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Design and Evaluation of an Integrated Mobile Web Employee Performance Management System for Hospitals: A Design Science Research Approach

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Abstract

This study aims to address the limitations of a web-based employee performance management system in a hospital environment characterised by high work mobility and limited computer access. This study designs and evaluates an integrated mobile- and web-based employee performance management system that enables real-time work-activity reporting and improves administrative efficiency. This study uses a Design Science Research (DSR) approach to develop and validate system artefacts as a technological solution. In contrast, the system development process follows the System Development Life Cycle (SDLC), which includes planning, analysis, design, implementation, and testing stages. The proposed system integrates a mobile application with a web-based e-performance platform through an Application Programming Interface (API), thus enabling real-time data synchronisation and more flexible access. The system's main features include user authentication, a performance dashboard, recording work activities, uploading evidence of activities, and performance reporting. The results of black-box functional testing across 18 scenarios showed a 100% success rate, indicating system reliability. Usability evaluation of 32 users yielded an average score of 4.38, categorised as very good, indicating high user acceptance. The findings of this study indicate that an integrated mobile-web system can improve accessibility, support real-time performance recording, and increase administrative efficiency in hospital employee performance management. This study contributes to the development of mobile-based performance management information systems in healthcare organisations. It demonstrates the effectiveness of combining DSR and SDLC approaches to produce practical, scalable information system solutions.

Keywords: Employee Performance Management; Mobile Web Integration; Design Science Research; Usability; Health Information Systems

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Introduction

The development of information technology has become a major catalyst for digital transformation across sectors, including healthcare, which is characterised by operational complexity and high service demands. The integration of digital technology into organisational processes enables increased efficiency, transparency, and data-driven decision-making (Atieh et al., 2025; Li, 2025; Nour & Arbussà, 2024). In modern hospitals, information systems no longer merely support clinical services but also serve as a strategic infrastructure for the overall management of organisational resources (Alves et al., 2024; Nguyen & Nielsen, 2023; Soori et al., 2026).

One crucial component of this transformation is the human resource management system, particularly its employee performance management component. A performance management system monitors work activities, evaluates performance outcomes, and supports decision-making for sustainable human resource development (Awan et al., 2020; Harefa et al., 2024; Hosciuc Rendi et al., 2025). In a hospital environment with a multidisciplinary workforce structure involving medical, paramedical, and administrative personnel, a performance management system is a key element in maintaining service quality and organisational operational effectiveness (Akula et al., 2025; Aljohani, 2025).

However, the implementation of performance management systems in the healthcare sector still faces various challenges. In many organisations, the process of recording work activities is still carried out manually or semi-digitally, which can potentially lead to reporting delays, data inconsistencies, and bias in performance evaluations (Alexander

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Wirapraja; Rizky Basatha; Fanny Megawati Manggaetan, 2025; Balaha et al., 2025; Mennad, 2025). Although web-based systems have been widely adopted as digital solutions, this approach still has limitations in highly mobile work environments, such as hospitals, where computer access is not always optimal (Kordova & Hirschprung, 2023; et al., 2025). This situation affects the system's ability to support real-time recording of work activities. Employees working across various service units often cannot access the system immediately, resulting in delayed reporting. This not only impacts the accuracy of performance data but also reduces the system's effectiveness in supporting data-driven decision-making (Bernardo et al., 2024; Seun et al., 2023).

The development of mobile technology offers a more flexible alternative approach to addressing these limitations. Mobile devices enable access to information systems without location and time constraints, thus supporting the direct recording of work activities in the field (Abiri et al., 2023; Jiao et al., 2025; Seedoyal Doargajudhur & Hosanoo, 2022). Furthermore, features available on mobile devices, such as cameras, notifications, and real-time connectivity, can enhance information system functionality and strengthen user interaction with the system (Alsabah et al., 2025; Grljević et al., 2025; Sabit, 2025).

