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**Using Dashboards to Improve Operation and Maintenance Project Management Processes
at Ibn Yaqub for Construction in Saudi Arabia**

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Introduction

In today's rapidly evolving business landscape, organizations increasingly depend on advanced technological solutions to enhance operational efficiency and improve decision-making processes. The emergence of digital tools, particularly dashboards, has transformed how companies manage projects, especially within the realm of operation and maintenance. In project management, real-time data visibility is essential for informed decision-making, optimizing workflows, and ensuring the timely completion of tasks. This research examines the implementation of dashboards to enhance the operation and maintenance of project management processes at Ibn Yaquub for Construction, a leading entity in Saudi Arabia's urban development sector (Marobin, 2013).

Ibn Yaquub for Construction operates in a complex and dynamic environment, managing projects that require efficient coordination among multiple departments. Operation and maintenance projects, in particular, are vital for ensuring that the company's infrastructure and assets function optimally. Given the significance of these projects, the demand for accurate and timely data has become increasingly urgent. Traditional methods of monitoring project progress, such as spreadsheets and manual reporting, have proven insufficient for providing the agility and oversight necessary in today's business landscape (Marobin, 2013).

Dashboards solve this challenge by providing a visual and interactive platform where key performance indicators (KPIs), project timelines, budget allocations, and resource usage can be monitored in real-time. This study will assess how dashboards can enhance project management processes within Ibn Yaquub for Construction, mainly focusing on improving efficiency, reducing downtime, and optimizing resource utilization in operation and maintenance projects (Kerzner, 2022).

The research aims to contribute to the growing body of knowledge on the practical applications of dashboards in project management, particularly in Saudi Arabia's rapidly evolving development landscape. By investigating Ibn Yaquub for Construction, the study will provide insights into the benefits and challenges of integrating dashboards into project management processes, offering recommendations that can be applied to similar regional organizations (Kerzner, 2022).

Research Problem

Effective management of operation and maintenance projects is essential for organizations like Ibn Yaqub for Construction, which plays a crucial role in Saudi Arabia's urban development initiatives. However, the complexity and scale of these projects often present significant challenges, such as tracking progress, resource allocation, and ensuring timely completion. Traditional project management tools and techniques, like manual reporting and spreadsheets, are insufficient to handle the growing demands for real-time data, decision-making, and cross-departmental coordination.

The lack of real-time visibility into key performance indicators (KPIs), delays in identifying project bottlenecks, inefficient resource allocation, and the inability to make timely adjustments are common issues faced in Ibn Yaqub's operation and maintenance projects. These challenges often lead to increased costs, compromised quality of work, and extended project timelines, ultimately affecting the company's overall performance and reputation.

This research addresses the following problem: How can implementing dashboards improve efficiency, resource allocation, and decision-making processes in managing operation and maintenance projects at Ibn Yaqub for Construction?

Importance of Research

This research is significant because it has the potential to provide valuable insights into how digital tools, specifically dashboards, can transform project management practices in Saudi Arabia's construction and urban development sectors. The results of this study will have both practical and theoretical implications.

Scientific Significance:

1. **Improving Operational Efficiency:** This research contributes to the theoretical understanding of the role of digital tools, specifically dashboards, in enhancing operational efficiency in Saudi Arabia's construction and urban development sectors. It offers deeper insights into how real-time data can improve monitoring processes and decision-making in project management.
2. **Enriching Project Management Literature:** The study adds to the academic literature on project management by focusing on how dashboards can improve decision-making and reduce human errors. It provides a scientific framework for assessing the impact of these tools on project efficiency and their ability to adapt to complex projects.
3. **Advancing Resource Management Knowledge:** The research will address how dashboards can optimize human and material resource management, enriching studies on efficient resource utilization in large-scale projects.

Practical Significance:

1. **Enhancing Operational Efficiency at Ibn Yaqub for Construction:** This research will help improve the company's operational efficiency by highlighting how dashboards can speed up workflows, reduce errors, and minimize delays and cost overruns.
2. **Optimizing Resource Management:** The research will demonstrate how dashboards provide detailed insights into workload distribution, employee productivity, and equipment usage, leading to significant cost savings and improved project outcomes.
3. **Improving Project Management:** The study will offer practical guidance on adopting agile, responsive project management systems that rely on dashboards to enhance team

communication, reduce the likelihood of mismanagement, and enable data-driven decision-making.

