Buildtrack: An Integrated Web-Based HR Management and Decision Support System for the Construction Industry

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ABSTRACT

Digital technologies developed rapidly in the 21st century have dramatically changed how organizations manage their information, allowing organizations to be more efficient, more readily accessible, and more automated than ever before. In human resource management (HRM), the digital technology advancements have simplified the job of human resource managers (HRMs) by allowing HRMs to organize employee performance records, track employee performance, and make decisions more easily through the use of technology than ever before. The objective of this study is to develop a web-based Human Resource Management System (HRMS) that will increase the efficiency, responsiveness, and accuracy of the processes currently in place to manage employee records, track employee records, and provide support for the decision to promote employees. The HRMS will consist of a number of modules, namely, an employee record management module, a worker record tracking module, and a decision support module for employee promotions. Users of the HRMS will be required to log in using a secure login feature and to have access to real-time updates to keep all records up-to-date. The HRMS is designed to assist companies to improve their HR processes, improve the performance of the organization, and meet the ISO 25010 standards for software quality. The expected benefits of the HRMS will be for HR personnel, management, employees, and future researchers and will improve how the company manages employee data, the transparency of the company, and the ability of the company to make effective, informed decisions.

Index Terms— Computerization, Database, DSS, HRMS, Manual System, Promotion Management Process, Web Application, System Functionality

INTRODUCTION

The twenty-first century has brought the digital age along with it, a period characterized by non-stop technological changes and improvements. The current era has changed the way the goals are achieved and got the attention of the world very fast, and also the achievements have been expanded in such a way that now we live in a world where digitization and automation have become the easy and common ways of doing things. Technology is no longer something that is confined to specific places; it is now reaching individuals, homes, workplaces, and businesses, thus allowing for simplicity and efficiency. Especially, companies are watching these technological trends very closely in order to make the most of the opportunities and to be able to compete further.

The use of digital computers on a large scale is one of the main examples of such a technological advancement. