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The Role of Building Information Modeling (BIM) in Controlling Project Costs through Effective Communication

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Abstract:

Building Information Modeling (BIM) has emerged as a transformative tool for improving communication among stakeholders in construction projects. These stakeholders include owners, contractors, and designers, who require integrated information exchange and precise documentation. While BIM adoption has seen widespread global implementation, its use in Saudi Arabia remains limited. This study investigates the impact of BIM on enhancing communication efficiency and controlling costs in construction projects within Saudi Arabia. Through quantitative analysis, it evaluates the perceptions of construction professionals—both experienced and inexperienced with BIM—regarding its effectiveness.

Research Problem: The construction sector in Saudi Arabia faces communication challenges due to reliance on traditional methods like 2D drawings and paper-based documentation. These outdated methods lead to delays, errors, and increased costs, hindering efficiency, particularly under the Kingdom's Vision 2030 initiative. This study identifies barriers to BIM adoption and highlights its potential in addressing these communication inefficiencies.

Objectives and Research Questions: The primary objective is to assess the role of BIM in overcoming communication obstacles and reducing project costs. Key research questions include: What are the primary barriers to effective communication in traditional project management? How does BIM improve communication efficiency and cost control compared to traditional methods?

Methodology: The study adopts a descriptive-analytical approach, utilizing electronic surveys to gather data from 120 engineers, out of which 85 valid responses were analyzed. Participants were divided into two groups—those with BIM experience and those relying on traditional methods. Statistical tools, including descriptive and inferential analysis, measured the impact of BIM adoption.

Findings: Communication Efficiency: BIM significantly enhances information sharing, reduces misunderstandings, and promotes collaboration among stakeholders. Cost Control: BIM decreases rework, provides accurate cost estimations, and improves decision-making, ultimately lowering project expenses. Collaboration and Transparency: BIM fosters transparency by providing centralized data repositories accessible to all stakeholders, enabling synchronized updates and reducing discrepancies. Barriers to Adoption: Limited awareness, lack of governmental mandates, and resistance to change emerged as major obstacles to BIM adoption in Saudi Arabia.

Key Results from Statistical Analysis: Group A (BIM users) reported higher efficiency scores (average 5.8/7) compared to Group B (traditional users) with an average score of 2.35/7. Significant improvements were noted in areas such as visualizing project outcomes, providing 3D models, and facilitating communication between engineers and clients. Statistical tests confirmed the hypothesis that BIM improves communication efficiency and cost control (p-value = 0.000).

Recommendations: Training and Awareness: Conduct comprehensive training programs to increase familiarity with BIM tools among stakeholders. Policy Integration: Establish government mandates for BIM adoption in public projects to accelerate implementation. Technological Integration: Encourage the use of digital collaboration platforms like BIM 360 to streamline communication. Simplified Interfaces: Develop user-friendly BIM tools to facilitate broader adoption. Continuous Evaluation: Regularly assess BIM effectiveness in ongoing and completed projects to refine its implementation strategies.

Conclusion: The study concludes that BIM plays a vital role in enhancing communication and controlling costs in construction projects. Its ability to centralize data, improve collaboration, and provide real-time

updates reduces errors and increases efficiency. Despite existing challenges, such as low adoption rates and resistance to change, BIM represents a promising solution for transforming Saudi Arabia's construction industry. Future efforts should focus on awareness campaigns, policy reforms, and technical training to ensure widespread adoption and integration of BIM practices.

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