Various studies have shown that the use of mobile technology in organisational information systems can improve operational efficiency, work productivity, and user acceptance (Fridkin et al., 2024; Rokonuzzaman et al., 2023; Sansovini & Magida, 2025). However, in the healthcare sector, most research still focuses on mobile applications for clinical services or patient care, while their use in employee performance management remains relatively limited. Furthermore, integrating mobile systems with existing web-based systems also presents challenges. Many organisations have invested significant resources in developing web-based systems, so new solutions need to be compatible with and integrate with existing systems to avoid redundancy and improve implementation efficiency (Choudhary, 2024; Cristache et al., 2025; Moghrabi et al., 2023).

Based on this literature review, several significant research gaps can be identified. First, there is a limited number of studies examining mobile-based employee performance management systems in the hospital context. Second, there is a lack of studies exploring the integration of mobile and web-based systems in complex organizational environments. Third, there is a paucity of research on comprehensive system evaluations, both from functional and user-experience perspectives, as indicators of information system success. This study aims to design and evaluate a mobile-based employee performance management system integrated with a web-based system in a hospital environment. A Design Science Research (DSR) approach was used to generate system artifacts aligned with organizational needs, while the development process followed the System Development Life Cycle (SDLC) stages to ensure the quality of the system implementation.

The contribution of this research lies in three main aspects. First, the development of a mobile-based performance management system integrated with the existing web system to support real-time reporting of work activities. Second, the DSR approach, combined with the SDLC, is used to develop a practical, solution-based information system. Third, the system evaluation includes functional and usability testing to measure system quality and user acceptance levels. Thus, this research not only offers a practical solution to improve the efficiency and transparency of employee performance management in hospitals but also makes theoretical contributions to the development of an integrated mobile and web-based information system for organizations with high levels of work mobility.

Method

Research Design

This study uses a Design Science Research (DSR) approach, which focuses on the development and evaluation of technological artifacts to solve organizational problems (Castro et al., 2025; Mdletshe et al., 2023; Muntean et al., 2022). This approach was chosen because it aligns with the research objectives, which focus not only on system development but also on evaluating system effectiveness in a real-world context. Within the DSR framework, this study encompasses the stages of problem identification, solution design, artifact development, and system evaluation. To ensure the artifact development process is carried out systematically and in a structured manner, this study adopts the System Development Life Cycle (SDLC) as its technical method. The SDLC encompasses the stages of planning, analysis, design, implementation, and system testing (ALazzawi et al., 2023; de Vicente Mohino et al., 2019; Perdana et al., 2025). The

integration of DSR as a conceptual framework and SDLC as an implementation approach enables this study to produce a system that is not only functional but also has practical validity and contextual relevance in a healthcare organisation.

Research Setting and Participants

This research was conducted at Dr Wahidin Sudirohusodo General Hospital in Makassar, a national referral hospital in Indonesia with a complex organisational structure and high levels of work mobility. The hospital has implemented a web-based E-Performance system as part of its human resource management system to record work activities and monitor employee performance. However, in practice, limited access to computers means that work activity reporting is not always carried out in real time. The study subjects consisted of hospital employees who use the E-Performance system and system administrators responsible for managing the information system. Overall, the study involved 36 respondents, consisting of 32 system users and 4 administrators. Respondents were selected using purposive sampling, based on their direct involvement in system use (Kassa & Worku, 2025; Oyedijo et al., 2023; Syamsiyah et al., 2025).

Data Collection

Data collection was conducted using a multi-method approach to obtain a comprehensive understanding of system requirements and evaluation of the developed system (Varajão et al., 2022; Wood et al., 2000). Observations were conducted to directly understand the flow of use of the web-based E-Kinerja system and identify operational obstacles faced by users in daily work activities. In addition, semi-structured interviews were conducted with employees and system administrators to explore user needs and expectations for the mobile-based system under development (Andayani et al., 2026; Kinney et al., 2024). Documentation was used as a supplementary data source to understand the organisational structure, performance management policies, and existing systems. A questionnaire was used to measure user acceptance of the developed system, particularly in terms of usability. The questionnaire instrument was constructed using a five-level Likert scale that included indicators of ease of use, interface clarity, access speed, ease of data input, and user satisfaction (Huang, 2023; Sudirjo et al., 2024). This approach enabled data triangulation, thereby increasing the validity of the research results.

