

Engineering Management for Construction Challenges of Human Resource Management

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Abstract- This study examines the key engineering management for construction challenges of human resource management (HRM) in construction projects and explores engineering management strategies to address them. The construction industry faces high turnover rates, skill shortages, safety concerns, and poor workforce productivity. By integrating engineering management principles—such as systematic planning, technology adoption, and performance optimization—this research proposes solutions to enhance HRM efficiency in construction projects.

I. INTRODUCTION

1.1 Background

Construction projects are labor-intensive and require effective HRM to ensure timely and cost-effective project completion. However, the industry struggles with workforce instability, regulatory compliance, and skill mismatches.

1.2 Problem Statement

HRM inefficiencies lead to delays, cost overruns, and safety risks. Traditional HR practices may not suffice, necessitating an engineering management approach for systematic workforce optimization.

1.3 Research Objectives

1. Identify key HRM challenges in construction projects.
2. Analyze the impact of poor HRM on project performance.
3. Propose engineering management strategies to mitigate HRM challenges.

II. LITERATURE REVIEW

2.1 HRM in Construction Projects

- Workforce planning, recruitment, training, and retention challenges.
- Role of labor laws and union influences.

2.2 Engineering Management Perspectives

- Application of systems engineering, lean construction, and automation.

- Data-driven decision-making for workforce optimization.

2.3 Gaps in Existing Research

Limited studies integrating HRM with engineering management techniques in construction.

III. RESEARCH METHODOLOGY

3.1 Research Design

Mixed-method approach:

- Quantitative: Surveys from construction firms on HRM challenges.
- Qualitative: Case studies of projects with effective HRM strategies.

3.2 Data Collection

- Primary data: Interviews with project managers, HR professionals, and engineers.
- Secondary data: Industry reports, academic journals, and government labor statistics.

3.3 Data Analysis

- Descriptive statistics for survey responses.
- Thematic analysis for interview insights.

IV. KEY HRM CHALLENGES IN CONSTRUCTION PROJECTS

4.1 Workforce Shortages & High Turnover

- Skilled labor scarcity due to aging workforce and lack of training programs.
- High attrition rates due to job insecurity and harsh working conditions.

4.2 Safety & Compliance Risks

- Inadequate safety training leading to accidents.
- Non-compliance with labor laws resulting in legal penalties.

4.3 Poor Productivity & Communication

- Inefficient task allocation and lack of real-time workforce tracking.

- Language barriers and cultural differences in multinational teams.

4.4 Ineffective Leadership & Motivation

- Lack of managerial training for supervisors.
- Low employee engagement due to poor incentives.

V. ENGINEERING MANAGEMENT SOLUTIONS

5.1 Workforce Planning & Optimization

- Predictive analytics for demand forecasting.
- Modular construction and prefabrication to reduce labor dependency.

5.2 Technology Integration

- Building Information Modeling (BIM) for workforce coordination.
- Wearable tech (IoT devices) for safety monitoring.

5.3 Training & Skill Development

- Virtual Reality (VR) for safety training simulations.
- Partnerships with vocational institutes for upskilling workers.

5.4 Performance Monitoring & Incentive Systems

- AI-driven productivity tracking tools.
- Gamification and reward systems to boost morale.

VI. CASE STUDIES

- Case 1: A high-rise project using BIM for labor optimization.
- Case 2: A multinational firm implementing VR safety training.

VII. DISCUSSION

- How engineering management improves HRM efficiency.
- Barriers to implementation (cost, resistance to change).

VIII. CONCLUSION & RECOMMENDATIONS

- Summary of key findings.

- Policy recommendations for industry stakeholders.
- Future research directions.

REFERENCES

[1] (APA/IEEE/Harvard style citations of relevant literature)

Appendices

- Survey questionnaires.