1940s. To understand the potential impact of rumors in implementing new technology (i.e., BIM), it is necessary to first identify definitions of rumors that appear in the literature. For example, Allport and Postman (1947, p. ix) defined rumor as a specific (or topical) proposition for belief, passed along from person to person, usually by word of mouth, without secure standards of evidence being present. Similarly, Knapp (1944, p. 22) defined the term as a proposition for the belief of topical reference disseminated without official verification. Decades later, Michelson and Mouly (2002, p. 341) discussed rumors as 'informal communication transmitted to another person or persons, irrespective of whether or not the communication has been established as fact'. According to these definitions, the term rumor seems to combine unconfirmed information with some factual content. In addition, this information is usually incorrect and inaccurate and then is disseminated among people (Dang et al. 2016).

In an organizational context, the spread of rumors is considered to be a routine activity of information sharing and exchange (Michelson and Mouly 2002). Thus, rumors can be thought of as a means of communication (Michelson and Mouly 2000) which means, as with all communication processes, the rumors comprise three components: sender, receiver, and communication channel. In terms of transmission, there is widespread agreement in the literature that rumors are spread through informal communication channels (Michelson and Mouly 2002). Moreover, the

management and communication literature largely agrees that rumors are transmitted quickly across informal and oral communication channels(Akande and Odewale 1994). To investigate how rumors proliferate, Dang et al. (2016) conducted a social networking study that explored user interaction with rumors on online social networks. The researchers used social network and content analysis methods along with text mining approaches to analyze and visualize their results. According to the findings, users who interacted with false rumors fell into three categories: groups that believed false rumors, groups that denied false rumors, and groups that joked about these rumors. Here, it is important to note that while much research on rumors focuses on the role information communication technologies (e.g., Twitter, Snapchat, etc.) play in disseminating rumors, no studies focus on the effects of rumors on technology implementation (i.e., BIM in the construction industry).

With respect to understanding the rumor-spreading process from a theoretical standpoint, a number of theories have emerged in the literature, such as "The basic law of rumor theory" (Allport and Postman 1947) and rumor-spread motivation theory (Bordia and DiFonzo 2005). For example, Allport and Postman's (1947, p. 502) 'basic law of rumor theory' posits that 'the number of rumors in circulation will vary with the importance of the subject to the individuals involved times the ambiguity of the evidence pertaining to the topic at issue.' According to this theory, a rumor is spread when two factors are present: importance and ambiguity. Here, importance refers to the fact that a rumor's subject should interest both speakers and listeners and ambiguity to the facts related to the topic of the rumor, which is often characterized by a degree of vagueness. This ambiguity typically arises from a lack of news, brevity, inconsistency, mistrust, or some other tension that makes an individual unable to accept the facts presented by conventional information channels. These two prerequisites (importance and ambiguity) correlate with rumor transmission. In other words, a rumor will spread if the importance and ambiguity of its subject grow.

Similarly, the rumor-spread motivation theory (Bordia and DiFonzo 2005) is popular in rumor studies. This theory identifies and discusses three motivations for spreading rumors: 1) fact-finding, 2) relationship-building, and 3) self-enhancement. This theory has been widely applied in the organizational studies literature, including Michelson and Mouly's (2000) study, which found that the dissemination of rumors is consistent with prior theoretical motivations. Similarly, Rosnow (1977) found three purposes for spreading rumors: influence, entertainment, and information. These findings are consistent with Sudhir (2018), who maintained that the rationale behind sharing rumors this largely due to four purposes one of which is sharing information, along with anxiety/uncertainty management, relationship management, and self-enhancement. The author found that in the absence of official explanations for a situation, rumors can serve as justifications, which in turn can lead others to spread rumors in order to make sense of situations and offer information to peers.

Such diversity in rumor functions and motivations has led to inquiries about the types of rumors. According to Michelson and Mouly (2000), the literature discusses four types of rumors: pipe dreams, anxiety rumors, anticipatory rumors, and aggressive rumors. This suggests an important question: Are rumors harmful or beneficial in the workplace? According to the management literature and organizational literature (e.g., Michelson and Mouly 2002), rumors can be harmful to organizations. In fact, the most common types of harmful workplace rumors are those associated with organizational change, uncertain environmental circumstances, and crises (Sudhir 2018). For example, the negative effects of unconfirmed information can include mistrust and fear. In practice, rumors can also lead to feelings of anxiety, distrust, and fear among employees and can depress employee motivation (Sudhir 2018).

However, this does not mean that there are no benefits to disseminating rumors. Rogers and Rogers (1976) showed that managers can benefit from the spread of rumors. For instance, an organization can assess the implications of new management initiatives and policy decisions by observing employee reactions to rumors (Mishra 1990; Michelson and Mouly 2000). Similarly, rumors can serve as a method to quickly share information between employees (Michelson and Mouly 2000).

