

# **DESIGNING DIGITAL TRANSFORMATION IN CONSTRUCTION: EPISODIC AND CONTINUOUS CHANGE PATTERNS IN BIM IMPLEMENTATION**

## **INTRODUCTION and BACKGROUND**

With numerous stakeholders and a wide range of role relationships, networks, and structures, the construction industry is a fragmented sector. Digital transformation in construction has emerged as a critical imperative for organizational survival and competitive advantage, with Building Information Modelling (BIM) representing one of the most significant technological shifts in the industry (Dossick & Neff, 2010). Yet despite widespread recognition of BIM's potential to revolutionize project delivery, construction firms continue to struggle with implementation, with many organizations experiencing protracted adoption processes, resistance from practitioners, and difficulty realizing anticipated benefits (El Hajj et al. 2023; Hire et al. 2022; Won et al. 2013; Xing et al. 2023; Xu et al. 2022). This reveals that digital transformation is not merely a technological problem, but an organizational design problem requiring careful attention to how change itself is conceptualized, organized, and executed (Hinings et al., 2018).

Chan (2018 p. 156) suggests that 'there is a deeply entrenched logic in organizing of construction work that drives resistance to technological change and innovation.' The construction industry has long been plagued by institutionalized ways of working that resist change. However, once formed, institutions evolve gradually due to unintended, interdependent actions taken by various agents over extended periods. Still, this literature has given insufficient attention to the temporal dynamics of organizational change—specifically, how construction firms navigate the tension between planned, episodic interventions and emergent, continuous evolution in their digital transformation journeys (Weick & Quinn, 1999). This gap is particularly significant because construction organizations operate in a paradoxical environment: they are simultaneously project-based (episodic by nature) and continuously evolving enterprises requiring ongoing adaptation to technological, regulatory, and market changes (Bakker et al., 2016).

The effectiveness of this transformation process depends on the mutual interaction between different individuals, groups, and contexts (Langley et al. 2013). These agents initially engage in processes, interpret circumstances, and eventually develop customary reactions that evolve into 'taken-for-granted' situations. Several studies have theorized technology as a vehicle for institutional change (Scott 2014). Drawing on institutional theory, practice-based perspectives and

change management scholarship, a qualitative case study approach is used to understand how two construction contracting firms navigate digital transformation with respect to BIM.

Thus, this paper explores how different patterns of organizational change- episodic and continuous- shape the trajectory and outcomes of digital transformation in construction. Also, try to understand the implications of these patterns for how organizations design their own transformation processes. By analyzing the experiences of two construction contracting firms, this research contributes to the change management literature by providing a theoretical lens to understand the mechanisms of digital transformation in a dynamic, emerging economy. The findings, which highlight the presence of both episodic and continuous change, offer valuable insights into how firms navigate the complex pressures to innovate. This study is in the early stages of development.

## **METHODOLOGY**

An inductive longitudinal case study was conducted to explore the existing institutional arrangements surrounding BIM implementation and the organizational change brought about by endogenous factors. Hughes suggests that institutions endure because individuals interact and perpetuate them (Scott, 2014). Geiger (2009) posits that analyzing organizational actions and related activities is key to comprehending them, as organizations constantly enact processes. The process of studying evolution can be challenging as it happens gradually over time, and the signs of change may not always be immediately apparent. However, by speaking with individuals involved in projects using BIM since 2009, we gain insight into the journey of change, their role, and their strategies. These conversations help to understand changes in work practices, the purposive actions by these agents, and the use of digital technology. We now provide a brief overview of the case setting, followed by a description of data collection and analysis.

**Research setting.** This research delves into understanding the change process to the organization due to the application of Building Information Modelling (BIM) by two prominent construction contracting firms in India, referred to as Firm Alpha (FA) and Firm Beta (FB), throughout this paper. These firms, FA and FB, handle projects spanning across diverse sectors such as residential, industrial buildings, educational campuses, airports, bridges, and metro rail. Even though these firms have integrated digital technology such as BIM into their design and execution phases, the transition from manual drafting to the use of CAD drawings and other construction techniques has

been slow. By interacting with some of the personnel, this study tries to understand the evolution of the firms due to BIM adoption since 2009 for FA and FB.

