Optimal Government Strategies for BIM Implementation in Low-Income Economies: A Case Study in Syria

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Abstract: Building information modeling (BIM) enables substantial improvement in the architecture, engineering, and construction (AEC) industry. As a leading actor in the AEC industry, policymakers have the means to develop appropriate strategies for addressing the factor affecting BIM implementation. However, the lack of empirical investigation on the relationships between factors to implementing BIM and government strategies prevents the strategies from being effective. This study aimed to establish relationships between critical factors and government strategies for implementing BIM using Syria as a case study. A systematic literature review and semistructured interviews with AEC professionals yielded 27 factors and 12 government strategies for implementing BIM. The collected data were analyzed using descriptive statistics, a chi-squared test, exploratory factor analysis (EFA), and partial least-squares structural equation modeling (PLS-SEM). The EFA classified the factors into four underlying constructs (technology, project environment, governmental and organizational, and people) and government strategies into two underlying constructs (soft and hard strategies). The structural equation model revealed that *soft strategies* positively affect technology, project environment, and people. Moreover, *hard strategies* positively affect technology. These findings provide new insights into the body of knowledge on optimal government strategies for implementing BIM in low-income economies. Policymakers can use the findings of this study to prioritize efforts and resources when promoting BIM implementation in the local AEC industry. **DOI: 10.1061/JAEIED.AEENG-1707**. © *2024 American Society of Civil Engineers*.

Practical Applications: This study aimed to establish relationships between critical factors and government strategies for implementing building information modeling (BIM). The findings illustrate that soft strategies positively and substantially affect technology, project environment, and people. Furthermore, hard strategies positively and substantially affect technology. With these findings, policymakers and project stakeholders can make informed decisions on government strategy selection to address the critical factors. At the early stage, executing appropriate strategies saves resources and contributes to implementing BIM successfully. This study provides empirical evidence of the relationships between the critical factors and government strategies for implementing BIM. It provides major areas policymakers can commit resources to enhance and eventually help diffuse BIM across the architecture, engineering, and construction (AEC) industry. It also helps embrace advances in BIM, including digital twins, and improve industry efficiency.

Introduction

Efficiency eludes the architecture, engineering, and construction (AEC) industry. Performance problems, including schedule delays, cost overruns, and quality issues, have afflicted the AEC industry for decades and still need fixing (Eastman et al. 2011). Moreover, the COVID-19 pandemic-induced impact has significantly limited physical activities in the construction sector and worsened the situation (Zamani et al. 2024). As a result, gains in the construction sector have reversed, urging policymakers to be innovative in design and construction practices (Lindblad and Gustavsson 2021; Mirpanahi and Noorzai 2021). Building information modeling (BIM) implementation in the AEC industry has proven sound as it unlocks opportunities for multiparty communication and supports decision-making through digitalized data (Succar 2009). The notable returns from BIM investment include effective cost estimation and control, reduced project duration, and better project quality (Awwad et al. 2020; Bansal 2021; Lee et al. 2023). Consequently, BIM maximizes the benefits for stakeholders by maintaining a proper balance among the project success measures (time, cost, and quality) (Al-Mohammad et al. 2023a). Owing to its benefits, several economies, including the United Kingdom, United States, Australia, Netherlands, Singapore, South Korea, and Hong Kong, have made implementing BIM mandatory (Awwad et al. 2020; Aibinu and Venkatesh 2014; Development Bureau Hong Kong 2017).

Despite its widely recognized benefits, the overall pace of BIM implementation worldwide is inconsistent (Al-Mohammad et al. 2023a). Implementing BIM creates fear due to the high initial investment, including software and hardware costs and consultancy fees (Saghatforoush et al. 2021). In the early stages, implementing BIM causes productivity loss due to the high learning curve, whose outcome is difficult to measure quickly (Eastman et al. 2011). As a fundamentally innovative approach for data sharing and

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