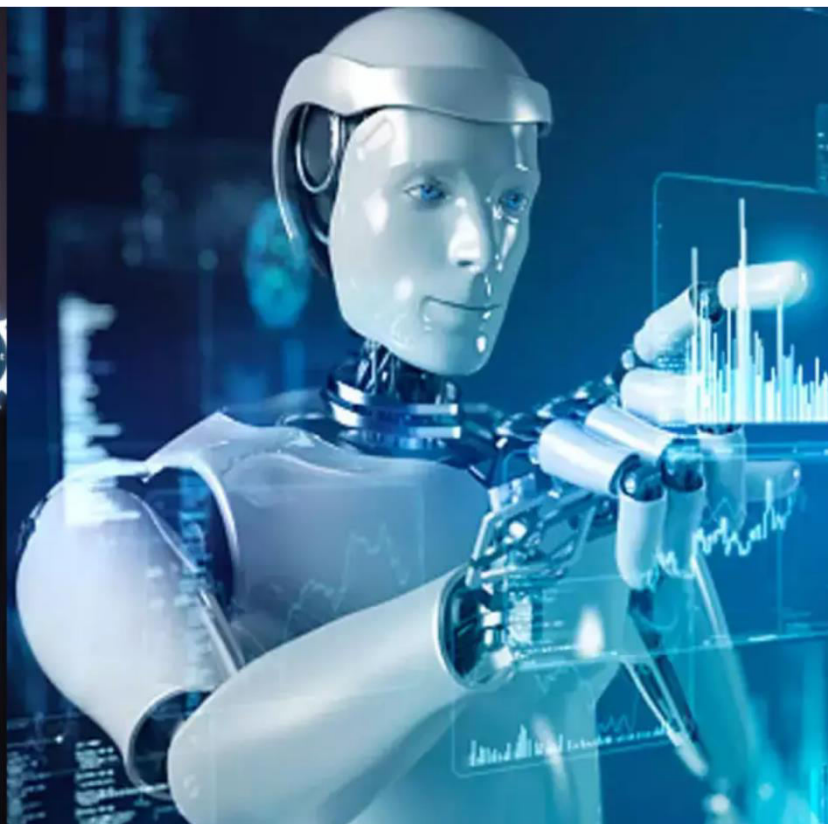




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Analysis of Labour Productivity Measurement of Bridge Awali BK

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ABSTRACT: This study evaluates labour productivity in the construction of the Bridge Awali BK, focusing on the factors that impact work efficiency and identifying potential areas for improvement. The research utilizes a combination of time-study techniques, work sampling, and performance measurement tools to analyze workforce output across various phases of construction. Data was gathered from on-site observations and project reports, with attention given to key variables such as labour skill levels, equipment utilization, environmental conditions, and workflow organization.

KEYWORDS: labour productivity, reliability test, factor analysis, regression analysis and hypothesis.

I. INTRODUCTION

Labour productivity is a critical factor in the success of any construction project, particularly in large-scale infrastructure endeavours such as bridge construction. The construction of the Bridge Awali BK, a vital infrastructure project, provides a unique context for analyzing the various factors that influence labor efficiency and overall project performance. In construction projects, labour productivity is often impacted by a combination of technical, environmental, and managerial factors, which can either enhance or hinder the timely completion of the project..

II. LITERATURE REVIEW

1. **Hwang, B. G., & Soh, C. K. (2013)** – Singapore Labour Productivity This study investigates productivity factors in construction workers and identifies how inadequate planning, poor supervision, and unclear task definitions reduce Labour performance.
2. **Thomas, H. R., & Napolitan, C. L. (1995)** – Impact of Changes Thomas and Napolitan present a quantitative analysis of how project changes, including design revisions and rework, directly reduce Labour productivity. They propose a model to estimate productivity losses due to change orders, which is applicable to the Awali BK Bridge where scope changes are likely.
3. **Chan, D. W. M., & Kumaraswamy, M. M. (2002)** – Fast-Track Construction This research examines the compression of construction timelines and its effect on Labour productivity. The authors argue that acceleration often results in overburdened crews and inefficient work sequences. They propose alternative scheduling methods, including phased starts and shift rotations.
4. **Jarkas, A. M., & Bitar, C. G. (2012)** – Gulf Region Productivity Factors Focusing on infrastructure projects in Kuwait, this study identifies 45 productivity-impacting factors, including Labour skill level, material availability, and site access. It categorizes them into controllable and uncontrollable domains.
5. **Moselhi, O., & Khan, Z. (2010)** – Formwork Operations This study presents a detailed productivity measurement framework for formwork tasks, which are critical in bridge superstructures. Using work sampling and time-motion analysis, they quantify Labour output at various construction phases.
6. **Zhai, D., & Goodrum, P. M. (2012)** – Field Data-Driven Insights Zhai and Goodrum analyze construction productivity using real-time field data and statistical models. They demonstrate that crew-specific productivity trends can predict future project performance. Applying this to Bridge Awali BK allows for forecasting Labour needs and progress rates.