Following this discussion of the motivations for functions of workplace rumors, the question remains as to how managers can address the rumors circulated within an organization. According to Sudhir (2018), managers can adopt a number of strategies to respond to rumors, including 1)

investing in rumor hotlines; 2) denials; 3) rebuttals; 4) bolstering; 5) accepting and apologizing; and 6) legal remedies. Sudhir (2018) also maintained that a vital factor in managing rumors concerns the speed at which organizations intervene in adopting the aforementioned strategies. Other studies have discussed similar approaches to managing rumors. For example, Koller (1992) identified three key strategies: the first is to simply 'wait them out' until rumors fade with time. Second, if waiting doesn't work, rumors should be publicly disproven. Third, organizations should either disseminate accurate information as soon as possible or advertise constructively. On a related note, as the spread of rumors is a dynamic process (Sudhir 2018), the factors that affect this process are the organizational context and individual characteristics (Michelson and Mouly, 2000).

After reviewing the literature on Saudi construction, rumors, organizations, and BIM research, the researcher did not find any studies that have explored the effect of rumors on implementing BIM in AE firms. For this study, a qualitative research methodology will be used to fill this gap in the literature.

3.Research Mmethod

This section outlines the research and data collection methods adopted in this study. This research targets the AE firms in KSA that actively implement BIM. To achieve the study objective, two stages were followed (see Figure 1).

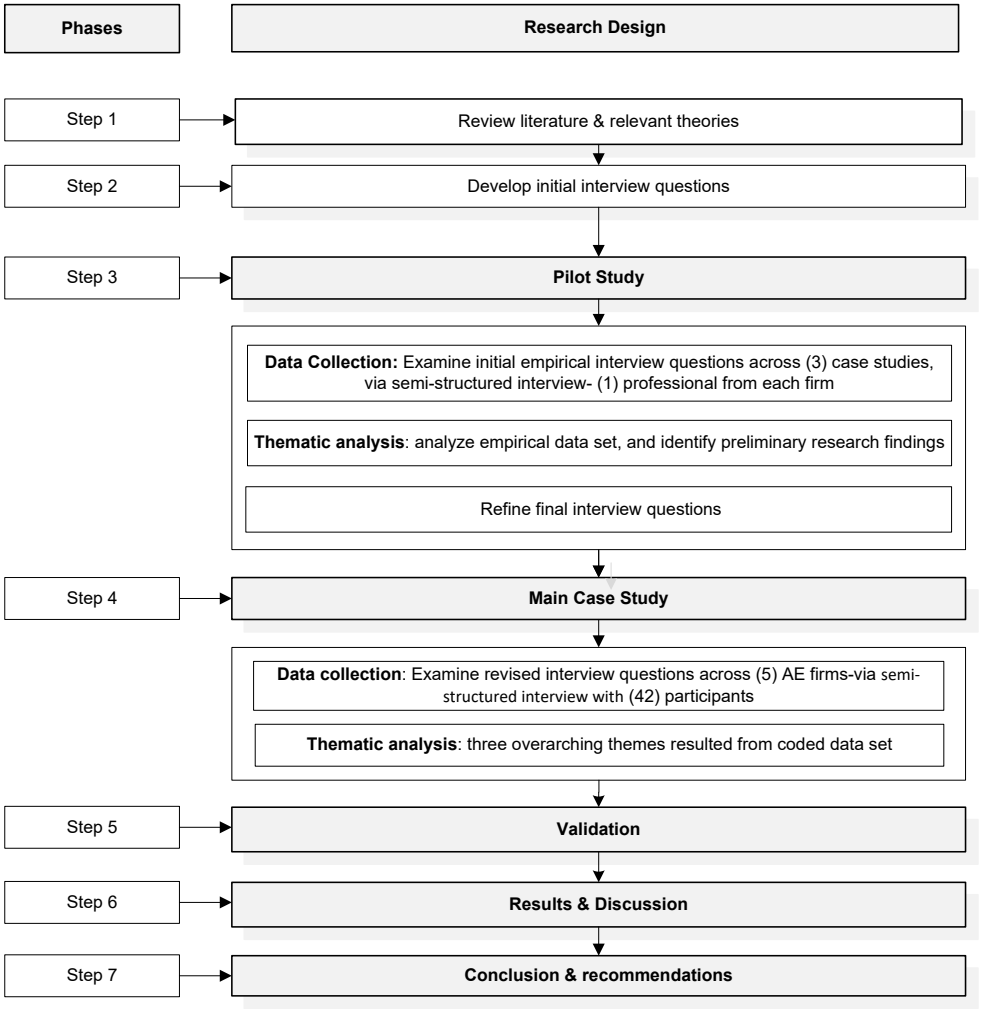

Figure (1). Diagram illustrating the research method

3.1 Case Study

First, a pilot study was conducted with three AE firms for which one professional from each firm with more than four years of experience with BIM was interviewed. There are several reasons to conduct a pilot study as a research technique. First, pilot studies allow researchers to gain a better understanding of issues in the research design and a deeper comprehension of the research context. Second, these studies serve to support the validity of the research findings (Yin 2009). Third, they assist in testing the initial interview questions (Bryman 2015), resulting in improved research quality (Yin 2009). Fourth, pilot studies facilitate the identification of the use of proper data collection techniques. Finally, these studies help researchers in developing coding themes. Here, it is worth noting that the interview questions for the pilot study were derived from the literature.

