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# Impact of BIM on Project Quality in Construction Industry

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**ABSTRACT:** In the construction sector, cost and time are widely recognized as primary factors influencing project outcomes, while quality neglected despite established quality management systems. Achieving success in construction projects while ensuring adherence to all parameters can be challenging. BIM, as a new technological tool, has proven highly effective in meeting these goals. Its utilization facilitates superior project outcomes, including enhanced design, construction, and maintenance processes, as well as improved compliance with regulations and standards. This study investigates the impact of BIM on construction quality, conducted through a two-stage approach involving literature review and industry surveys. The literature review revealed a strong correlation between BIM and construction project quality. Industry surveys gathered insights from professionals and BIM practitioners, analyzed using the Ishikawa Diagram to identify key factors. The Relative Importance Index (RII) was employed to rank these factors on a scale of 1 to 5, with higher rankings indicating greater effectiveness. Findings shows that Clash detection emerged as the most influential factor, followed by a strong database and degree of complexity. These findings align with the opinions of experienced industry professionals, validating the significance of BIM in enhancing construction quality.

**KEYWORDS:** BIM, Project quality, RII, fish bone diagram, clash detection, strong database

## I. INTRODUCTION

### BIM

BIM, stands for Building Information Modeling, is a digital portrayal of both the physical and functional attributes of a building or infrastructure. This collaborative process integrate data, people, processes, and technology to enhance the quality and efficiency of construction projects.

Quality control stands as a essential yet time-intensive duty within the construction industry. Firstly, standards for individual components are scattered across various national, industry, and municipal regulations governing construction quality. Secondly, due to the intricate network of interactions among project participants, attributing accountability for mishaps proves challenging. Thirdly, current quality control efforts predominantly concentrate on the final component, with less attention paid to quality control of overall construction process. ISO 9001 classifies a structured system describe processes, methods, and responsibilities to achieve quality policies and objectives as a quality management system. Quality planning, quality assurance, quality control, and quality improvement are all part of this system. Presently, the advanced technologies for quality management, including Building Information Modeling (BIM) and lean building methodologies are accessible in construction sector.

### Objective

1. To determine the quality criteria associate to the utilization of BIM.
2. To assess the identified criteria and prioritize them based on their significance.
3. To understand beneficial influence of BIM on the overall project quality.

## II. RELATED WORK

Their findings suggest that BIM technology holds significant promise as a quality management tool, advocating for its adoption to enhance integration and collaboration in infrastructure construction projects. The integration of information facilitated by the utilization of ICT and BIM technology contributes to an overall enhancement of project quality. [9]. The study presents a series of propositions linking the implementation of BIM with enhanced Information Sharing Capability (ISC) and Collaborative Decision Capability (CDC) within the construction sector of the building industry. Embracing BIM brings forth a multitude of advantages for construction stakeholders, notably in refining data



management and transfer processes and elevating design quality. [ 2] In contrast to organizations that do not employ BIM in their projects, those that utilize BIM were successful in meeting project deadlines, staying within budget, and satisfying customers. Additionally, all the conclusions drawn from this research indicate that senior management struggles to embrace TQM principles in construction projects where BIM is not utilized. [4] Addressing the knowledge deficit through the implementation of BIM in Quality Management via integrated solutions for enhancements. The model incorporates fully standardized and structured building regulations to provide clear construction task specifications for instruction and verification. Utilizing design information ensures consistency of information. The application of 4D guarantees timely inspection and virtualization of the entire process. [5 ] This study explores and deliberates on the quality effectiveness of BIM-based building projects. A total of 206 questionnaires were distributed among contractors, consultants, and government clients. Quantitative data analysis was conducted using the Statistical Package for Social Science (SPSS). As a result, the three research cohorts identified twenty-seven (27) indicators of quality efficiency in BIM-based construction. The aim of the research was to furnish a guideline for BIM compliance and to scrutinize the adoption process towards achieving BIM level 3 (full integration) within the Malaysian construction industry. This initiative aimed to provide support to participants involved in BIM-based construction projects, particularly government agencies. [ 7] To enhance the quality control system and elevate the standard of architectural design within the BIM environment, the study devised technological advancements for building elements and formulated application strategies. Specifically, the research scrutinized output data and tasks conducted during the design phase to identify precise quality control objectives across various instances.[6]

### III. METHODOLOGY

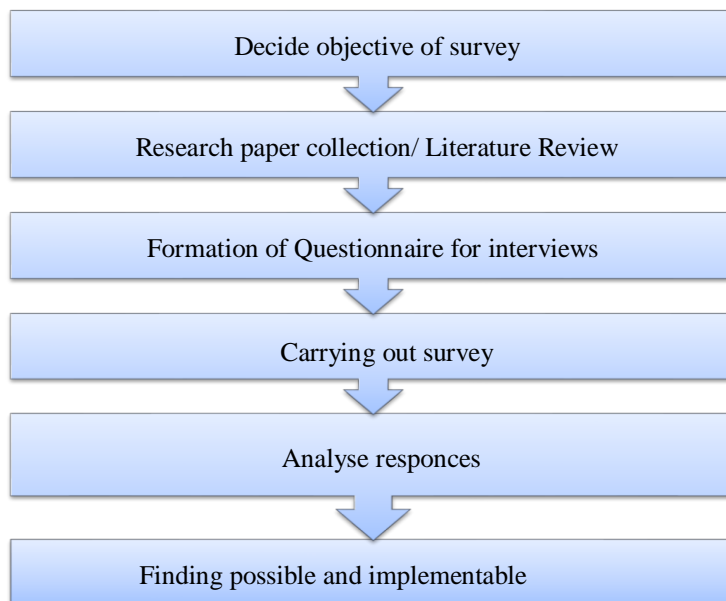
Methodology involves two stages of research that was carried out – the initial literature review and the industry reviews.

#### 1. Literature review

In this step research from published papers that were available online had been read through and studied the various aspects in which BIM was able to contribute. from the literature papers different factors are derived and their causes and effects are showed with the help of Ishikawa Diagram which is also known as fish boned diagram.

#### 2. Industrial survey- industrial survey involves following steps

Flow Chart - Stages of Survey





#### IV. CONCLUSION

The literature review reveals that implementing BIM proves particularly advantageous during the design and construction phases. In the traditional construction industry, the introduction of BIM has instigated significant changes in factors such as Clash Detection, Degree of project complexity, Collaboration & Communication, and Enhanced scheduling & sequencing.

In conventional construction processes, detecting clashes among individual elements was challenging until structures were erected on-site. However, with BIM integration, this clash detection process can occur much earlier in the design phase, facilitating smoother execution on-site and resulting in fewer errors and optimal construction project quality. Furthermore, the results and literature review highlights that benefits such as streamlined decision-making, facilitated problem discussions and resolution, interdepartmental information transfer, and increased accuracy in on-site processes are readily attainable through BIM utilization. These factors collectively contribute to a notable enhancement in the overall quality of the project.

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