III. OBJECTIVE

1. To Measure Productivity: Quantify Labour productivity for critical construction activities using appropriate metrics, such as output per hour or output per Labourer.
2. To Identify Influencing Factors: Analyze factors affecting Labour productivity, including skill levels, equipment availability, weather conditions, site organization, and management practices.
3. To Develop Improvement Strategies: Propose actionable strategies to enhance Labour productivity, such as workforce training, process automation, and resource planning.
4. To Compare with Industry Standards: Compare measured productivity rates with industry benchmarks to assess performance gaps and identify areas for improvement.

IV. METHODOLOGY

The analysis of Labour productivity for the construction of the Awali BK Bridge involves a systematic approach to evaluating workforce efficiency, identifying key influencing factors, and assessing potential areas for improvement.

1. Data Collection
2. Productivity Measurement
3. Identifying Productivity Influencers
4. Comparative Analysis
5. Recommendations and Optimization Strategies

V. FACTORS AFFECTING ON LABOUR PRODUCTIVITY

1 Skill level and experience of workers

The skill level and experience of workers are critical to achieving high Labour productivity in construction projects. Skilled workers perform tasks faster, with greater accuracy and less need for supervision. Their experience allows them to anticipate problems and solve issues on-site efficiently.

2 Physical fitness and ability of workers

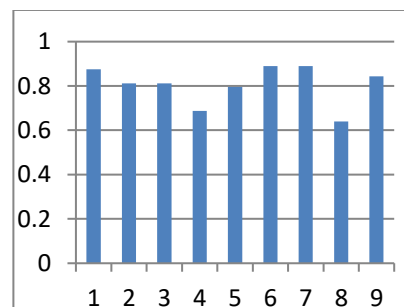
Physical fitness and ability of workers play a vital role in determining Labour productivity on construction sites. Physically fit workers can handle demanding tasks such as lifting, climbing, bending, and long hours of manual Labour more efficiently. They experience less fatigue, which leads to consistent output throughout the workday.

3 Training and education level of workers

The training and education level of workers significantly influence their ability to perform tasks efficiently and safely. Well-trained workers understand construction methods, safety protocols, and quality standards, reducing errors and rework. Education enhances comprehension of drawings, measurements, and instructions, especially in technical tasks like bridge construction.

TABLE RESULT FOR FACTOR AFFECTING LABOUR PRODUCTIVITY BY RII METHOD

SR NO	FACTORS AFFECTING	$RII = \sum W / A * S$	RANKING
1	Skill level and experience of workers	0.875	2
2	Physical fitness and ability of workers	0.812	4
3	Training and education level of workers	0.812	4
4	Age and fatigue of workers	0.687	6
5	Project comlesity and design	0.796	5
6	Quality of supervisor and leadership	0.89	1
7	Equipment availability and fuctionality	0.89	1
8	Weather condition and climate	0.64	7
9	Safety protocols and accidents preventions	0.843	3



Observation taken from a work location 176m chainage towards south side

Sr. No	Name of activity	Categories of labour with their quantity			Average Time required to complete(Minutes)
		Forman	Helper	Skilled labour	
02	Placing & Erecting the steel bar along with holding the stirrups with binding wire(size of foundation 3.5*1.8*5.06) Foundation No: A1&P1	01	08	04	2520
		01	12	07	1680

VI. ADVANTAGES & DISADVANTAGES

ADVANTAGES

1. Improved Workforce Efficiency
2. Cost Control & Budget Management
3. Enhanced Project Scheduling & Planning
4. Identification of Training Needs
5. Quality & Safety Assurance

DISADVANTAGES

1. Complexity in Data Collection
2. Time-Consuming Process
3. Resistance from Workers

VII. FUTURE SCOPE

FUTURE SCOPE

1. Development of Advanced Productivity Measurement Techniques

Use of Artificial Intelligence (AI) and Machine Learning (ML): Implement AI and ML algorithms to analyze historical productivity data and predict future trends, helping project managers optimize workforce allocation and anticipate challenges.

2. Benchmarking and Standardization

Creation of Productivity Benchmarks: Establish standardized productivity metrics for various activities in bridge construction, tailored to different environmental and project conditions.

3. Integration with Construction Technologies

Building Information Modeling (BIM): Integrate productivity measurement with BIM to enable dynamic project planning, real-time updates, and optimization

VIII. CONCLUSION & RECOMMENDATION

CONCLUSION

The analysis of Labour productivity in the Awali BK bridge construction project underscores the critical role of effective workforce management, data collection, and process optimization. By identifying productivity bottlenecks and implementing targeted improvements, the project can achieve higher efficiency, reduced costs, and timely completion. Moreover, the findings from this study provide valuable insights that can be applied to similar bridge construction projects, contributing to the ongoing evolution of construction practices and the optimization of Labour resources.

RECOMMENDATIONS**1. Enhance Worker Training and Skill Development**

To improve productivity, invest in continuous training programs for workers. Ensure that Labourers are well-versed in the specific skills needed for bridge construction, such as formwork, reinforcement, and concrete placement.

2. Optimize Equipment Availability and Functionality

Ensure that all necessary equipment, including cranes, excavators, and concrete pumps, is readily available and well-maintained. Equipment downtime can severely affect productivity, so establishing a regular maintenance schedule and keeping backup machines on hand is crucial.

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