Instrument Validity and Reliability

Instrument quality is a crucial aspect of this research. Therefore, validity and reliability tests were conducted to ensure that the questionnaire measured the constructs accurately and consistently. Validity testing was performed using Pearson correlation to assess the relationship between each item and the total construct score, while reliability was assessed using Cronbach's Alpha (Khanal & Chhetri, 2024; Kiliç et al., 2023; Polat et al., 2025). The test results showed that all items had correlation values above 0.30, thus indicating they were valid. Furthermore, a Cronbach's alpha of 0.89 indicated excellent internal consistency. Thus, the questionnaire instrument was deemed suitable for use in system usability evaluation.

System Development Procedure

System development was carried out following the SDLC stages, from planning through system testing. In the planning stage, system requirements were identified through observation and discussions with hospital management. The analysis stage focused on identifying the system's functional and non-functional requirements based on the collected data. The design stage included designing a client-server system architecture, in which the mobile application functions as a client that communicates with the server via an Application Programming Interface (API) (Omotayo & Efuntade, 2023). In addition, a system model was designed to illustrate the interaction between the user and the system. In the implementation stage, the mobile application was developed using Kotlin on the Android platform. The mobile system was then integrated with the web-based E-Kinerja system through an API to enable real-time data synchronisation. The testing stage employed black-box testing to ensure that all system functions operate according to predetermined specifications (Jenko et al., 2025; Kurnia et al., 2025).

System Evaluation Framework

The system evaluation was conducted using the DeLone and McLean Information Systems Success Model, a widely used framework in information systems research (Elsdaig & Nassar, 2019; Jeyaraj, 2020; Widyaningrum et al., 2024). This model emphasises that information system success can be measured through several key dimensions, including system quality and user satisfaction. In this study, the evaluation focused on system quality through functional testing

and user satisfaction through usability analysis. This approach allows for a comprehensive system assessment from both technical and user-experience perspectives.

Data Analysis Technique

Data analysis was conducted using a quantitative descriptive approach. Data obtained from the questionnaire were analysed using average values to measure system usability (Bonivin Talan, 2025; Nugraha et al., 2025). The analysis results were then interpreted to determine the level of user acceptance of the developed system. Furthermore, system testing data were used to calculate the system's level of functional success. Through this approach, the study can provide an objective picture of the system quality and the effectiveness of system implementation in supporting employee performance management in the hospital environment.

Results and Discussion

Results

System Development Results

The development results show that a mobile-based employee performance management system integrated with a web-based system can overcome key problems identified in the initial stages of the research, namely limited access to the system, delays in recording work activities, and limited flexibility in reporting employee performance. These problems previously arose from limited reliance on desktop computers in work units, so employees were not always able to input data directly during work activities.

By integrating a mobile application with the web-based E-Kinerja system, employees can now record work activities directly using their smartphones. This allows for real-time reporting without requiring computer access. Thus, the developed system improves data accuracy, reduces the potential for information loss, and expedites the flow of work activity reporting within the hospital organisation. The system was developed using the System Development Life Cycle (SDLC) approach, which encompasses planning, requirements analysis, system design, implementation, and testing. This approach was chosen to ensure a systematic, structured development process. Each stage contributes significantly to producing a system that is not only technically functional but also meets user needs and the hospital's operational context, which is characterised by high work mobility.

From a Design Science Research perspective, the system developed in this study can be categorised as a technological artefact designed to address real-world problems within organisations. This artefact not only serves as an operational system but also has scientific value for the development of integrated mobile web-based information systems. Thus, this research not only produces a technological product but also provides a conceptual contribution to the development of performance management information systems.

