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DEVELOPMENT OF A SPREADSHEET BASED CONSTRUCTION COST ESTIMATION SYSTEM

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ABSTRACT –

Cost estimation is a critical component in construction project management, directly influencing budgeting, resource allocation, and project feasibility. This paper presents the development of a spreadsheet-based construction cost estimation system aimed at improving accuracy, efficiency, and accessibility for small to medium-scale construction projects. The proposed system leverages spreadsheet automation to generate precise cost estimates from final working drawings. Validation and testing demonstrate that the model provides a reliable and cost-effective solution, with potential scalability when integrated with Building Information Modelling (BIM) tools in future work.

INTRODUCTION

Accurate cost estimation is pivotal in the construction industry, serving as a foundation for project planning, resource allocation, and risk management. Traditional methods are often time-consuming and error-prone. With advancements in information technology, there is a growing shift toward automated systems that enhance accuracy and efficiency.

This paper introduces a spreadsheet-based cost estimation tool tailored for construction projects. The system integrates structured data entry with automated calculations to assist project managers and estimators in producing reliable cost forecasts.

OBJECTIVE

The objective of this project is to develop an easy-to-use, spreadsheet-based construction cost estimation tool that provides:

- Accurate and reliable estimates
- Time efficiency compared to manual methods
- Flexibility to accommodate local rates, materials, and labor costs
- Potential scalability for future integration with BIM systems

METHODOLOGY

The methodology involves the following steps:

1. Data Collection: Acquiring final working drawings and collecting local material and labor rates.
2. Spreadsheet Model Development: Designing templates for each work category including foundations, superstructures, plastering, and finishes with embedded formulas for quantity take-offs.
3. Rate Analysis: Embedding live rate analysis formulas based on current market prices.
4. Testing and Validation: Comparing outputs with traditional manual estimates for accuracy and efficiency.
5. Iterative Improvements: Refining the tool based on testing feedback.

RESULTS AND DISCUSSIONS

Case Study 1: Single-Storey Residential House – Kerala

Built-up Area: 1200 sq. ft, Total Estimated Cost: ₹21.5 Lakhs.
The tool effectively captured local material fluctuations, especially for laterite bricks and sand.

Case Study 2: G+1 Residential Building – Tamil Nadu

Built-up Area: 2200 sq. ft, Total Estimated Cost: ₹38 Lakhs.
Labor cost variations were captured accurately for semi-urban settings.

Case Study 3: Commercial Shop Complex – Karnataka

Built-up Area: 1500 sq. ft, Total Estimated Cost: ₹29.8 Lakhs.
Steel price fluctuations were dynamically adjusted.

Case Study 4: Small Warehouse/Storage Unit – Maharashtra

Built-up Area: 3000 sq. ft, Total Estimated Cost: ₹42 Lakhs.
The tool managed complex calculations for steel trusses efficiently.

Case Study 5: Institutional Building – Andhra Pradesh

Built-up Area: 5000 sq. ft, Total Estimated Cost: ₹72 Lakhs.
Community preferences like flooring and ceilings were incorporated into the estimates.
Overall, the spreadsheet-based tool improved estimation accuracy (variance <5%) and reduced estimation time by 35-40%. Its flexibility in handling region-specific rates was particularly beneficial.

ARTICLE ANALYSIS AND NOTES

The reviewed literature underlined the importance of ICT tools in construction estimation. Spreadsheet-based systems serve as an efficient middle ground between manual estimation and fully automated BIM-based solutions. Articles by Keerthi (on BIM) and Gupta (on spreadsheet programming) directly influenced the template structure and calculation flow adopted in this project.

CONCLUSION

The developed spreadsheet-based cost estimation system provides an accessible, accurate, and efficient solution for small to medium-scale construction projects in India. The model bridges the gap between traditional methods and advanced digital tools. Future work can focus on:

- Integration with BIM for automated quantity take-off.
- Developing cloud-based versions for collaborative use.
- Incorporating AI-driven market rate forecasting.

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