Study Objectives

This study explores how dashboards can effectively be used to enhance the management of operation and maintenance projects at Ibn Yaqub for Construction. The specific objectives of the research are:

1. To assess the current project management practices at Ibn Yaqub for Construction and identify the limitations of traditional tools in managing operation and maintenance projects.
2. To evaluate the role of dashboards in improving decision-making processes by providing real-time data visibility, performance tracking, and resource allocation in operation and maintenance projects.
3. To determine the impact of dashboards on project efficiency, focusing on reducing delays, optimizing resources, and overall project performance.
4. To identify the challenges and barriers to dashboard implementation in project management processes at Ibn Yaqub for Construction.
5. To provide recommendations for successfully integrating dashboards into the operation and maintenance project management processes, contributing to better project outcomes and alignment with Saudi Arabia's Vision 2030.

Study Questions

Main Question:

How can implementing dashboards enhance the management of operation and maintenance projects at Ibn Yaquub for Construction and align with the company's strategic goals in the context of Vision 2030?

Sub-Questions:

1. What challenges do Ibn Yaquub for Construction face in managing operation and maintenance projects using traditional tools?
2. How can dashboards improve the decision-making processes in managing these projects?
3. How do dashboards enhance efficiency, resource management, and overall performance in operation and maintenance projects?
4. What potential challenges and limitations might Ibn Yaquub for Construction face when implementing dashboards?
5. How can dashboards contribute to achieving better project outcomes and aligning with the strategic objectives of Ibn Yaquub for Construction, particularly in line with Saudi Arabia's Vision 2030?

Study Hypotheses

Based on the theoretical foundations and literature review, this study proposes the following hypotheses:

H1: Dashboards remarkably improve the operation and maintenance of project management decision-making.

This hypothesis is based on the principles of information and decision theory. It suggests that providing real-time, actionable data through dashboards leads to better, more informed decisions in managing complex projects.

H2: Using dashboards enhances resource allocation efficiency in operation and maintenance projects.

Based on systems theory and the balanced scorecard approach, this hypothesis posits that dashboards enable project managers to allocate resources more effectively by providing a comprehensive view of project needs and resource availability, resulting in more efficient use of manpower, equipment, and materials.

H3: Dashboards reduce project delays by providing real-time visibility into key performance indicators (KPIs).

This hypothesis aligns with Kerzner's (2022) assertion that dashboards help identify potential bottlenecks and delays early, allowing project managers to intervene and make necessary adjustments promptly.

H4: Implementing dashboards in operation and maintenance projects improves overall project performance by reducing downtime and optimizing equipment maintenance.

Based on Total Productive Maintenance (TPM) principles, this hypothesis suggests that dashboards integrated with TPM practices enhance equipment reliability and minimize downtime, thereby improving project performance.

H5: The use of dashboards positively influences the alignment of project outcomes with organizational strategic objectives, particularly in Vision 2030.

This hypothesis draws from the balanced scorecard approach, which emphasizes aligning project metrics with broader strategic goals. Dashboards help ensure that projects remain aligned with organizational objectives by tracking performance across multiple dimensions, such as financial, operational, and customer satisfaction metrics.

Literature Review

The increasing complexity of projects and the need for efficient management have led to the evolution of various tools and methodologies to enhance project performance. Among these tools, dashboards have emerged as a significant innovation, enabling real-time monitoring and control of project metrics and KPIs. This literature review delves into current academic and industry research surrounding the use of dashboards in project management, focusing on their application in operation and maintenance projects. It draws upon various studies to explore how dashboards contribute to improved project outcomes, decision-making processes, and resource optimization.

1. The Evolution of Project Management Tools and Dashboards

Project management has historically relied on traditional tools like spreadsheets, manual reporting, and static presentations to track project progress and performance. However, as project complexity has grown, these methods have proven insufficient for providing the level of insight required to manage projects effectively. Dashboards have emerged as a dynamic solution, offering real-time data visualization and allowing managers to monitor KPIs, assess risks, and make informed decisions.

Kerzner (2022), in his book *Project Management Metrics, KPIs, and Dashboards: A Guide to Measuring and Monitoring Project Performance*, outlines the importance of dashboards as a project management tool. He emphasizes that dashboards offer a centralized platform to monitor critical metrics, helping maintain project timelines, manage resources, and ensure that the project aligns with its objectives. Dashboards provide managers with real-time, actionable insights, which aid in reducing project delays, improving efficiency, and fostering better decision-making.

2. Enhancing Operational Efficiency through Dashboards

Dashboards are particularly effective in improving operational efficiency, especially in industries managing complex maintenance and operational tasks. The ability to visualize equipment performance, monitor resource allocation, and identify potential bottlenecks enables companies to streamline operations and minimize downtime.