For the main study, the researcher focused on understanding the research context and responding to the research question: What are the effects of rumors on the implementation of BIM technology? According to Saunder et al. (2009), case study methods provide the ability to respond to 'what' and 'why' research questions. This strategy is most often applied in exploratory studies (Saunder et al. 2009). In addition, to generalize study results, examining multiple cases rather than a single case can be preferable (Yin 2009). As a result, the researcher adopted a case study approach to address the research question in a social and collaborative context and to collect qualitative data from participants at five Saudi AE firms. The firms were selected from among the largest private Saudi AE firms that work in the BIM projects sector and collaborate with the public sector.

3.2 Data Collection Method

Following a literature review on BIM studies, four data-gathering techniques suitable for this study emerged: semi-structured interviews (e.g., Dossick and Neff 2011; Son et al. 2015; Liu et al. 2016; Wang and Leite 2016), questionnaires (e.g., Barlish and Sullivan 2012 Eadie et al. 2013 and Alzara et al. 2016), observations (e.g., Hooper and Ekholm 2010; Linderoth 2010 and Sebastian 2011) and experimentation (e.g., Wang and Leite 2016). Following this, the researcher adopted a qualitative data collection method using semi-structured interviews (Yin 2009). Semi-structured interview data 'are likely to be used not only to uncover and comprehend the 'what' and 'how', but also to place a greater emphasis on exploring the 'why' (Saunders et al. 2009, p.321). This interview approach was chosen because it is appropriate in a case study context and has been widely applied in the BIM literature.

All interviews were conducted as virtual meetings using the Zoom platform. The research participants included architects, BIM managers, BIM coordinators, department managers, and CEM engineers from the five selected Saudi AE firms. The data collection process ran from January 2020 to April 2021 and included interviews with 42 participants with four to eight years of BIM experience. Most interviews ran 60 to 90 minutes, and 65:24:11 hours of interview material were collected. All sessions were audiotaped, transcribed, and manually coded for analysis. To protect the personal information of the participants, interviewees were assigned codes, including A (for architects), E (for engineers), and C (for firms).

3.3 Thematic Analysis

The interview transcripts were coded using a thematic analysis technique. The three themes that emerged were data-driven, and the coding process was conducted in four stages. The first stage generated a list of initial codes. In the second stage, these codes were compared with the results of the pilot study to bring further insight into the list of codes. For the third stage, the literature and relevant theories were reviewed, which resulted in the development of the final list of codes. In the fourth stage, the codes were presented to two experts in the field for their input and to validate the results, which resulted in further refinements to the code list and the emergent themes. Table 2 lists these themes and their codes along with examples of statements taken from the interview transcripts.

It is worth noting that while the data collection process was planned to span four months, obstacles arose related to the COVID-19 pandemic that extended this period for more than ten months. As a result, all planned face-to-face sessions were conducted as online meetings.

Table (2). Themes, codes, and select statements taken from interview data

Themes	Codes	Statements from interview transcripts
1. Lack of awareness	1.1 Lack of professional skill and knowledge	– *'The most frequent rumors [among professionals] relate to BIM disrupting work, because practitioners haven't been educated to understand BIM systems."* (E22-C5) – *'People don't know the difference between BIM as a system and programs as tools. You will find this with many employees as a reason for resistance. People don't mind using Revit as a tool, but when it comes to using it as part of a BIM system, they resist.'* (A6-C2)
	1.2 Resistance to change	– *'Sometimes it happens that engineers who are decision-makers are older, and...because of their age, BIM is new to them. So, they reject anything new that might change their style of working, or calls to learn new skills, or to put in more effort…. They are accustomed to a specific manner of doing things, so they try to disrupt any new things with resistance'* (E2-C1) – *'These people [the resisters] want to avoid using BIM.... They might convey to owners that this technology will waste time, and its implementation failed in the past, and so on....'* (E2-C1) – *'He [an employee] doesn't want to develop his skills or make an effort to learn something new, so he conveys to the owner a false picture of [BIM] technology*.' (E2-C1). – '*One engineer launched a rumor among the decision-makers that BIM was a terrible failure in [office name].'* (E4-C1) – *'Of course, we have a lot of rumors. The project coordinator was against BIM, and he spread rumors that...BIM will delay the delivery of projects'* (A3-C1)
	1.3 Anxiety	– *'You asked about why they're launching rumors? [is that] people are anxious about losing their positions*' (E2-C1) – *'They are anxious about losing their jobs, which is why they're spreading rumors'* (A5-C2)
2. Ineffective role of decision-makers	2.1 Lack of formal policies and government obligations	– *'One thing that has delayed BIM implementation until now is a lack of government legislation to require offices and contractors [to adopt BIM]. This absence of policy has given incorrect rumors about the futility of adopting BIM the opportunity to spread.'* (A18-C4) – *'If the head of the commission, the man above him, a minister or a person in charge of the municipalities—if a decision came out of tomorrow, everyone would work with it. Of course they would ignore all rumors.'* (A23-C5)
	2.2 Ineffective institutional leadership	– *'Senior management attitudes prevented us from growing more with BIM. It's said that it can't succeed, it's simply a luxury…and that some organizations have implemented it and failed, and it has no benefit.'* (E11-C4) – *'Management must direct firms to support practitioners. For example, you have a distinguished person who works on BIM, and he develops his skills. I should distinguish and reward him, so that every employee understands that whoever doesn't grow stays in their position…few companies support this development.'* (A11-C3)
3. Lack of client demand	3.1 Client perception/ knowledge	– *'Some clients have heard about BIM, but their knowledge is too limited.'* (A20-C4) – *'All clients are not familiar with the potential of BIM. They may have heard about it, but, for example, no specialist individual will engage with you in a high-level discussion about a BIM execution plan.'* (A2-C1)
	3.2 Client demand	– *'Clients don't demand it [BIM] in the government and the private sector. The culture of BIM hasn't reached them yet.'* (A2-C5) – *'The market doesn't demand BIM. Generally, clients ask for CAD,... For high-cost projects, we use BIM and later convert [the drawings] to CAD'.* (E10-C3) – *'Some contractors refuse [BIM], and they have the right because their contract doesn't cover BIM work.'* (A12-C4) – *'BIM projects and skilled contractors do exist, but they are few.'* (A7-C2)

