

Implementation Of Mobile Web Applications Using Balanced Scorecard KPI Formulation

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Abstract

Implementation of mobile web applications has become a key factor in improving organizational performance in the digital era. This research examines the application of the Balanced Scorecard (BSC) model in the formulation of Key Performance Indicators (KPI) for mobile web applications to increase operational effectiveness and efficiency. The Balanced Scorecard, developed by Kaplan and Norton, is a managerial tool that integrates multiple performance perspectives financial, customer, internal processes, and learning and growth in one comprehensive framework. This study focuses on how KPIs designed based on the BSC model can be used to assess and monitor the performance of mobile web applications. The implementation process begins with identifying the organization's strategic objectives and establishing relevant KPIs for each BSC perspective. Next, this research evaluates how these KPIs are applied in the context of mobile web applications and their impact on application performance and user satisfaction. The results of this research show that the use of BSC-based KPIs can increase visibility of mobile web application performance, assist in identifying areas of improvement, and support better strategic decision making. This research also identifies challenges that may be faced in implementing the BSC model in the context of mobile technology and provides recommendations to overcome these challenges.

Keywords: balanced scorecard, kpi, mobile web.

INTRODUCTION

In today's digital era, mobile web applications have become an integral component in the business and operational strategies of many organizations. With advances in technology and increased use of mobile devices, these applications have not only become a tool to reach customers, but also play a crucial role in improving operational efficiency and user satisfaction. However, the main challenge faced by organizations is how to effectively monitor and evaluate the performance of these applications to ensure that the organization's strategic objectives are achieved.

The Balanced Scorecard (BSC), introduced by Robert S. Kaplan and David P. Norton in the early 1990s, offers a comprehensive approach to performance management by integrating multiple perspectives in one framework. BSC not only focuses on financial performance, but also includes customer perspectives, internal processes, and learning and growth. Thus, the

BSC provides a more holistic picture of organizational performance and allows for more integrated measurement.

Implementing the Balanced Scorecard in the context of mobile web applications requires the formulation of Key Performance Indicators (KPI) that are relevant for each BSC perspective. This KPI functions as a measuring tool to assess various aspects of the application, from user satisfaction to the efficiency of internal processes and their impact on the organization's strategic goals.

This research aims to examine the implementation of the Balanced Scorecard model in KPI formulation for mobile web applications. The main focus of this research is to explore how BSC-based KPIs can be used to measure and improve the performance of mobile web applications. In addition, this research also aims to identify challenges that may be faced in implementing the BSC model in the context of mobile technology and provide recommendations for overcoming these challenges.

By using the BSC approach, this research is expected to provide deeper insight into how organizations can utilize KPIs to monitor and optimize their mobile web applications. The results of this research are expected to make a significant contribution to the performance management literature and mobile web application development practice, as well as offering practical guidance for application developers and managers in improving the effectiveness and efficiency of their applications.

Research on mobile web application implementation and performance management has grown rapidly in recent years, especially with the increasing importance of mobile technology in business strategy. Related studies can be divided into several main categories, namely the application of the Balanced Scorecard (BSC) in a technological context, the formulation and use of KPIs for mobile web applications, as well as the evaluation of mobile application performance in general.

The Balanced Scorecard (BSC), introduced by Kaplan and Norton (1992), has been widely utilized to measure organizational performance by integrating multiple perspectives for a comprehensive evaluation. In the field of information technology, studies like those by Seddon (1997) and Van Grembergen (2002) have demonstrated the effectiveness of BSC in assessing and enhancing information system performance. These studies highlight how BSC facilitates the alignment of technology strategies with overarching business objectives, providing a structured approach to performance management. However, despite its proven utility, limited attention has been given to the specific application of BSC in evaluating and optimizing mobile web applications, indicating a gap in research that could offer significant insights into this rapidly evolving technological domain.