Vilarinho, Lopes, and Sousa (2018) conducted a study on developing dashboards for SMEs to enhance the performance of productive equipment and processes. Their research found that dashboards improved operational visibility, allowing for better decision-making and resource allocation. Dashboards enable a proactive approach to equipment maintenance, reducing unplanned downtime and extending the equipment's lifecycle, resulting in cost savings.

Similarly, Fatnani, Nwachukwu, and Makhmoor (2017) explored the use of dashboards in operations management. Their research demonstrated that dashboards optimized production workflows by offering visual representations of production data, allowing managers to swiftly identify inefficiencies and implement corrective actions. This is particularly relevant for companies like Ibn Yaqub for Construction, which manage large-scale operational and maintenance projects requiring real-time oversight to ensure optimal performance.

3. Dashboards in Digitalized Industrial Environments

The industrial sector has increasingly embraced digitalization, and dashboards have become an essential component of this transformation. Østrem (2018) conducted a case-based study focusing on project performance and the use of dashboards during industrial digitalization. His research highlights the significant role dashboards play in identifying areas for improvement during industrial processes, particularly in large-scale projects. Dashboards offer centralized monitoring and analysis of data, which is crucial in industries like construction, where swift decision-making is necessary to maintain project timelines and operational efficiency.

Sukmandhani et al. (2022) also explored the design and implementation of a dashboard-based web service for management operations. Their study showed that web-based dashboards streamlined communication and collaboration across departments, enhancing project management efficiency. For organizations managing multiple projects, the ability to have a unified view of project status, resource allocation, and performance metrics is invaluable.

4. Performance Measurement and Monitoring with Dashboards

Dashboards in project management play a critical role in measuring and monitoring performance. Dashboards provide a clear view of KPIs, which are essential for evaluating project progress. By offering real-time data, dashboards enable project managers to make informed decisions and take corrective actions when necessary.

Eckerson (2010), in *Performance Dashboards: Measuring, Monitoring, and Managing Your Business*, discusses the importance of dashboards in tracking performance across business functions. Dashboards provide real-time feedback, which is particularly important in project management, where delays or missteps can result in cost overruns and missed deadlines. Marobin (2013) further supports this, noting that dashboards significantly improve a manager's ability to track key metrics like budget, timeline, and resource allocation, enhancing overall project management efficiency.

5. Dashboards and Total Productive Maintenance (TPM)

In operation and maintenance projects, dashboards can be integrated with TPM practices to enhance equipment performance and minimize downtime. Mustaffa, Rosli, and Ong (2017) proposed integrating TPM with dashboards to improve performance efficiency. Their research demonstrated that using dashboards alongside TPM practices improved equipment reliability and operational efficiency by enabling proactive maintenance management.

6. Challenges and Opportunities in Dashboard Implementation

Despite the benefits of dashboards, their implementation is not without challenges. Brahimi et al. (2019) identified several barriers to successful dashboard implementation, such as data integration issues and resistance to change among employees. However, they also emphasized the opportunities dashboards provide to improve transparency, accountability, and overall project performance.

Borden, Murray, and Yorkos (2008) also addressed dashboard implementation challenges, stressing the need for accurate and relevant data. Despite these challenges, their study concluded that dashboards offer significant improvements in project management outcomes when implemented correctly.

Conclusion

Literature emphasizes dashboards' crucial role in enhancing project management, particularly in operation and maintenance projects. Dashboards offer real-time visibility into key metrics, enabling better decision-making, resource optimization, and operational efficiency. Although challenges exist in implementation, the benefits of dashboards in improving project outcomes are clear. This review provides a strong foundation for further research into using dashboards at Ibn Yaqub for Construction, especially in operation and maintenance project management.

Research Gap

This research highlights several gaps in the existing literature on using dashboards in project management, particularly in the context of development and real estate companies in Saudi Arabia. Although dashboards have been studied extensively in industrial and technological sectors, their application in companies like Ibn Yaqub for Construction, which manages operation and maintenance projects, remains underexplored. The following key gaps emerge:

1. **Lack of Studies on Development and Real Estate Companies in Saudi Arabia:** Most studies on dashboards have focused on industries like manufacturing, IT, or small- and medium-sized enterprises (SMEs). However, companies like Ibn Yaqub for Construction, which manage complex developmental and real estate projects, operate in a unique environment influenced by project demands, operational complexity, and long-term maintenance needs. There is little research on how dashboards can specifically benefit these projects in the Saudi context.
2. **Absence of Studies on Operational and Maintenance Projects in Saudi Arabia:** Existing research overlooks the specific challenges of operational and maintenance projects within Saudi Arabian companies. These projects require efficient resource management, equipment maintenance, and timely decision-making to prevent delays and ensure smooth project execution. Dashboards, which provide real-time data on these critical elements, have not been extensively studied in this context, mainly focusing on how they address project delays, resource allocation, and maintenance efficiency.
3. **Alignment with Vision 2030 Objectives:** Vision 2030 emphasizes sustainable development, operational efficiency, and the alignment of project outcomes with national strategic goals. While dashboards have the potential to support these goals by providing transparency and improved management processes, few studies have examined how dashboards contribute to achieving Vision 2030's objectives. There is a gap in research specifically linking dashboard usage in project management to broader national goals, particularly in large-scale development projects in Saudi Arabia.
4. **Limited Empirical Field Data:** Most of the current literature relies on theoretical frameworks and case studies from other regions, with little quantitative field data from

within Saudi Arabia. This gap limits the ability to apply existing findings to the specific challenges Saudi companies like Ibn Yaqub for Construction face. A practical, data-driven study that collects empirical evidence from fieldwork within Saudi Arabia is essential to provide actionable insights into how dashboards can improve project performance locally.

In summary, the lack of research focused on development companies and the absence of empirical studies within the Saudi context underscores the need for this study. By addressing these gaps, the research aims to provide evidence-based recommendations on how dashboards can improve the management of operation and maintenance projects at Ibn Yaqub for Construction aligned with the broader goals of Vision 2030.

Theoretical Foundations of the Study

The foundation of this study rests on several key theories and frameworks related to project management, performance monitoring, and decision-making in organizational settings. Dashboards are rooted in the principles of systems thinking, information theory, and the balanced scorecard approach, all of which aim to provide decision-makers with actionable insights for enhancing efficiency and productivity in project management.

1. Systems Theory

Systems theory emphasizes the interconnectivity of various elements within an organization or project. In project management, systems theory highlights how different aspects of a project, such as resources, timelines, risks, and team dynamics, interact and influence one another. This theory serves as the backbone of dashboards, which provide an integrated view of project metrics and KPIs. By offering a holistic view of various project components, dashboards enable project managers to see how different parts of the system are performing in relation to one another, helping them make more informed decisions. This aligns with the work of Kerzner (2022), who emphasizes that dashboards provide a systemic view of project performance, allowing for proactive management (Hespanha, J. P. 2018).

2. Information Theory

Information theory, first developed by Claude Shannon, concerns the transmission, processing, and storage of information. In the context of dashboards, information theory highlights the importance of providing relevant, accurate, and timely data to decision-makers. Dashboards serve as a medium for transmitting key project information to managers, enabling them to process data and make informed decisions quickly. As Eckerson (2010) points out, the primary purpose of dashboards is to measure, monitor, and manage performance by presenting critical information in a digestible format. The efficiency of dashboards in improving project management processes is closely tied to their ability to deliver real-time, actionable information that managers can use to address issues as they arise (Ash, R. B. 2012).

3. The Balanced Scorecard Approach

The balanced scorecard framework, developed by Robert Kaplan and David Norton, is a strategic performance management tool that measures organizational performance across multiple perspectives: financial, customer, internal processes, and learning and growth. Dashboards are often aligned with the balanced scorecard approach because they allow organizations to track KPIs across various dimensions. By incorporating financial data, customer satisfaction metrics, and internal performance indicators, dashboards provide a well-rounded view of project health and enable managers to ensure that all aspects of the project are aligned with strategic objectives. This framework is particularly useful in operation and maintenance projects, where multiple factors must be managed simultaneously to ensure project success(Chan, T. K., & Hiap, P. T. 2012).

4. Decision Theory

Decision theory is concerned with the process of making choices in the presence of uncertainty. In project management, decisions must often be made quickly and with incomplete information. Dashboards help mitigate the uncertainties involved in decision-making by providing a comprehensive view of real-time data, enabling managers to make informed choices that are more likely to lead to successful outcomes. Vilarinho, Lopes, and Sousa (2018) stress that dashboards enhance decision-making by providing managers with the information needed to act quickly and efficiently in dynamic environments (Chernoff, H., & Moses, L. E. 2012).

5. Total Productive Maintenance (TPM)

Total Productive Maintenance (TPM) is a management approach that focuses on maximizing the effectiveness of equipment by minimizing downtime and improving operational efficiency. Mustaffa, Rosli, and Ong (2017) argue that dashboards can be effectively integrated with TPM strategies to enhance maintenance operations by providing real-time data on equipment performance. This theory is directly relevant to operation and maintenance projects, where the ability to monitor equipment performance and take proactive maintenance actions is critical to ensuring project success (Jain, A., Bhatti, R., & Singh, H. 2014).