4.Results

Although the benefits and challenges of BIM technology have been extensively discussed in the literature, this study shows that rumors play a role in the BIM implementation process in Saudi AE firms. This is largely due to three themes: a lack of awareness, the ineffective role of decision-makers, and low client demand (As shown in table.2).

4.1 Theme 1: Lack of Awareness

The analysis results suggest that the transmission of inaccurate rumors regarding BIM implementation often stems from a lack of awareness among professionals and project parties. The findings suggest that this lack of awareness results from three factors: 1) lack of professional skills and knowledge, 2) resistance to change, and 3) anxiety. Moreover, another finding emerged that within the context of AE firms, such rumors are transmitted through informal communication channels, such as one-on-one meetings, phone calls, and text messages.

Many participants discussed the phenomenon of rumor transmission around BIM due to a lack of BIM skills and knowledge among professionals and project parties, which is an obstacle to implementing BIM within Saudi firms. For example, one interviewee reported that 'The most frequent rumors [among professionals] relate to BIM disrupting work, because practitioners haven't been educated to understand BIM systems.' (E22-C5). This has resulted in increased transmission of false rumors about BIM-related challenges. Similarly, the study findings revealed a link between a lack of skills and knowledge among older and more senior individuals and increased dissemination of rumors. For example, according to one participant, 'An older and more senior staff member sometimes told the owner that using BIM is a waste of time, and that he tried to implement it before and failed' (E2-C1). The same participant interpreted this behavior as follows:'[He] doesn't want to grow professionally or make an effort to learn something new, so he conveys to the owner a false picture of [BIM] technology.' Concerning BIM implementation, participants suggested a correlation between low awareness and lack of BIM training, forums and conferences, and the dissemination of rumors.

In terms of resistance to change, the study results showed that rumors were often used as a tool of resistance to change within the firms. Moreover, negative rumors were often spread by BIM users who have had negative experiences with other users or organizations. For example, 'One engineer started a rumor among decision-makers that implementing BIM was a terrible failure in [office name]' (E4-C1). According to this participant, this increased resistance to change manifested either in the form of outright rejection or the dissemination of similar rumors about BIM's ineffectiveness. Another participant stated that 'sometimes…engineers who are decision-makers are older, and...because of their age, BIM is new to them. So, they reject anything new that might change their style of working, or calls to learn new skills, or to put in more effort…. They are accustomed to a specific manner of doing things, so they try to disrupt any new things with resistance' (E2-C1). This participant then clarified that 'These people [the resisters] want to avoid using BIM... They might convey to owners that this technology will waste time, and its implementation failed in the past, and so on....' (E2-C1).

With respect to the dissemination of rumors, one participant stated,'Of course, we have a lot of rumors. The project coordinator was against BIM, and he spread rumors that...BIM will delay the delivery of projects (A3-C1). In addition, as discussed previously, older employees and those in positions of power tend to resist change by spreading rumors. The study findings suggest that this is due to practitioner anxiety regarding the transition to new systems. To illustrate this point, one participant indicated 'People are anxious about losing their positions' (E2-C1).

Consequently, the results revealed that the dissemination of rumors resulted from a lack of awareness across project parties, which eventually contributed to delays in BIM implementation in Saudi firms.