The resulting system includes several key modules: user authentication, a performance dashboard, work activity input, activity evidence upload, performance reporting, and activity category management. These modules were designed based on observations, interviews, and documentation, reflecting the actual needs of users in the field. The implementation of the work activity input module is a key feature that significantly improves operational efficiency by enabling direct, structured recording of activities.

System Architecture

The system architecture developed in this research uses a client–server approach, in which the mobile application acts as a client that communicates with the server via an Application Programming Interface (API). This approach enables real-time data exchange between the mobile application and the existing web-based system. The developed system architecture is shown in Figure 1.

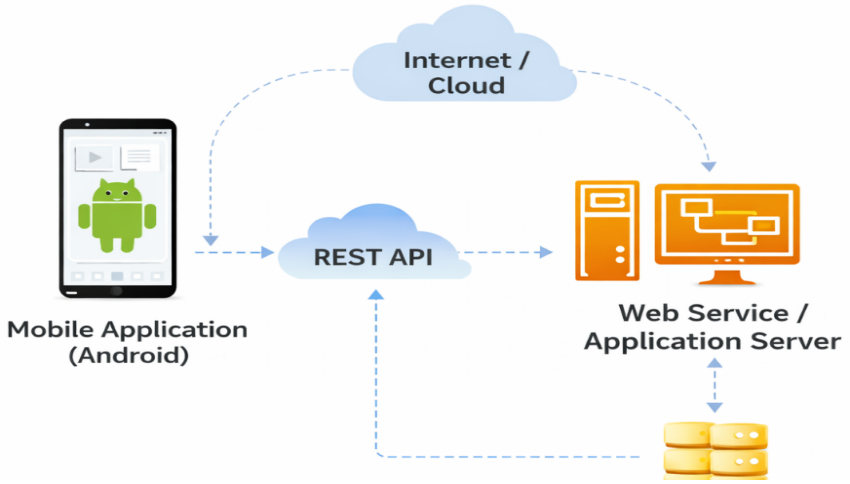

Figure 1. Architecture of the Integrated Mobile Web Employee Performance Management System

Figure 1 shows that the mobile application serves as a user interface, allowing employees to access the E-Kinerja system on smartphones. The mobile application communicates with the server via an API, which acts as a bridge between the mobile application and the system database. User input through the mobile application is processed directly by the server and stored in the system database, enabling real-time data synchronisation. This architectural approach was chosen because of several advantages, including high scalability, flexibility in system development, and ease of integration with other systems. The use of APIs allows for modular system development, simplifying maintenance and further development. Furthermore, this architecture supports system interoperability, a crucial aspect of modern information system development.

System Interface Implementation

The system interface was designed with usability principles in mind to ensure it is easy to use for users with varying levels of technological ability. The interface design was simple, intuitive, and responsive, allowing for comfortable use on various mobile device screen sizes. Figure 2 displays the mobile application interface: login, dashboard, and activity input.

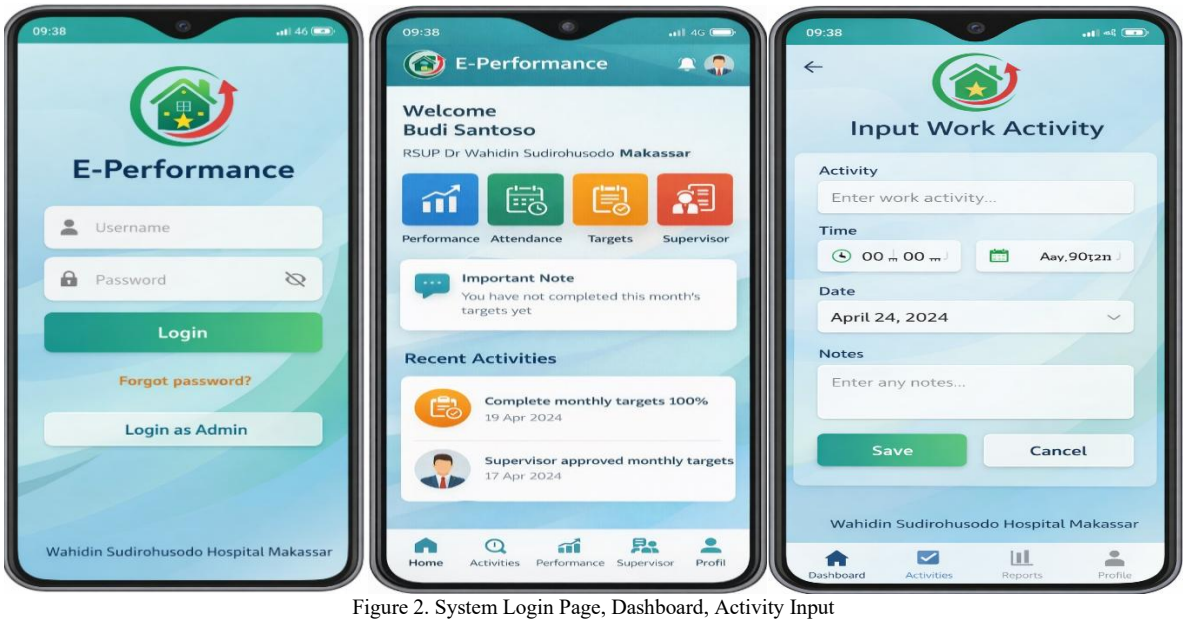

Figure 2. System Login Page, Dashboard, Activity Input

Figure 2 shows that users can access the system by entering their registered email address and password. The simple interface design helps users log in quickly, thereby increasing system access efficiency. The login interface serves as an initial authentication mechanism, ensuring that only authorised users can access the system. The simple design allows users to log in quickly and efficiently. The system dashboard serves as an information centre, displaying a real-time summary of work activities and performance status. The information presented on the dashboard is designed to be easy to understand, allowing users to obtain an overview of performance without complex navigation. The work activity input feature is a key component of this system. This feature allows users to record work activities directly as they occur. This is a major advantage compared to previous web-based systems, where activity recording was often delayed.

Performance Report Interface

The performance report feature was developed to display a summary of employee work activities over a specific period. This feature supports a more structured and data-driven performance evaluation process. The performance report interface is shown in Figure 3.

Figure 5. Employee Performance Report Page

Figure 5 shows that the system displays a work activity report in tabular form, including activity categories, dates, descriptions, and verification status. This report can be used as a basis for employee performance evaluations. Furthermore, the performance report feature allows users to view a summary of work activities for a specific period, supporting a more systematic, data-driven performance evaluation process.

System Functional Testing

System testing was conducted to ensure that all system functions operate according to the designed specifications. Testing was conducted using black-box testing, which focuses on testing system functions without considering the program's internal structure (Berihun et al., 2023; Surpiyono, 2020). Testing was conducted on six main modules with a total of 18 test scenarios. Testing was conducted on six main system modules, comprising 18 test scenarios. The system testing results are shown in Table 1.

Table 1. System Functional Test Results

Module	Test Scenarios	Success Rate
User Authentication	3	100%
Dashboard	3	100%
Activity Input	4	100%
Evidence Upload	3	100%
Reporting	3	100%
Category Management	2	100%
Total	**18**	**100%**

Test results showed that all system modules functioned well with a 100% success rate. This demonstrates the system's high functional quality and ability to consistently meet user needs. This success also indicates that the integration between the mobile application and the web-based system can be implemented stably in a hospital's operational environment.

Usability Analysis

A usability evaluation was conducted to assess user acceptance of the developed system. The evaluation was conducted using a questionnaire administered to 32 system users using a five-level Likert scale. The results of the system usability analysis are shown in Table 2.