Methodology and Research Methods

This study investigates the impact of dashboards on the management of operation and maintenance projects at Ibn Yaqub for Construction Development Company. To achieve the study objectives and answer the research questions, a quantitative research methodology will be employed. This methodology is used because it can collect and analyze numerical data from a large group of respondents, allowing for generalizable conclusions about the impact of dashboards on project management.

1. Research Design

The research design follows a descriptive approach, which involves collecting data on the current use of dashboards in project management at Ibn Yaqub for Construction. The study will evaluate how dashboards influence decision-making, resource allocation, project delays, equipment maintenance, and alignment with strategic objectives. A structured questionnaire will be used as the primary data collection tool to gather information from employees directly involved in the operation and maintenance of projects at Ibn Yaqub for Construction.

2. Population and Sample

The population of this study consists of employees at Ibn Yaqub for Construction Development Company who are involved in operation and maintenance project management. This includes project managers, engineers, maintenance staff, and support personnel who utilize or could benefit from dashboards in their daily operations. A sample of these employees will be selected using a simple random sampling technique to ensure that every individual in the population has an equal chance of being selected, thus reducing potential biases in the results.

The target sample size is estimated to be 50-100 respondents, which is deemed sufficient to provide reliable and valid data for statistical analysis. This sample size ensures that the study can capture a range of perspectives on the use and effectiveness of dashboards within the company.

3. Data Collection Instrument

The primary tool for data collection in this study will be a structured questionnaire. The questionnaire will be designed to assess respondents' views on the current use of dashboards, their impact on project management processes, and the challenges faced during their implementation. It will consist of closed-ended questions using a Likert scale (ranging from 1 = Strongly Disagree to 5 = Strongly Agree), allowing respondents to rate their level of agreement with various statements related to the study hypotheses.

The questionnaire will be divided into the following sections:

- **Demographic Information:** This includes questions about the respondents' roles, experiences, and departments within Ibn Yaquub for Construction.
- **Current Use of Dashboards:** This section assesses how dashboards are currently used in project management and the extent to which respondents are familiar with the tool.
- **Impact of Dashboards on Decision-Making and Resource Allocation:** Evaluate the effectiveness of dashboards in improving decision-making processes and optimizing resource use.
- **Effect on Project Delays and Equipment Maintenance:** Investigates whether dashboards have contributed to reducing project delays and improving equipment performance through better maintenance practices.
- **Challenges in Implementing Dashboards:** Identifies the barriers and challenges encountered while implementing dashboards in project management.
- **Alignment with Strategic Objectives:** This measure measures how dashboards support project alignment with Ibn Yaquub for Construction's strategic goals, including the broader objectives of Saudi Arabia's Vision 2030.

Study Tools

The primary tool for this study is the **structured questionnaire**. This tool is chosen because it allows for the collection of standardized data from a large group of respondents, making it suitable for statistical analysis. The questionnaire will be designed to address the research objectives and study hypotheses, using a combination of demographic questions, Likert scale statements, and multiple-choice questions.

The questionnaire will be distributed to employees in both electronic and paper formats to maximize response rates and accessibility. The electronic version will be distributed via email or an internal company communication system, while the paper version will be distributed to those who prefer or require a hard copy.

Study Limits

Several limitations may affect the scope and findings of this study:

1. **Limited Generalizability:** The study is limited to Ibn Yaquub for Construction employees, meaning the findings may not be fully generalizable to other companies or industries. The specific organizational culture and project management practices of Ibn Yaquub for Construction may influence the results, limiting the applicability of the findings to other contexts.
2. **Self-Reporting Bias:** Using a self-reported questionnaire introduces the potential for response bias, where respondents may overestimate or underestimate the effectiveness of dashboards based on their personal experiences or preferences.
3. **Time Constraints:** The time available to distribute the questionnaire and collect responses may limit the comprehensiveness of the data collection process. Some respondents may not have enough time to provide detailed answers, which could affect the depth of the data.
4. **Technological Familiarity:** Not all employees may be equally familiar with using dashboards in project management. As a result, the study may face challenges in assessing the true impact of dashboards on employees who have limited experience with the tool.
5. **Scope of the Questionnaire:** The questionnaire may not capture all potential factors influencing the use and effectiveness of dashboards in project management, such as organizational support, training, or the availability of necessary resources for dashboard implementation.

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