3.2 Theme 2: Ineffective Role of Decision-makers

The second theme that emerged concerns the ineffectiveness of decision-makers i.e., owners, organization leaders, and government officials with respect to BIM uptake. According to the results, this ineffectiveness can be found at both institutional and governmental levels and is largely due to the lack of policies and mandates for BIM implementation in Saudi projects, as well as the inefficiencies of institutional leadership in terms of

providing training and incentives for employees.

At the governmental level, the study results suggest that a lack of government policy has contributed to the spread of rumors about BIM benefits and challenges, and then on the BIM implementation process. To illustrate this, one participant stated that 'One thing that has delayed BIM implementation until now is a lack of government legislation to require offices and contractors [to adopt BIM]. This absence of policy has given incorrect rumors about the futility of adopting BIM the opportunity to spread' (A18-C4). Moreover, rumors are often introduced in official meetings between the BIM teams and some government ministries. As another participant stated, 'We [organization representatives] don't need BIM, we currently work in 2D… [and] we already have regulations stipulating that architectural offices must review requirements' (E10-C3). When asked why they don't want BIM, he said, 'We don't want to add more load to us. Each office must check for itself. This method works well for us, so we don't want to complicate the process. All you do [BIM teams] is 3D.' According to this participant and others, some widely repeated rumors by decision-makers state that 'BIM is simply 3D rendering', despite numerous attempts by BIM teams to clarify this distinction.

At the institutional level, the participants asserted that institutional leadership plays a key role in the dissemination of rumors. According to the findings, this role concerns a lack of professional training courses, motivation and incentives. For example, there was consensus among participants that an absence of professional BIM training courses and knowledge facilitated the circulation of rumors. Moreover, in some cases, it was discovered that many employees who were involved in the transmission of BIM-related rumors 'treated them as facts rather than rumors' (A18-C4). In terms of the role motivation and incentives play in this process, the findings suggest that both had a significant effect on the spread of rumors concerning BIM. For example, the results showed that in the absence of leaders offering BIM training and knowledge courses, the main incentive for professionals to develop their skills was self-motivation. However, according to responses such as this statement, 'This doesn't imply that their gains in competence levels were enough' (E14-C4). Moreover, the results found a general lack of appreciation for these professional efforts. As a result, in one instance 'several staff employees left their jobs' (E22-C5).

In addition, many participants stated that individual efforts most commonly appeared in conjunction with a lack of decision-maker initiatives at the institutional level. As a result, in the absence of government policies that require BIM, most BIM implementation in Saudi firms has been based on individual efforts that resulted in the formation of small groups of professionals who are interested in BIM. According to the findings, these small groups have attracted other interested professionals and many who were not yet interested in the benefits of BIM or aware of the consequences of delaying BIM implementation. However, given the fact that the influence of these groups was limited, this situation contributed to the dissemination of rumors as a form of resistance.

The findings also show that leaders and managers occasionally use rumors to assess managerial decisions. For example, 'Senior management attitudes prevented us from growing more with BIM. It's said that it can't succeed and is simply a luxury… and that some organizations have implemented it and failed, and it has no benefit' (E11.C4). When asked about the spread of rumors by leaders and managers, participants recalled several instances. For example, one stated, 'Why BIM? The traditional [2D] way gives us the same result… BIM is just luxury and show, it's 3D, and they [employees] play with it. This is a strong rumor that exists.' (A23-C5). Other participants stated that some senior managers have similar perceptions about BIM, such as this response: 'All the information that BIM can supply…we do it manually." (E9-C3). In addition, many participants identified a widely circulated rumor that BIM is '…3D, and we don't want 3D.' As most participants indicated, this suggests that the BIM implementation process requires active management, which prompted inquiries as to the types of support that decision-makers can offer to staff. Some participants suggested that the government should partner with software companies to offer training courses, non-profit forums, and competitively-priced software and supplies.

In general, participants confirmed that the presence of BIM-related rumors can affect its implementation and that this situation was largely due to the ineffectiveness of decision-makers at governmental and institutional levels.

3.3 Theme 3: Lack of Client Demand

According to the findings, another factor that influences the effect of rumors on BIM implementation is a lack of client demand. Many participants supported this notion, with one stating that 'Clients don't demand it [BIM] in the government and private sectors. The culture of BIM hasn't reached them yet' (A2-C5). Moreover, the findings suggest that this low demand is a result of client perceptions, which can shift depending on a number of factors, including news reports, anecdotes regarding BIM, and level of awareness. For example, some participants stated that rumors sometimes circulated among clients, such as, 'BIM delays the delivery of projects despite its high cost' (A18-C4), and that while 'Some clients have heard about BIM, their knowledge is limited' (A20-C4).

Thus, the results suggest that clients generally lack sufficient knowledge to encourage them to demand BIM services. In addition, most participants mentioned that client awareness can play a role in improving understanding and perception of BIM, which could help clients filter misinformation and inaccurate rumors regarding the technology and lead to increased client demand. However, several participants also asserted that increased client awareness is insufficient in the absence of government policies mandating the use of BIM. Similarly, the study findings suggest that if the use of BIM were mandatory, client perceptions regarding the technology could change, which could, in turn, affect the content and frequency of rumors regarding the potential of BIM.

