Review on Digitalization of Construction Project Life Cycle Through ERP Software

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Abstract— The construction industry is one of the major contributors to economic development and infrastructure growth. However, managing construction projects effectively remains a significant challenge due to issues such as improper resource planning, cost overruns, project delays, inefficient communication, and lack of coordination among departments. Traditional management methods are often unable to meet the increasing complexity and demands of modern construction projects. To overcome these challenges, Enterprise Resource Planning (ERP) systems have emerged as an effective technological solution for integrating and managing various business processes within construction organizations.

This study focuses on the effective implementation of ERP systems and their applicability in multistoried residential building projects. The main objective of the study is to evaluate how ERP systems can improve construction project performance through better planning, resource management, inventory control, financial management, and project monitoring. The research includes a detailed literature review on ERP applications in the construction industry and identifies key modules such as estimation planning, bill of quantities (BOQ), inventory management, procurement, accounting, project scheduling, and resource management.

A case study of Kadam Infracon has been carried out to understand the practical application of ERP in managing construction activities. Data related to project estimation, quantity calculations, material management, manpower planning, and project execution were collected and analyzed using ERP modules. The findings indicate that ERP helps in reducing project delays, improving communication, minimizing material wastage, enhancing decision-making, and increasing overall productivity. It also provides real-time monitoring, accurate reporting, and better financial control throughout the project lifecycle.

The study concludes that ERP systems play a crucial role in improving operational efficiency, quality management, and project control in construction projects. Although challenges such as high implementation cost, lack of training, and resistance to change exist, effective ERP implementation can significantly enhance project performance and organizational growth. Therefore, ERP can be considered an essential tool for achieving integrated construction management and supporting digital transformation in the construction industry.

Keywords: Enterprise Resource Planning (ERP), Construction Management, Multistoried Residential Building, Resource Planning, Inventory Management, Project Monitoring, Bill of Quantities (BOQ), Construction Productivity.

I. INTRODUCTION

Enterprise Resource Planning (ERP) is an integrated software system designed to manage and coordinate the various functions of an organization through a centralized database. It combines multiple departments such as finance, procurement, inventory, human resources, project planning, sales, and quality management into a single unified platform. ERP helps organizations streamline business processes, improve operational efficiency, reduce errors, and support better decision-making.

In the construction industry, effective management of resources such as labor, materials, machinery, finance, and time is essential for successful project execution. Construction projects involve multiple stakeholders, dynamic workflows, and large volumes of data, making information management a critical aspect of project success. Traditional construction management methods often lead to communication gaps, data duplication, delays, cost overruns, and inefficient resource utilization.

ERP systems provide a solution to these issues by enabling real-time information sharing and process integration across all project functions. Once data is entered into the ERP system, it becomes available to all relevant departments, ensuring transparency, accuracy, and faster decision-making. The major modules of ERP used in construction include project planning, estimation, procurement, inventory management, financial accounting, human resource management, contract management, asset management, and customer relationship management.

The construction industry differs significantly from manufacturing because each project is unique, temporary, and location-specific. Therefore, ERP implementation in construction requires a project-centric approach rather than a product-centric one. Construction ERP helps manage project scheduling, resource planning, cost control, subcontractor management, billing, and project progress tracking.

The Indian construction sector is one of the fastest-growing industries and contributes significantly to the country's economic development. However, it faces several challenges such as poor planning, inefficient material management, lack of coordination, cost escalation, and project delays. The adoption of ERP systems can help address these challenges by improving process automation, resource optimization, and project monitoring.

Despite the increasing use of ERP in construction, many organizations still face difficulties in implementation due to high costs, employee resistance, lack of technical expertise, inadequate training, and poor system customization. Moreover, the use of ERP modules specifically for quality management in construction remains limited.

This study focuses on understanding the effective implementation of ERP systems in multistoried residential building projects and evaluating its impact on construction management. The research aims to analyze the applicability, benefits, and challenges of ERP in improving project performance, productivity, cost control, and quality management in the construction industry.

1.2 Need for Study

The construction industry deals with complex operations involving planning, procurement, material management, scheduling, cost control, and quality assurance. Conventional methods of managing these operations often lead to inefficiencies and delays. ERP systems offer an integrated approach to improve coordination and decision-making. Therefore, it is essential to study the implementation of ERP in construction projects and evaluate its effectiveness in enhancing project performance.