**Data collection.** We primarily gathered data through extensive interviews with personnel directly involved in the BIM implementation journey. Alongside this, we collected secondary data from PowerPoint presentations and contract documents from various projects. Our approach was unbiased, with no initial hypothesis in place, and our findings evolved from the data. We conducted a total of 62 interviews with personnel from Firm A and Firm B, with the difference in interview hours attributed to factors such as company size, BIM team size, level of BIM adoption, and the type of adoption at each firm. We conducted multiple interviews with each informant and compared their stories with those of other informants to increase the data's internal consistency and validity (Yin 2018). We encouraged informants to discuss their strategies for fulfilling BIM requirements and how BIM affected their workflow, organizational structure, existing ways of working, and roles.

**Data analysis.** The transcription process for the interviews involved both manual and software methods, with the Descript software being utilized in some cases. For accuracy, any errors in the software generated transcripts were corrected manually. Our analysis was conducted manually through a process of open and axial coding, following the methodology outlined by Corbin and Strauss (2008). Initial coding identified key events, decisions, and practices in each firm's BIM journey. Subsequent analysis compared temporal patterns, organizational structures, and practice evolution across cases, deliberately seeking points of divergence. Drawing on Weick and Quinn's (1999) framework, we categorized change initiatives, decision-making processes, and practice adaptations as primarily episodic or continuous. This categorization then informed deeper analysis of consequences and mechanisms. Throughout the analysis, we engaged in constant comparison (Corbin & Strauss, 2008) both within and across cases to develop theoretical insights about how change patterns shape transformation outcomes.

## **FINDING**

FA has been a well-established corporation with numerous subdivisions that specialize in an array of projects, ranging from infrastructure, such as airports, metro rail, coastal roads, bridges, to residential, health and hospitality, educational institutes, and commercial establishments. During our study, we interacted with several key personnel, including the Vice President of the digital team, the Design Head, the Head of BIM strategy, BIM managers, BIM coordinators, engineers,

senior architects, and site personnel directly involved in utilizing BIM. Initially, BIM was implemented at the project level to meet stringent deadlines for the construction of complex airport projects in two Indian cities, with a primary focus on MEP services. Over time, the teams expanded their usage of BIM into other areas, thereby enhancing their capabilities. As the project teams demonstrated improved performance, top management recognized the value of BIM adoption and transitioned to an organization-wide approach. Throughout this time, project teams at all levels continued to improve performance and drive innovation at the project level.

Through experience gained from previous projects, the teams gained more confidence in utilizing BIM. The top management was informed about the benefits of BIM by the experienced project teams, which led to the establishment of a central BIM team by 2017. This team encouraged other project teams within the organization to adopt BIM and, in collaboration with various software vendors, provided training to enhance their awareness. They also assigned new roles and responsibilities, such as BIM managers at a centralized level and BIM coordinators at the project site, to focus on BIM implementation. Initially, BIM was used only by the design team, but later BIM coordinators and planning engineers extended its use to the site, with support from BIM managers.

FB, a company with an extensive history, has primarily focused on executing residential projects, commercial buildings, and factories. By 2010, the senior leadership recognized the importance of digital technology in construction and decided to adopt BIM. However, as the teams lacked BIM capability, external consultants were initially brought in to assist with pilot projects. Despite these efforts, the company was unable to successfully implement BIM. This can be attributed to the hesitance of lower and middle management teams to implement BIM. To address this, the senior leaders decided to distribute BIM implementation across various regions and provided each team with guidelines and manuals to aid in the integration of BIM into their projects. As a result, the decision was made to decentralize BIM utilization responsibility to regional offices, which led to increased regional responsibilities for BIM implementation and exploration of various use cases. However, actual BIM use on projects often diverged from prescribed ways or failed to take off at all. Although no special BIM team was formed, top management aimed to make it a standard way of working. Over time, regional project teams independently built their capabilities and became more enthusiastic about BIM use, starting with visualization and moving on to clash detection and quantity take-off. Despite this effort, cross-learning opportunities were limited because senior

leadership handled each regional level individually. Eventually, BIM specialists were recruited to accelerate adoption, with management taking a top-down approach to incorporate BIM into the organization. The informants from this company included the Head of Strategy, the Head of Planning-VDC, the Manager of Operations, the Senior Manager of Strategy, the Architect, and the VDC Modelers.