In addition to the lack of client demand, participants identified a general reluctance of contractors to implement BIM as another factor that can contribute to decreased client demand. For example, one participant explained that 'some contractors refuse [BIM], and they have the right, because their contract doesn't cover BIM work' (A12-C4), and another indicated that 'BIM projects and skilled contractors do exist, but they are few' (A7-C2). One participant interpreted this situation as 'contractors refusing to work on BIM projects because they believed it is against their interests' (E4-C1). Furthermore, the results showed that while some AE firms are knowledgeable about BIM and have highly competent employees and resources, their deliverables are typically converted from BIM to CAD formats. One participant stated 'The market doesn't demand BIM. Generally, clients ask for CAD,… For high-cost projects, we use BIM and later convert [the drawings] to CAD' (E10-C3).

Here, it is important to note that this study explored how rumors affected BIM implementation under ordinary professional conditions. However, as discussed previously, the COVID-19 pandemic affected the data collection period and method. As a result, an unexpected finding emerged that 'The COVID-19 crisis hasn't had any obvious negative effect on BIM projects... Indeed, the crisis affected the economy as a whole, but not BIM projects…. It could be said that the crisis benefited the BIM concept' (E10-C3). In fact, many participants asserted that the need for employees to work remotely is growing more than before, particularly in times of crisis. One stated that 'following the COVID-19 crisis, the importance of integrating BIM has grown' (A21-C5). The findings also showed that a lack of policies and awareness, especially during unusual circumstances, led to increases in employee anxiousness, which in turn contributed to the spread of rumors. According to participants, the number of projects declined during COVID-19, which resulted in elevated fear and anxiety among staff about losing their jobs.

In conclusion, the findings suggest that rumors appear to play a significant role in the BIM implementation process in Saudi AE firms. Surprisingly, practitioner anxiety about the transition to new, innovative work systems was found to be a source of rumors surrounding the use of BIM. Further, the results showed that client awareness is insufficient without government mandates for the use of BIM by project partners and that client perceptions of BIM could shift if mandates were enacted, which could change the content, frequency, and spread of rumors. Finally, in contrast to non-BIM projects, the COVID-19 crisis had no obvious negative effect on BIM projects. This suggests that the pandemic may have supported the implementation of BIM.

5.Discussion

This paper addressed the question of whether rumors play a role in the adoption of BIM, the related benefits and challenges of this process, and their effects on implementing BIM in AE firms. The data analysis results of the 42 interview transcripts suggest that the dissemination of rumors influences the implementation of BIM technology in Saudi AE firms. This is due to three main causes: lack of

awareness, ineffective role of the decision-makers, and lack of client demand.

Concerning lack of awareness, several influential factors were revealed: 1) lack of professional skills and knowledge, 2) resistance to change, and 3) anxiety. Following this, the findings suggest that a lack of professional skills and knowledge contributed significantly to negative experiences, which subsequently led to the spread of incorrect rumors about BIM challenges, and, in certain cases, it resulted in creating resistance to change by professionals. Along with this, resistance mainly appeared among older employees and those in positions of power. Despite the fact that resistance to change has been well explored in the literature, such as Rowlinson et al. (2010) Dossick and Neff (2011), and Eadie et al. (2013), the analysis revealed that the spread of rumors was employed as a method of resistance to BIM implementation inside AE firms. Although studies of rumors (e.g., Sudhir 2018) indicated that one consequence of spreading rumors includes feelings of anxiety and fear among employees, this study found that one of the reasons for spreading rumors is employee anxiety about using new technologies. According to the findings, rumors have contributed to delaying or, in some circumstances, terminating BIM implementation in Saudi AE firms. Although it is widely agreed upon in the BIM literature that the aforementioned factors are influential in implementing BIM successfully (e.g., Khosrowshahi and Arayici 2012; Hore and Mcauley 2013; Ahuja et al. 2020), for this study, this implies that their contribution in spreading rumors was significant. In addition to this, from the perspective of rumor theory (Allport And Postman 1947), the presence of inexperienced professionals, ambiguity in understanding the benefits and challenges of BIM, and interest from practitioners all contributed to the spread of rumor among professionals.

The second theme concerns the ineffective role of decision-makers, i.e., owners, organizational leaders, and government officials. The study results revealed that this phenomenon has led to a lack of policies and government mandates for BIM implementation in Saudi projects and a lack of motivation and incentives. This, in turn, affected the success of the implementation of BIM technology. For example, in the absence of policy, a smaller group has taken the lead in the BIM implementation process, which poses a risk to the future of this approach. This is because the implementation process is linked to knowledge and skill levels. Following this, the findings suggest that this group launched and circulated unconfirmed, inaccurate, and incomplete information about BIM benefits and challenges and the future of the technology in the industry. In the absence of authentic decision-makers, they have taken on the role of de facto legislators. This could perhaps be explained by rumor spread motivation theory (Bordia and DiFonzo 2005), which holds that certain groups circulate rumors to reinforce their position and roles in organizations. In addition, according to studies such as Rosnow (1977), one of the main objectives of spreading rumors is to gain influence. Thus, the motivation for spreading rumors may be to influence employees to adopt BIM in their organizations or vice versa. It is worth noting that analysis of the participant data revealed that most of the content of the circulated information was quite limited, and some were incorrect, with little information being exaggerated.