Table 2. System Usability Analysis Results

Indicator	Mean	Std. Dev	Interpretation
Ease of Use	4.41	0.52	Very Good
Interface Clarity	4.34	0.47	Very Good
System Speed	4.28	0.56	Good
Data Input Ease	4.47	0.43	Very Good
User Satisfaction	4.39	0.49	Very Good
Overall Mean	**4.38**	**0.49**	**Very Good**

Based on Table 2, the system's average usability score is 4.38, indicating a very good level of user acceptance. The indicator with the highest score is ease of data input, indicating that users find the developed system simplifies recording work activities. This finding indicates that the developed system successfully addresses users' primary operational needs, particularly in recording work activities, which were previously hampered by limited access to computers. Meanwhile, the access speed indicator received the lowest average score among the indicators, although it is still in the good category. This indicates that aspects of system performance can still be improved, particularly in connection stability, data synchronisation, and application interface response.

Conceptually, these usability results confirm that the success of an information system is determined not only by meeting functional requirements but also by the extent to which it provides a positive user experience. The highest score on the ease of data input indicator indicates that the system successfully addressed the main user issues during the recording of work activities. Conversely, the relatively lower score on the access speed indicator indicates that improving technical performance remains a relevant area for further research.

Discussion

The findings of this study indicate that integrating mobile systems with a web-based E-Performance system significantly impacts employee performance management in hospitals. The developed system not only expands users' access to E-Performance services but also reduces reliance on computers, which had previously been a major obstacle in the work activity reporting process. In hospital operations characterised by high work mobility, the ability to record work activities directly on mobile devices is strategic because it enables faster, more flexible, real-time reporting. These findings confirm that integrating mobile technology into organisational information systems can increase access flexibility and streamline information flow in hospital operational processes (Tortorella et al., 2022; Wu & Trigo, 2020).

Compared with previous studies that generally focused on the use of mobile technology for clinical services or patient care, this study broadens the scope of mobile technology utilisation to include employee performance management. This position is important because it demonstrates that digital transformation in healthcare organisations is not only about improving the quality of patient care but also about strengthening internal administrative systems, including

human resource management. Thus, this study positions mobile systems not merely as operational tools but as strategic instruments that can more comprehensively support the effectiveness of healthcare organizational governance.

From a digital transformation perspective, the implementation of a mobile-based E-Performance system reflects a shift from conventional information systems to more adaptive, integrated, and responsive systems that meet fieldwork needs. Hospitals, as complex organisations, require systems that not only store data but also support mobility, rapid response, and continuous information flow. In this context, the system developed in this study demonstrates that digitising the performance management process can be achieved by integrating new artefacts into existing digital infrastructure. These findings reinforce the view that digital transformation in the healthcare sector needs to be understood broadly, encompassing both clinical and administrative dimensions (Xi et al., 2026; Yang & Kim, 2026).

The evaluation results also showed that the developed system had high usability, with an average score of 4.38, placing it in the very good category. This finding indicates that the system not only works technically but is also well-received by users. A high level of usability is important because the success of information system implementation in an organisation is determined not solely by the system's technical capabilities but also by how easy it is for end users to use, understand, and adopt. In this context, the research results align with the technology acceptance model, which emphasises that ease of use and perceived usefulness are important factors influencing user acceptance of new systems (Lee et al., 2025; Legramante et al., 2023; Luo et al., 2024).

Furthermore, the highest score for the ease of data input indicator indicates that the developed system successfully addresses the most basic operational need, namely, facilitating the direct recording of work activities. This finding is significant because the primary problem with the previous system was input delays due to limited access to computers. With the mobile application, this obstacle can be significantly reduced. Conversely, the access speed indicator scored lowest among the indicators, although it still falls within the good category. This finding indicates that although the system has been well received, technical performance aspects such as connection stability, data synchronisation efficiency, and interface response speed still require further attention. Thus, this discussion not only confirms the system's success but also identifies key areas for further research and implementation.

Based on the DeLone and McLean Information System Success Model, the results of this study indicate that the developed system has high system quality and user satisfaction. System quality is reflected in the functional testing results, which showed a 100% success rate for all main modules. In contrast, user satisfaction is reflected in the usability evaluation results, which are in the very good category. These two dimensions are important determinants of information system success because they will influence the intensity of system use and the benefits generated for the organisation (Kalankesh et al., 2020; Laumer et al., 2017). Therefore, the developed system can be said to be not only technically valid but also widely accepted from a user perspective.

In addition to increasing efficiency and ease of use, the mobile-based E-Performance system also enhances transparency and accountability in the employee performance management process. Every work activity recorded through the system can be directly monitored by superiors, making the performance evaluation process more objective and evidence-based. This is crucial in hospital organisations, where the complexity of work and the large number of work units often complicate manual or semi-manual performance monitoring. With structured digital documentation, the assessment process no longer relies primarily on subjective perceptions but on systematically recorded activity data. This finding aligns with the concept of data-driven decision-making, which emphasises using data as the basis for strategic decisions within an organisation (Antônio Scapini, 2025; Bernardo et al., 2024; Huynh, 2025).

This study also strengthens previous findings showing that human resource management information systems can improve the effectiveness of employee performance management and support sustainable employee development (Alhajaj & Ahmad, 2023; Oktaviannur & Kindiasari, 2024). However, the contribution of this study lies in the context and form of its integration. Unlike many studies examining HR information systems in general, this study specifically demonstrates that mobile-web integration within a performance management system can address the needs of healthcare organisations with high levels of work mobility. In the hospital context, effective employee performance management is not only crucial for internal administration but also has indirect implications for service quality governance and the consistency of task execution.

Regarding work flexibility, this study's findings demonstrate that mobile technology offers significant advantages. Employees can enter work activities anytime, anywhere, accelerating the reporting process and eliminating the need for dedicated facilities. In a dynamic hospital environment, this flexibility is not merely an added feature but a fundamental operational necessity. These findings reinforce the argument that mobile technology can improve work productivity by increasing the flexibility of access to information systems (Bondanini et al., 2025; Cosa & Torelli, 2024). Thus, the system's benefits extend beyond the technical level to the organisational level, impacting work methods, reporting speed, and the accuracy of performance documentation.

From a scientific perspective, this research contributes to the development of information systems literature, particularly in the context of mobile-based performance management systems in the healthcare sector. The first contribution lies in the development of a system artefact that integrates a mobile application with an existing web system within a hospital organisation. The second contribution lies in applying a Design Science Research approach that goes beyond constructing the artefact to empirically evaluating it through functional and usability testing. The third contribution lies in the expansion of the study context, from a focus on clinical applications to managerial and administrative applications within healthcare organisations. Thus, this research demonstrates that the DSR approach can effectively produce technological solutions that are both practically relevant and academically valuable.

From a practical perspective, the results of this study have important implications for hospitals and other healthcare organisations. Developing a performance management system that adapts to user needs can improve administrative efficiency, accelerate reporting, and strengthen transparency in performance evaluation. Organisations with existing web-based systems can also consider mobile integration as a phased development strategy without replacing the entire system. From a change management perspective, this approach is more realistic and more user-friendly because it leverages existing infrastructure. Therefore, mobile-web integration can be viewed as a practical and sustainable digital transformation strategy.

However, the results of this study also indicate that there is still room for further development. One promising opportunity is the system's integration with analytical technologies such as machine learning to support performance prediction, identify work activity trends, or provide recommendations to management. Development in this direction could enhance the system's strategic value, moving it from a mere recording and reporting tool to a more intelligent decision-support system. Furthermore, the development of intelligent notification features, more dynamic dashboard visualisations, and integration with other HR systems, such as attendance or work scheduling, could also expand the system's organisational benefits.

