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A STUDY ON THE EFFECTS OF BUILDING INFORMATION MODELING (BIM) ON THE LABOUR PRODUCTIVITY OF BUILDING CONSTRUCTION PROJECTS IN PATNA CITY

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Abstract
Building information modeling (BIM) is a cutting-edge technology with huge promise for transforming the building sector by enabling increased project collaboration, efficiency, and cost-effectiveness.

Keywords: BIM, Mathematical Model

Introduction

Over the past several years, the construction industry has witnessed enormous technological advancements, with Building Information Modeling emerging as a game-changer. Building Information Modelling (BIM) is a digital depiction of a building's functional and physical characteristics that enables stakeholders to efficiently plan, design, build, and manage buildings. The growing use of BIM across the world has raised interest among academics and business professionals due to its possible impact on worker productivity Patna City, being one of India's major metropolitan areas, is undergoing fast expansion and development, increasing demand for building projects. The purpose of this examine is to look at the effects of BIM adoption on the labor productivity of building developments projects in Patna. This study seeks to give significant insights to construction businesses, legislators, and other stakeholders for

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improving project results and resource management by analyzing how BIM effects many areas of construction operations.

The construction world is critical to the growth and development of cities, and Patna City, India, is no exception. Over the years, the construction world has encountered issues relating to project delays, cost overruns, and inefficiencies, which are frequently linked to traditional building processes. Building Information Modeling has evolved as a technology-driven method that promises to transform the building process by improving collaboration, data collection, decision-making, and project results. However, the extent of BIM's impact on labor productivity in building construction projects in Patna City remains relatively unexplored. This study aims to bridge this knowledge gap by investigating the effects of BIM adoption on labor productivity within the local context.

METHODOLOGY

A. *Methodology's.*

1. *RESEARCH DESIGN*

   The impact of Building Information Modeling (BIM) on worker productivity in Patna City building construction projects is investigated in this study using a thorough mixed-method research technique. Both quantitative and qualitative methods are used in the research strategy to fully comprehend the topic.

   Contingency Planning Include contingencies in the budget to account for unforeseen costs or changes in scope.

2. *DATA COLLECTION*

   Surveys and questionnaires will be distributed to construction industry experts actively involved in three different building projects in Patna City, which have been chosen to represent a variety of construction scenarios, including infrastructural, business, and residential developments.

3. *DATA ANALYSIS*

   In order to generate actionable insights, the quantitative data gathered from the surveys and building project records will be subjected to a rigorous statistical analysis. The information will be succinctly and understandably presented using descriptive statistics

like mean, median, standard deviation, and frequency distributions. These statistics indicators reflect the deployment of BIM and labor productivity at Baba Hans Construction Private Ltd.

A direct comparison of productivity measures for the three projects (A, B, and C) will be performed to compare labor productivity between the two methodologies. Any identified changes will be statistically significant using suitable statistical tests.

4. *BIM SOFTWARE*

For the BIM software-based approach, Autodesk Revit will be used for the Adaptations of Building Information Modeling. Autodesk Revit is a widely-using BIM software known for its capabilities in creating detailed 3D models, facilitating collaboration, and streamlining construction workflows.

5. *RESEARCH LIMITATIONS*

In spite of the thorough studies technique and records series strategies used in these paintings, it's miles essential to focus on the constraints that can affect how the effects are interpreted and generalized.

6. *COMPARISON OF TRADITIONAL AND MODERN SOFTWARE-BASED APPROACHES FOR BIM*

Building Information Modeling (BIM) has evolved over the years in the construction sector, with both classic and modern software-based methodologies being employed for BIM implementation. This section compares these two techniques, highlighting their key characteristics, advantages, and limitations.