## **DISCUSSION AND CONCLUSION**

Digital transformation in construction with regard to BIM raises fundamental questions about how organizations design and manage their own evolution. We extend the understanding of dynamics in organizational change by showing how episodic and continuous patterns guide the digital transformation. These patterns functioned as what Weick (1995) terms sensemaking structures that shaped how organizational members interpreted and responded to the digital transformation.

### **Continuous change**

Continuous change is “life”- the constant adjustment that constitutes organizational existence (Weick & Quinn, 1999, p.375). Here, the change is ongoing, evolving, and cumulative with small modifications that occur constantly as people adapt to local contingencies and learn from experience. In the first case, the agents modified both their actions and their manner of interacting with other actors, thereby creating an environment conducive to change as suggested by Barley (2020). This continuous change pattern manifested in organic diffusion rather than planned rollout. Project team members initiated the use of BIM in their work, gradually building their skills by starting small at the project level. BIM managers led small BIM teams in defining and refining the uses of BIM, starting with MEP services, as these often led to significant reworks resulting in time and cost overruns. As these new practices became habitual and were implemented in other projects, they began to raise awareness and build capacity among other project teams. The firm offered minimal corporate direction, instead allowing practices to evolve through use and gradual stabilization. Institutionally, this pattern reflects what Oliver (1991) terms “acquiescence” at the organizational level. The firm conformed to external BIM requirements when the client demanded them, but allowed practitioners to interpret what BIM meant and how it should be practiced internally. Ultimately, BIM adoption was achieved through cognitive agents (Scott, 2008), with

BIM managers being considered carrier professionals (ibid) who took the initiative, improvised, and helped lower management.

### **Episodic change**

From an institutional perspective, FB's approach reflects a strong commitment to normative and regulative isomorphism (DiMaggio & Powell, 1983). As posited by Weick and Quinn (1999), episodic change is characterized as infrequent, discontinuous and intentional- typically conceptualized as planned interventions to move organizations from one state to another. This view, rooted in Lewin's (1947) unfreeze-change-refreeze model, assumes organizations are relatively stable systems that occasionally require deliberate disruption and restructuring. Episodic change is "drama"- visible, bounded events with clear beginnings and endings (Weick & Quinn, 1999, p.365). The firm sought to achieve legitimacy through visible alignment with best practices. However, episodic logic created tensions when confronted with the emergent nature of change. But FB did not bring about any dramatic change, despite displaying an episodic change.

It can be seen that the firms follow a combination of patterns. This is supported by Burnes (2004), who argues that for successful transformation, alternating between episodic intervention and continuous refinement is required. We extend change management theory by identifying the conditions under which episodic and continuous change patterns create complementarity versus tension. While existing research recognizes that these patterns can alternate (Romanelli & Tushman 1994) or coexist (Farjoun 2010), we show that the sequence matters critically. Continuous change builds practice-level capability, and cognitive legitimacy creates conditions for successful episodic consolidation (Firm Alpha), whereas episodic intervention without this foundation encounters resistance and fails to catalyze continuous evolution (Firm Beta). This reveals that cognitive institutional change through continuous experimentation may be a prerequisite for successful normative-regulative institutional change through episodic intervention. For practitioners, we suggest that BIM implementation requires rethinking transformation as orchestrating temporal dynamics rather than executing predetermined plans. It is suggested to start by enabling continuous experimentation to build capability and demonstrate value. Then recognize when episodic consolidation becomes viable, accordingly, design consolidation as formalization of emergent practices, and maintain space for continuous evolution.

We intend to further dig deep into understanding the characteristics of the change agents, their mechanisms to bring about change and understand why episodic change brought about a slow change in construction despite the studies speak about dramatic changes in each of the episodes. Also, expand the study to explore the implications of these patterns on how organizations design their own transformation processes. Further, it can be investigated whether transformation can be designed in advance or emerge through flexibility.