Overall, this discussion demonstrates that the developed mobile-based E-Performance system has successfully met user functional needs and achieved a high level of acceptance. This system significantly increases the flexibility of work activity reporting, the transparency of performance recording, and administrative efficiency in employee performance management. These findings also reinforce the role of information technology as a critical enabler in the digital transformation of healthcare organisations, particularly in institutions with high operational complexity and high work mobility.

This study still has several limitations that require attention. First, the developed system was implemented only on Android, so it did not support iOS users or adopt a cross-platform approach. Second, the usability evaluation was conducted at a single institution with a relatively limited number of respondents, so generalisation of the findings requires caution. Third, this study did not evaluate the impact of system implementation on organisational performance indicators longitudinally, so the system's long-term benefits cannot be fully measured. Therefore, future research is recommended to involve more institutions, develop a cross-platform system, and use a more comprehensive evaluation design to better understand the system's impact on organisational effectiveness.

Conclusions and Suggestions

Conclusions

This study successfully designed and evaluated a mobile-based employee performance management system integrated with a web-based E-Performance system using the Design Science Research (DSR) approach and the System Development Life Cycle (SDLC) method. The developed system was proven capable of overcoming limitations in

accessing web-based systems by providing a more flexible, real-time work activity recording mechanism. The functional test results showed a 100% success rate, indicating that all system modules met the specified requirements. In addition, the usability evaluation results showed an average score of 4.38 in the very good category, indicating a high level of user acceptance of the developed system. These findings confirm that the success of an information system is determined not only by technical aspects but also by ease of use and a positive user experience. Thus, the resulting system is not only functionally valid but also suitable for adoption within the organization's operational context.

Practically, this study demonstrates that integrating mobile applications with web-based systems can increase access flexibility, accelerate reporting processes, and support transparency in employee performance management. In hospitals with high levels of work mobility, this system provides a relevant solution to improve administrative efficiency and the accuracy of performance data. Theoretically, this study contributes to the development of a mobile-based performance management information system integrated with existing systems. It strengthens the application of the DSR approach in producing technological artefacts that are not only technically functional but also empirically tested. This study also expands the literature on information systems in the healthcare sector by positioning mobile technology as a strategic component in human resource management, not only in clinical services.

Suggestions

Although the developed system has demonstrated positive results, several opportunities remain to further enhance its strategic value. First, developing the system on other platforms, such as iOS, or through a cross-platform approach, should be considered to expand the user base and improve system interoperability. Second, integrating analytical technologies, such as machine learning and predictive analytics, can support more in-depth analysis of employee performance and provide data-driven recommendations for management decision-making. Third, the development of advanced features, such as interactive visual dashboards, intelligent notifications, and integration with other information systems within the organisation, such as attendance systems, e-office systems, and personnel management systems, can improve operational efficiency and reduce data redundancy. This integration approach is crucial for realising a comprehensive, connected information system ecosystem within the organisation. Furthermore, further research is recommended to evaluate the impact of system implementation on employee productivity and organisational performance longitudinally. The use of more comprehensive technology adoption evaluation models, such as the Technology Acceptance Model (TAM) or the Unified Theory of Acceptance and Use of Technology (UTAUT), can also provide a deeper understanding of the factors influencing the long-term success of system implementation.

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This research did not receive external funding.

Contributions

All authors contributed significantly to this research. The lead author was responsible for the conceptualisation and design of the study. Methodology development, data collection, and system implementation were carried out collaboratively by the entire research team. Data analysis and interpretation of results were carried out by the lead author with support from the research team. The initial draft was prepared by the lead author, while critical revision,

validation of the scientific substance, and refinement of the manuscript were carried out jointly by all authors. All authors have read and approved the final version of the manuscript.

Conflict of Interest

The authors declare no conflicts of interest in this research. This research was conducted independently without any influence from any party that could influence the results or interpretation of the research.

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