1.3 Objectives of Study

1. To study the implementation process of ERP systems in the construction industry.
2. To identify the major ERP modules used in multistoried residential building projects.
3. To analyze the benefits of ERP in improving productivity, resource utilization, and project control.
4. To evaluate the impact of ERP on project cost, quality, and time management.
5. To identify the challenges faced during ERP implementation in construction projects.
6. To recommend effective strategies for successful ERP implementation in construction organizations.

II. STATE OF DEVELOPMENT

This paper reviews previous researches concerning the factors behind using or avoiding ERP.Enterprise Resource Planning is important software in construction industry. Various authors have different contribution in their own respective module. Purpose of this chapter in report is to highlight the work done on use of ERP and gives some useful terms which will useful further in this report

Jonathan Jing sheng Enterprise resource planning ERP Was originated in the manufacturing industry. It provides a general working environment for an enterprise to integrate its major business management functions with one single common database so that information can be shared and efficient communications can be achieved between management functions. This paper first briefs the ERP technology, its origin, and its current development in general. Based on the needs of running a construction enterprise, ERP shows its potential for the construction industry. However, the unique nature of the industry prevents a direct implementation of existing ERP systems, which are primarily developed for the manufacturing industry. This paper underlines the importance of the establishment of the basic theory for developing construction enterprise resource planning systems CERP. A CERP must address the nature of the general industry practice. Fundamental features are identified and discussed in the paper. Three-tiered client/server architecture is proposed, with discussions on the functions And major components of each tier. Needed research issues are discussed, including CERP architectures, project management functions, advanced planning techniques, standardization of management functions, and modeling human intelligence. Construction management examples are incorporated into the discussions.

C. S. Dudgikar It is found that the majority of construction firms in India have awareness about the ERP systems but very few organizations have so far implemented such systems. The

major reason is that the implementation of any ERP system needs a huge investment in time, money and resources. However, when implemented to solve the right problems, these ERP systems can be a powerful tool for business improvement. The construction industry is a highly fragmented industry. For developing quality module of ERP, a resource (5 M's) based e-Model has been developed. The reports of this module have been designed in such a manner so as to give the concise and precise knowledge of quality parameters of a construction project to its various stakeholders such as builder, developer, contractor, project manager, quality inspector and last but not least the consumer. This paper even exhibits these reports which inform the various stakeholders and help them deciding the right quality benchmarks at a right time within a right budget.

Sudhanva Kadoli India is a developing nation, with globalization widely making impact over its economy. It is observed that large amount of development is mostly concentrated towards the country's urban infrastructure. Due to larger population migrating towards cities it is necessary to accommodate and provide basic infrastructural facilities to their ever increasing demands. So it is necessary for the construction enterprises to efficiently manage their functioning and address the customer requirements by balancing the functioning of individual departments in the construction enterprise. Construction ERP is an ultimate solution to manage entire enterprise under a single roof. This paper presents an efficient ERP system to manage different departments in accordance with for the managerial the company policies and customer requirements. ERP is responsible for integrating business processes within an enterprise. This will only automate the functioning of Construction Company. To enable decision making tier of the company based upon history and future risks BI and DSS are implemented using feedback logic.

Yu-Cheng LIN Enterprise Resource Planning (ERP) is the latest high-end solution information technology has lent to business application. Enterprise resource planning systems are highly complex information systems. The implementation of these systems is a difficult and high cost proposition that places tremendous demands on corporate time and resources. Many ERP implementations have been classified as failures because they did not achieve predetermined corporate goals. The paper identifies main success factors critical to a successful implementation. A summary of successful ERP implementation is presented based on lesson learned from the interviews with experts and discussed in terms of these key factors.