Here, it is important to mention that the timeframe for collecting data extended into the COVID-19 pandemic period. Thus, this crisis might have participated in increasing the level of transmission of rumors. This finding is consistent with other studies on the impact of rumors on organizations (e.g., Sudhir 2018), who found that rumors can become more harmful to organizations in times of crisis and under uncertain environmental circumstances.

Surprisingly, the study results suggest that many BIM departments were more active during the COVID-19 pandemic period than other departments within the same firms that had closed. This demonstrates the performance of BIM technology under pandemic conditions. In addition, the study findings support those in the BIM literature (e.g., Abbasnejad et al. 2020; Ahuja et al. 2020) that suggest that a lack of motivation, incentives, and legislation are all influential factors in the success of implementing BIM. This study, on the other hand, added the effect of rumors as a new dimension of the impact of these factors.

The third theme concerns a lack of client demand and how it relates to the spread of rumors. According to the findings, low client demand is caused by a lack of perception of BIM benefits and challenges, which can lead to an increase in the transmission of misleading information about new technology i.e., BIM. This can influence perceptions and in turn, affect demand for BIM

implementation in firms. This phenomenon could help to explain why BIM technology is not in high demand in the Saudi market. Furthermore, the results revealed that contractors are reluctant to switch to BIM, assuming that it will be detrimental to their interests. On the other hand, the findings do not suggest that client perceptions affect contractor perceptions, or vice versa. Many researchers have studied the effect of client demand on the process of BIM implementation (e.g., Brewer and Gajendran 2010; Linderoth 2010; Khosrowshahi and Arayici 2012; Eadie 2013; Ahuja et al. 2020) and lack of expertise in the BIM implementation process (e.g., Goes and Santos 2011; Eadie et al. 2013; Abubakar et al. 2014; Liu et al. 2016; Ahuja et al. 2020). However, none of these studies clarify the influence of lack of client demand on rumors and their relevance to BIM implementation.

This study is consistent with the BIM literature on the influence the aforementioned factors have on the success of BIM implementation processes. However, this work adds a new dimension, namely the effect of rumors on BIM implementation in Saudi AE firms.

6.Conclusion and Future Work

The purpose of this study was to explore the influence of the spread of rumors on the implementation of new technologies (i.e., BIM) in Saudi architectural engineering firms. This aim was addressed through a case study research approach on the effect of rumors on BIM implementation. The results of the literature review and case study analysis suggest that the causes of this phenomenon can be categorized into three overarching themes: lack of awareness, lack of influence of decision-makers, and lack of client demand. Interestingly, the findings revealed that the primary means used to spread rumors in AE firms is through informal channels, which is consistent with the literature (e.g., Michelson and Mouly 2002). Based on this study, rumors should be employed in a way that serves to accelerate BIM implementation while also ensuring that practitioners recognize the importance of BIM.

Concerning the contribution to knowledge, this study is the first attempt in the BIM literature that explores the rumor impact on implementing new technology in AE firms in general, and in Saudi AE firms in particular. Although numerous studies in the BIM literature provide insight into the factors that influenced the success of the BIM implementation process, this research demonstrates that some of those factors are associated with the rumor-spreading phenomenon across various professionals. For instance: lack of professional skill and knowledge, resistance to change, and ineffective leadership skills. In addition, the research result revealed that the presence of rumors could be delayed or sometimes canceled BIM implementation in AE firms. For example, one of the significant findings was that BIM adoption in AE firms is slower than expected, which was due partially to the role of incorrect rumors. Along with this, it is important to mention that the influence of rumors within AE firms varies depending on individual characteristics and workplace context.

In terms of research implications for practice, a review of rumor literature (e.g., Sudhir 2018) revealed the negative impact of incorrect rumors can lead to feelings of mistrust, fear, anxiety, and a decrease in employee motivation. For this reason, studying the effects of rumors as a common practice and social behavior on the BIM implementation process constitutes a step forward in formulating strategies and approaches for this process. For instance, raise awareness regarding the consequences of spreading the rumors, address incorrect rumors regarding BIM technology, deliver in-house solutions, and offer BIM-related practical and theoretical coursework for practitioners and stakeholders. Thus, AE firms must identify various sorts of rumors and their contents, and then determine appropriate methods to address or reduce their impact, especially with implementing new innovative technologies. Because, being aware of the driving factors behind the spread and impact of rumors on BIM implementation, such as the lack of professionals skills and knowledge, resistance to change, and lack of awareness; enables forwards, the firms to set up solutions and proper strategies for these issues in advance, which thus reduces or eliminates the spread of incorrect rumors and subsequently their impact.