RESULT

In this segment, the study presents the quantitative evaluation of the survey facts accumulated from production professionals in Patna city, India, regarding BIM adoption and its effect on exertions productivity

The regression analysis provides standardized regression coefficients, which allow for comparisons of the relative impact of each underlying category on labor productivity. A

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positive coefficient indicates a positive impact, while a negative coefficient indicates a negative impact. The statistical significance of the coefficients and the overall regression model is evaluated using p-values and the F-statistic

The formula used for linear regression analysis is:

Perceived productiveness = β0 + β1(Undertaking) + β2(Person (hard work)) + β3(man or woman (Supervision)) + β4(Organizational) + β5(man or woman (management)) + ε

Perceived Productivity = β0 + β1(Project) + β2(Individual (Labor)) + β3(Individual (Supervision)) + β4(Organizational) + β5(Individual (Management)) + ε

Role	Average Years of BIM Experience	Frequency	Percentage (%)
General Manager (GM)	> 20 years	3	3.30%
Project Manager (PM)	11–20 years	5	5.49%
Duty Project Manager	6–10 years	18	19.78%
Project Engineer (PE)	0–5 years	26	28.57%
Site Foremen	6–10 years	5	5.49%
Site Engineer	0–5 years	12	13.19%
BIM Manager	6–10 years	6	6.59%
BIM Coordinator	0–5 years	7	7.69%
Others	0–5 years	9	9.89%
Total		**91**	**100.00%**

Subcategory (%)	Percentage of Projects Adopted BIM Within the Past 5 Years (%)
Zero Experience	13.6
1–25	2.9
26–50	26.2
51–75	38.8
76–100	18.4

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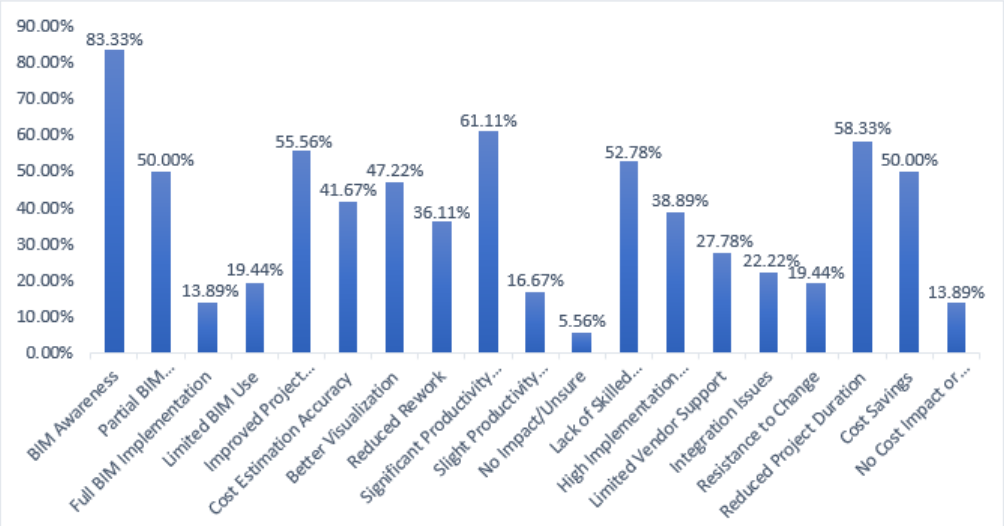

CONCLUSION

1. Throughout this research, an in-depth investigation into the impact of Building Information Modeling (BIM) on labor productivity in construction projects in Patna City was conducted. The study amalgamated both quantitative and qualitative data to reveal significant findings that shed light on the relationship between BIM adoption and labor productivity:
2. Firstly, it became evident that the adoption of BIM positively influences labor productivity in construction projects. The integration of BIM tools and processes facilitates seamless project coordination, clash detection, and constructability reviews among various stakeholders. As a result, construction teams experience a considerable reduction in rework instances during the construction phase, leading to enhanced efficiency and resource allocation.
3. Secondly, the level of BIM proficiency among construction professionals and the frequency of BIM adoption in projects were found to have substantial effects on labor productivity. Construction projects led by more experienced professionals, who possess a deep understanding of BIM implementation, tend to exhibit better labor productivity outcomes. Similarly, projects with higher BIM adoption rates throughout the project lifecycle tend to yield improved labor productivity results.
4. Moreover, through rigorous factor analysis, five critical factors affecting labor productivity were identified: Individual (Supervision), Individual (Labor), Project, Organization, and

Individual (Management). Each factor exerted a different influence on labor productivity, with Individual (Supervision) demonstrating the highest positive impact. Consequently, it is essential for construction project stakeholders to consider these factors when planning and optimizing BIM implementation.

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