Thakare Amol K An Enterprise resource planning system is a fully integrated business management system covering functional areas of an enterprise like logistic, production, finance, accounting and human resources etc. It organizes and integrates operation processes and information flows to make optimum use of resource such as men, material, money and machine. ERP is a global tightly integrated closed loop business solution package and is multifaceted. In simple words, Enterprise Resource Planning promises one database, one application, and one user The Study aims at studying effectiveness of ERP implementation in construction industry. The Study was performed on HIT-OFFICE which is an ERP software developed by EDSS Pvt. Ltd. The effectiveness of implementation of ERP was studied by estimating, scheduling, material planning, contractor management and billing in HIT-OFFICE using Quotation, Purchasing, Inventory, Study and Accountancy module of the software. A list of questionnaire was prepared to collect reviews from Study Managers and Engineers of various organizations to evaluate the changes occurred after the application of ERP. The companies which are ready for huge investment provided they are adaptive to change in working system, ERP is the best solution for them as it would result in optimization of Resources, savings of Time, Money and most importantly Energy.

Mahmood Ali Benefits reaped from implementing Enterprise Resource Planning (ERP) systems have made them a critical part of organizations. These systems, which are developed on best business practices, are sometimes unable to satisfy unique organizational needs, such as those specific to the construction industry which present a unique set of challenges different from those of manufacturing and service industries. This paper aims to study the development of in-house ERP system in an organization in a developing country, and seek to explore and understand the development of ERP system designed exclusively around the needs of an organization. This study adopts a case study based qualitative research methodology. Primary data is collected through a series of interviews, discussions with the project manager, development staff and end users. The outcome of the study shows that through proper planning coupled with detailed needs analysis, suitable change management strategy, an experienced project team and selecting the appropriate software development process, any organization can design and develop ERP system that caters for the organization specific needs. Therefore, eliminating the need of complex software customization or altering business processes. Further, by developing an in-house system, the probability of a failed implementation is greatly reduced thus allowing the organization to focus on its core Business while benefitting from the new system.

Abhijit N. Bhirud ERP or Enterprise Resource Planning can enable companies to optimize their business processes and allows for necessary management .Thus, ERP can be said as system software that can integrate several activities in a project & deliver a unison result for bettering performance & increase profits. A construction ERP system provides Cost optimization, incorporate design changes, Consistent quality

conformance, Reliable, Faster and on time delivery, Incorporates value engineering, Collaborative work environment, team tracking facility. The case study relating to ERP implementation by firms operating in the Infrastructure construction industry is investigated. It is found that to ensure efficient implementation firms must first have a good reason why ERP should be implemented, determine the tradeoffs, choose an appropriate re-engineering process, identify and mitigate risks that may arise. Based on the findings, strategies for managing the implementation of ERP in the construction industry are developed.

Table 1 Summary on Enterprise Resource Planning

Author / Year /Journal	**Area of Study**	**Gaps**
Aisha Momoh and Rajkumar , 2008 , Communications of the IBIMA	A Work Breakdown Structure for Implementing and Costing an ERP Project	Top management support,Budgeting and scheduling
Mukesh Srivastava & Betsy , 2009 , Journal of	Chinese Cultural Implications for ERP Implementation	Business process reengineering ,
Ada Wong Harry Scarbrough , 2010 , UK	Critical Failure Factors in ERP Implementation	Factors affecting failure of ERP implementation like - Training - Top management support - Inadequate knowledge to Business Process owner
Anees Ara, Abdullah S. Al-Mudimigh , 2011 , Global Journals Inc. (USA)	The Role and Impact of Project Management in ERP project implementation life cycle.	Impacts on Turnover and other factors. Role of Business Process owners
Ahmed A. Elragal and Ayman M. Al-Serafi , 2011 , Communications of the IBIMA	The Effect of ERP System Implementation on Business Performance: An Exploratory Case-Study	The Effect of ERP System Implementation on Business Performance
Ashish Kr. Dixit, Om Prakash , 2011 , Journal of Arts, Science & Commerce	A Study of Issues Affecting ERP Implementation in SMEs	A Study of Issues Affecting ERP Implementation in project Management
Brett Machen , (2014) , University of South Australia	An Investigation into the Effectiveness of Using SAP-PS as a Multidimensional Project Control System	Number of project to rollout
Fahd Alizai (2014) , Department of Civil and Transport	A model for the implementation of ERP systems in midsize businesses	Critical success factor,. Knowledge , Transfer and Training
Malak Abdel Moaty , 2014 , Queen's University Belfast	Change management of construction project	In proper change Management , User Training
Ada Wong Harry Scarbrough , 2010 , UK	Critical Failure Factors in ERP Implementation	Factors affecting failure of ERP implementation like - Training - Top management support - Inadequate knowledge to Business Process owners
Ms. Richa Sharma , 2012 , International Journal of Management,	ERP – The Changes Trends of Information Technology	ERP – The emerging Trends in business processof Information Technology

IT and Engineering IJMIE		
Durgaparsad Sharma , Arvind Kumar sharma And Narpit singh Sekhawat 2012 , International journal of electrical Engineering	The Best Performance Practices in Project Management of SAP ERP Accomplishment	The Critical Success factors – Quality, Time, Scope and Cost
Xu Zhao , Kai-chao Yu , Project Management Implementing SAP R3	Research on ERP and PLM integration based on R&D Project Management	Product lifecycle management and its selection for ERP implementations
Rajneesh Chauhan, Rajeev Dwivedi and Arun Mohan Sherry , 2012 , Business Systems Research	Critical success factors for offshoring of enterprise resource planning (ERP) implementations	ERP SAP Success factors for Implementation in Construction co.
Jiangping Wan, Jiajun Hou1 , 2012 , Journal of Software Engineering and Applications,	Research on SAP Business One Implementation Risk Factors with Interpretive Structural Model	SAP ERP Project system Implementation Risk Factors
Khalid Al Marri , 2014 , The Business & Management Review,	ERP implementation in the project-based organizations of the construction industry	Knowledge , transfer and training for critical success factor
Yu-Cheng Lin and Meng- Hsueh ,2016	Construction Enterprise Resource Planning Implementation: Critical Success Factors	In proper business process map into ERP. Business Process Required
Muhammad Umar and Nawar khan , 2016, IJCSNS international Journal of Computer Science and Network Security	SAP-ERP implementation Change management model using quality approach	Proper budget and top Management support not done.

III. CONCLUSION

The construction industry is becoming increasingly complex due to growing project sizes, higher quality expectations, tight budgets, and strict deadlines. Traditional project management methods often fail to provide effective coordination among various departments such as planning, procurement, inventory, finance, quality control, and project execution. This study was carried out to understand the effective implementation of Enterprise Resource Planning (ERP) systems and evaluate their applicability in multistoried residential building projects.

From the study, it is concluded that ERP plays a significant role in integrating different construction processes into a single platform, thereby improving communication, data accuracy, and decision-making across the organization. ERP systems help manage various project functions such as project estimation, bill of quantities, inventory control, material planning, manpower management, cost monitoring, subcontractor coordination, billing, and financial accounting. By implementing ERP, construction organizations can achieve better control over project resources, reduce operational delays, and improve project transparency.

The analysis of ERP implementation in the case study of Kadam Infracon indicates that ERP improves the planning and execution of construction activities by enabling efficient management of materials, labour, and finances. Modules such as estimation planning, BOQ generation, inventory management, and project tracking assist in reducing errors, avoiding duplication of work, and ensuring timely availability of construction resources. ERP also supports project managers by providing real-time updates, analytical dashboards, and accurate reports for monitoring project progress and controlling costs.

The study further reveals that ERP implementation contributes significantly to reducing construction delays, improving

productivity, minimizing material wastage, and enhancing resource utilization. It supports better coordination among stakeholders and ensures that project data is centrally stored and easily accessible. In multistoried residential projects, where multiple tasks occur simultaneously, ERP provides better scheduling, procurement planning, and task management, leading to improved project efficiency and quality.

However, the study also identifies certain challenges associated with ERP implementation in the construction industry. High initial investment, employee resistance, lack of training, data migration issues, customization requirements, and inadequate top management support can affect the successful implementation of ERP systems. In addition, many ERP systems are primarily designed for manufacturing industries and may require modifications to suit construction-specific requirements such as BOQ management, subcontractor control, and project-based costing.

Despite these challenges, the study confirms that ERP is an effective management tool for the construction industry when properly planned and implemented. Successful ERP adoption requires clear objectives, strong leadership support, proper employee training, effective change management, and system customization according to project needs.

In conclusion, ERP systems have become an essential technological solution for improving efficiency, productivity, cost control, and quality management in construction projects. The implementation of ERP in multistoried residential buildings helps achieve better project planning, resource optimization, and financial control, ultimately contributing to timely project completion and improved organizational performance. Therefore, ERP can be considered a valuable and sustainable solution for the digital transformation of the construction industry.

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