Hence, to improve the BIM implementation level in AE firms, it, recommends including the consequences of spreading rumors and the practical ways to curtail it in domestic BIM education and research agenda. Also, it is necessary to provide research grants for national research institutions and centers to improve the implementation process. Finally, the author recommends that the gap between government institutions and AE firms be

bridged to pursue what is best practice for the Saudi construction industry. All of which will be greatly beneficial to the Saudi construction industry.

Contrary to expectations, in terms of the crisis (i.e., the COVID-19 pandemic), the results showed that the relevance of BIM technology increased and the demand for remote work is growing. Consequently, the concept of implementing BIM benefited from the COVID-19 crisis.

While the researcher studied multiple cases rather than a single case to generalize the study outcomes, the COVID-19 pandemic had a significant impact on this study. For this reason, and for generalization purposes, there is a pressing need for researchers, developers, and practitioners to study the impact of rumors in other countries or BIM contexts under more typical circumstances. Following this, the researcher recommends applying additional theories related to rumors in this context, which could assist in exploring additional influences, deeper interpretations, and insights into how to improve the BIM implementation process.

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تأثير الإشاعة على عمليات تطبيق نمذجة معلومات البناء (BIM) في شركات الهندسة المعمارية (EA) في المملكة العربية السعودية

الجوهرة عبدالله الناصر

أستاذ مساعد، قسم العمارة وعلوم البناء، كلية العمارة والتخطيط، جامعة الملك سعود، الرياض، المملكة العربية السعودية.

aaalnaser@ksu.edu.sa

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ملخص البحث. تواجه صناعة البناء في المملكة العربية السعودية حاليًا تحديات كبيرة تتعلق بتأخير المشروع وتجاوز التكاليف وعدم كفاية التعاون مع أصحاب المصلحة في المشروع، وكل ذلك أعاق أجندة الحكومة. استجابة لذلك، حظيت نمذجة معلومات البناء (BIM) مؤخرًا باهتمام كبير باعتبارها ابتكارًا مناسبًا من قبل مجموعة من أصحاب المصلحة في المملكة العربية السعودية. ومع ذلك، على الرغم من مزايا BIM العديدة، إلا أن فوائدها الكاملة لم تتحقق بعد. لهذا السبب، تدعم مجموعة كبيرة من المؤلفات أهمية BIM في شركات الهندسة المعمارية (AE) من خلال التركيز على تحديات وفوائد BIM، بالإضافة إلى عوامل نجاحها. على الرغم من ذلك، فإن دراسة حول كيفية تأثير الشائعات على عملية تنفيذ BIM لا تزال في مهدها. لهذا السبب، تهدف هذه الورقة إلى استكشاف الدور المؤثر الذي تلعبه الشائعات فيما يتعلق بالتحديات والفوائد المحتملة للتكنولوجيا الجديدة (BIM) على عملية تنفيذ مثل هذه التكنولوجيا في شركات AE. عند القيام بهذا البحث، تم إجراء مراجعة الأدبيات عبر مجموعتين من الأدبيات: دراسات متعلقة بنمذجة معلومات البناء BIM ودراسات علم الشائعات. بالتوازي مع هذا، تمت مراجعة النظريات مثل نظرية التعاون عبر المهن (Amabile et al. 2001)، ونظرية تحفيز انتشار الشائعات (Bordia and DiFonzo 2005)، والقانون الأساسي لنظرية الشائعات (Allport And Postman 1947). بعد ذلك، تم اعتماد منهج دراسة الحالة وتم إجراؤه على مرحلتين. تم إجراء دراسة تجريبية تم من خلالها اختيار خمس حالات دراسية من بين الشركات السعودية الرائدة في المملكة العربية السعودية. تم جمع البيانات من ٤٢ مقابلة شبه منظمة مع مجموعة من المهنيين، وأظهر التحليل الموضوعي وجود تأثير كبير للشائعات على نجاح تطبيق BIM. ويرجع ذلك أساسًا إلى ثلاثة عوامل رئيسة: نقص الوعي، وعدم فعالية دور صانعي القرار، ونقص طلب العملاء. إضافة الى ذلك، تدعم هذه النتائج نتائج الدراسات السابقة حول مجموعة من التحديات الرئيسة التي تمت مواجهتها في تنفيذ BIM. تساهم هذه الدراسة في الأدبيات من خلال تقديم رؤى جديدة حول تأثير الشائعات على نجاح تطبيق BIM في شركات AE السعودية. علاوة على ذلك، امتد تأثير الشائعات إما إلى تأخير أو إلغاء مفهوم تطبيق BIM في بعض شركات AE . على عكس التوقعات، زادت فائدة BIM مع أزمة COVID-19. نتيجة لذلك، يوصى بإجراء مزيد من البحث حول الموضوع الحالي .

الكلمات المفتاحية: نمذجة معلومات البناء، الإشاعات، عمليات تطبيق، شركات الهندسة المعمارية السعودية