The formulation and use of Key Performance Indicators (KPIs) for mobile web applications is an increasingly important area of focus, as these metrics play a crucial role in assessing various aspects of application performance, including user experience and technical efficiency. Research by Kuniavsky (2003) and Nielsen (2007) has emphasized the significance of metrics for web and mobile applications, particularly in areas like speed, reliability, and user satisfaction. Furthermore, studies such as those by Alshamari et al. (2015) highlight the challenges in developing effective KPIs for mobile applications, noting the difficulties in accurately and consistently measuring user experience. These challenges point to the need for more refined methodologies to ensure that KPIs are both relevant and reliable in evaluating mobile web application performance.

Research on mobile application performance evaluation typically focuses on both technical metrics and user experience. Studies by Dey et al. (2006) and Shneiderman (2010) emphasize the use of various metrics, such as response time, error rate, and user satisfaction,

to assess application performance. These studies offer a solid foundation for understanding how such metrics can be applied within a Balanced Scorecard (BSC) framework, providing valuable insights into the effectiveness of mobile applications. However, they often overlook the integration of Key Performance Indicators (KPIs) within the BSC specifically for mobile web applications, highlighting a gap in research that could offer more comprehensive approaches to performance evaluation in this area.

Initial research has begun to explore the integration of the Balanced Scorecard (BSC) with Key Performance Indicators (KPIs) in the context of mobile technology. For instance, Ferreira and Otley (2009) identified the potential of BSC integration for IT project management, though they did not delve into its practical applications for mobile web applications. This study paves the way for a more systematic approach to KPI formulation based on BSC, yet there remains a need for further research to tailor this framework specifically to mobile technology. Such research could provide valuable insights into how BSC and KPIs can be effectively combined to evaluate and enhance mobile web application performance.

METHOD

This research aims to explore and apply the Balanced Scorecard (BSC) model to formulate Key Performance Indicators (KPIs) for mobile web applications. The research method involves several key steps, including identifying strategic objectives, determining KPIs, implementing a monitoring system, and evaluating results. By integrating the BSC framework with mobile web application performance, this study seeks to provide a systematic approach for improving and assessing the effectiveness of these applications. The first step in the research method is to identify the strategic objectives of the organization that are relevant to mobile web applications. This involves reviewing the organization's strategic documents and conducting interviews with key stakeholders to gather insights. The goal is to understand how mobile web applications can contribute to the overall success of the organization, particularly in areas such as financial performance, customer satisfaction, internal processes, and learning and growth. This foundational information will serve as the basis for formulating the KPIs that align with the organization's strategic goals. Once the strategic objectives are identified, the next phase is to determine the appropriate KPIs that can measure the performance of mobile web applications in achieving these objectives. These KPIs will reflect the organization's priorities in different BSC perspectives, ensuring that the evaluation is comprehensive. By aligning the KPIs with strategic goals, the organization can track the success of its mobile web applications and make data-driven decisions to optimize performance and outcomes.

The next step in this research is the formulation of Key Performance Indicators (KPIs) based on the strategic objectives identified in the previous phase, aligned with the Balanced Scorecard (BSC) perspectives. This process involves determining specific KPIs for each of the four BSC perspectives, ensuring that they are relevant to the performance of mobile web applications. For the Financial Perspective, KPIs focus on the financial impact of the mobile web application, such as metrics to measure increased revenue, cost reductions, and Return on Investment (ROI). These indicators help to evaluate how the application contributes to the financial goals of the organization, assessing its cost-effectiveness and overall profitability. The Customer Perspective emphasizes KPIs that measure user satisfaction and experience, which are critical for ensuring the success of a mobile web application. Metrics such as Net Promoter Score (NPS), user retention rate, and task completion time provide valuable insights into how well the application meets customer needs and expectations, allowing the

organization to focus on improving user experience. For the Internal Process Perspective, KPIs are designed to assess the efficiency and effectiveness of the internal processes related to the mobile web application. This includes metrics like application response time, error frequency, and the speed at which new features are developed. These indicators provide an understanding of how well the application performs technically and how effectively the internal processes are supporting its development and maintenance. In the Learning and Growth Perspective, KPIs focus on the development of organizational capabilities and the fostering of innovation. Metrics such as staff training levels, the number of software updates, and adoption rates of new technologies are used to track progress in these areas, ensuring that the organization is continually improving and staying up to date with technological advancements. Once these KPIs are formulated, they will be validated through discussions with the development team and management to ensure that they are relevant, realistic, and aligned with the organization's strategic goals. This validation process is essential to ensure the accuracy and effectiveness of the KPIs in measuring mobile web application performance.