## REFERENCE

- Bakker, R. M., DeFillippi, R. J., Schwab, A., & Sydow, J. (2016). Temporary organizing: Promises, processes, problems. *Org. Stud.*, 37(12), 1703-1719.
- Burnes, B. (2004). Kurt Lewin and the planned approach to change: A re-appraisal. *J. Manag. Stud.*, 41(6), 977-1002.
- Chan, P. 2018. "Change and Continuity: What can construction tell us about Institutional theory?" *Soc. under Constr.*, D. J. Sage and C. Vitry, eds., 151–184. Cham: Springer International Publishing.
- Corbin, J., and A. Strauss. 2008. *Basics of Qualitative Research: Techniques and Procedures for Developing Grounded Theory*. Sage Publ. Inc. USA: Sage Publications, Inc.
- DiMaggio, P. J., & Powell, W. W. (1983). The iron cage revisited: Institutional isomorphism and collective rationality in organizational fields. *Am. Soc. Rev.*, 48(2), 147-160.
- Dossick, C. S., & Neff, G. (2010). Organizational divisions in BIM-enabled commercial construction. *J. Constr. Eng. Manag.*, 136(4), 459-467.
- El Hajj, C., G. Martínez Montes, and D. Jawad. 2023. "An overview of BIM adoption barriers in the Middle East and North Africa developing countries." *Eng. Constr. Archit. Manag.*, 30 (2): 889–913. <https://doi.org/10.1108/ECAM-05-2021-0432>.
- Farjoun, M. (2010). Beyond dualism: Stability and change as a duality. *Acad. Manag. Rev.*, 35(2), 202-225.
- Geiger, D. 2009. "The Practice-Turn in Organization Studies: Some Conceptual and Methodological Clarifications." *Methods Bus. Adm.*, A. G. Scherer, I. M. Kaufmann, and M. Patzer, eds., 187–205. Gabler Verlag Wiesbaden.
- Hinings, B., T. Gegenhuber, and R. Greenwood. 2018. "Digital innovation and transformation: An institutional perspective." *Inf. Organ.*, 28 (1): 52–61. <https://doi.org/10.1016/j.infoandorg.2018.02.004>.
- Hire, S., S. Sandbhor, and K. Ruikar. 2022. "Bibliometric Survey for Adoption of Building Information Modeling (BIM) in Construction Industry– A Safety Perspective." *Arch. Comput. Methods Eng.*, 29 (1): 679–693. Springer Netherlands. <https://doi.org/10.1007/s11831-021-09584-9>.
- Langley, A., C. Smallman, H. Tsoukas, and A. H. Van de Ven. 2013. "Process Studies of Change in Organization and Management: Unveiling Temporality, Activity, and Flow." *Acad. Manag. J.*, 56 (1): 1–13.
- Lewin, K. (1947). Frontiers in group dynamics: Concept, method and reality in social science; equilibrium and social change. *Hum. Rel.*, 1(1), 5-41.
- Oliver, C. (1991). Strategic responses to institutional processes. *Acad. Manag. Rev.*, 16(1), 145-

- Romanelli, E., & Tushman, M. L. (1994). Organizational transformation as punctuated equilibrium. *Acad. Manag. J.*, 37(5), 1141-1166.
- Scott, W. R. 2014. *Institutions and organizations: Ideas, Interests and Identities*. Sage Publ. Inc.
- Weick, K. E. (1995). *Sensemaking in organizations*. Sage.
- Weick, K. E., & Quinn, R. E. (1999). *Organizational change and development*. *Ann. Rev. Psych.*, 50(1), 361-386.
- Won, J., G. Lee, C. Dossick, and J. Messner. 2013. "Where to Focus for Successful Adoption of Building Information Modeling within Organization." *J. Constr. Eng. Manag.*, 139 (11): 1–10. [https://doi.org/10.1061/\(asce\)co.1943-7862.0000731](https://doi.org/10.1061/(asce)co.1943-7862.0000731).
- Xing, M., J. Cao, and D. Cao. 2023. "Impacts of Policy Mix Comprehensiveness on BIM Implementation: Moderating Effects of Environmental State and Response Uncertainty." *J. Constr. Eng. Manag.*, 149 (2): 1–13. <https://doi.org/10.1061/jcemd4.coeng-12716>.
- Xu, J., W. Lu, and E. Papadonikolaki. 2022. "Human-Organization-Technology Fit Model for BIM Adoption in Construction Project Organizations: Impact Factor Analysis Using SNA and Comparative Case Study." *J. Manag. Eng.*, 38 (3): 1–15. [https://doi.org/10.1061/\(asce\)me.1943-5479.0001013](https://doi.org/10.1061/(asce)me.1943-5479.0001013).
- Yin, R. K. 2018. *Case study research and applications: Design and methods*. SAGE Publications Inc.