After the KPIs are established, the next step is to implement a monitoring system that enables the collection of relevant data for ongoing evaluation. This system will employ analytical tools and dashboards that allow for real-time tracking of the predefined KPIs. By using technologies such as Google Analytics, Firebase, or other mobile application performance monitoring tools, data on various aspects of the mobile web application's performance can be continuously collected and analyzed. The monitoring system will focus on both technical metrics and user experience indicators. Tools like Google Analytics and Firebase can provide valuable insights into user interactions, such as page views, session duration, and application load times, while also tracking performance metrics like error rates and response times. These data points help measure the effectiveness of internal processes and customer satisfaction, as reflected in the established KPIs. In addition to technical monitoring, the system will also include the collection of user feedback to gain a more holistic view of the application's performance. Surveys and sentiment analysis will be used to gather qualitative insights from users, assessing aspects such as user satisfaction, ease of use, and overall experience. By combining both quantitative data and user feedback, the monitoring system will provide a comprehensive understanding of how the mobile web application is performing against the set KPIs.

RESULT AND DISCUSSION

Calculation of Performance Achievement

Calculation of performance achievements for each KPI depends on polarization applied to the KPI. The following is the formula used in calculation of performance achievements (achievement):

a. Maximize

$$Achievement = \frac{A}{T} \times 100 \% \dots$$

$$Ach = \frac{(T + \Delta T)}{TX} \times 100 \% \dots$$

$$Ach = [T + (A - T)] \times 100 \% \dots$$

b. Minimize

$$\text{Achievement} = 200\% - \frac{A}{T} \times 100\%$$

$$\text{Ach} = \frac{T - \Delta T}{T} \times 100\%$$

$$\text{Ach} = \frac{T - (A - T)}{T} \times 100\%$$

$$\text{Ach} = \frac{2T - A}{T} \times 100\%$$

Where:

Ach = Achievement

T = Target

A = Actual

Δ = Difference between Actual and Target

Score Calculation

The score calculation used to assess organizational performance can be seen in Table 3.1 below:

Table 1. Scores for KPI Performance Achievement Assessment

Achievement	Score	Category
$\text{Ach} \geq 115\%$	Score = 4	Excellent
$100\% \leq \text{Ach} < 115\%$	$3 \leq \text{Score} < 4$	Good
$85\% \leq \text{Ach} < 100\%$	$2 \leq \text{Score} < 3$	Fair
$70\% \leq \text{Ach} < 85\%$	$1 \leq \text{Score} < 2$	Poor
$\text{Ach} < 70\%$	Score = 1	Poor

The following is a graphic of the assessment system used by the organization.



Figure 1. Graphic of Performance Achievement Assessment System

Web Application Map Design

The web application map design basically depicts the application menu in detail structured, making it easier for users to access existing information on each page of the web application. Figure 3.2 below is web application map overview for the Balanced Scorecard Dashboard.

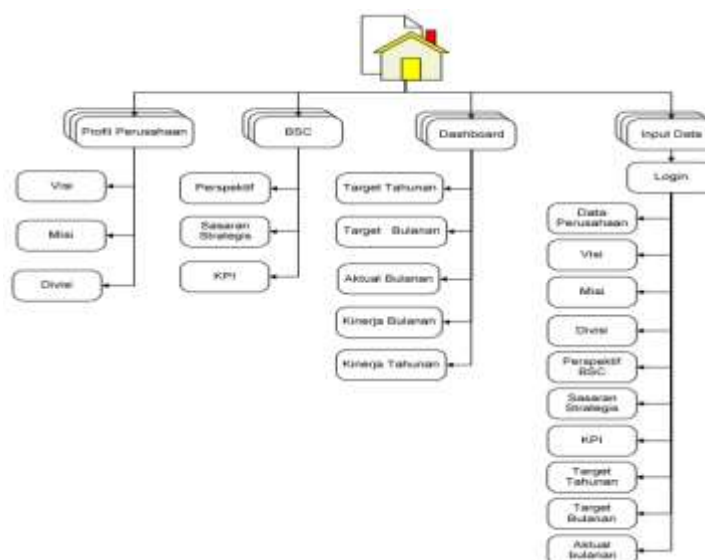


Figure 2. BSC Dashboard Web Application Map Design

CONCLUSION

This research has shown that the application of the Balanced Scorecard (BSC) model in the formulation of Key Performance Indicators (KPI) for mobile web applications can provide comprehensive and integrated insight into application performance. By adopting BSC, organizations can measure mobile web application performance from four key perspectives financial, customer, internal processes, and learning and growth which helps in ensuring that the application is not only effective in achieving strategic goals but also contributes to the long-term success of the organization.

The identification and formulation of BSC-based KPIs highlight the critical importance of aligning mobile web application performance with the broader strategic objectives of the organization. By establishing KPIs across the four Balanced Scorecard perspectives financial, customer, internal processes, and learning and growth this research emphasizes how each aspect of the mobile web application contributes to the achievement of organizational goals. The financial perspective ensures that the application supports profitability and cost efficiency, while the customer perspective focuses on user satisfaction and retention, aligning the application's performance with customer needs. The internal process perspective helps ensure that the application operates efficiently, supporting the organization's operational goals, and fostering innovation through the learning and growth perspective. This comprehensive approach to formulating KPIs allows the organization to monitor and assess the application's performance in a way that directly links to its strategic objectives. By continuously tracking these indicators, organizations can adjust their strategies, ensuring that the mobile web application not only meets current goals but also adapts to future needs, contributing to long-term success.

The implementation of the monitoring system designed in this research enables real-time data collection and detailed analysis of the KPIs. By utilizing analytical tools and dashboards, organizations can effectively track the performance of their mobile web applications across various metrics. These tools provide continuous insights into application functionality, user interactions, and overall system health, allowing for immediate identification of any performance issues or areas requiring improvement. This approach empowers organizations to make informed, data-driven decisions based on up-to-date performance data. For instance, if certain KPIs such as response time, user retention, or error

rates indicate underperformance, targeted adjustments can be made to optimize the user experience and application efficiency. Moreover, the system fosters agility by allowing organizations to respond swiftly to changes in user behavior, technological advancements, or unforeseen challenges. Overall, integrated performance monitoring enhances the organization's ability to adapt, ensuring that the mobile web application remains aligned with strategic goals and continues to evolve based on real-time insights.

The results of KPI evaluation have highlighted several key areas that require further attention, particularly in optimizing internal processes and enhancing the user experience. These findings point to the need for improvements in aspects such as application response time, error reduction, and the implementation of new features that align with user needs and expectations. Addressing these issues can significantly elevate the overall performance of the mobile web application, ensuring that it meets the evolving demands of users. Based on these insights, this research offers practical recommendations for improvement. These include the development of new features informed by user feedback, which could enhance engagement and satisfaction. Additionally, efforts to streamline internal processes such as improving error handling mechanisms, reducing response time, and ensuring the quick release of updates will increase the application's efficiency. By incorporating these recommendations, organizations can not only enhance the functionality of their mobile web applications but also improve overall user satisfaction, thereby contributing to their long-term success and alignment with strategic objectives.

This research makes a significant contribution to the literature on mobile web application performance management by presenting a systematic approach to KPI formulation and monitoring through the Balanced Scorecard (BSC) framework. By integrating financial, customer, internal process, and learning and growth perspectives, this research provides a comprehensive methodology for assessing and improving the performance of mobile applications. It offers valuable insights for practitioners in the field of application development, equipping them with a structured approach to optimize their development processes and ensure alignment with organizational goals. Furthermore, the findings are highly relevant for managers overseeing digital strategy and information technology initiatives. The research emphasizes the importance of aligning mobile web application performance with broader business objectives, thereby helping managers make data-driven decisions that enhance the user experience, operational efficiency, and overall application performance. In this way, the study supports the development of more effective performance management practices in the digital and technology sectors, ultimately driving better outcomes for organizations and their stakeholders.

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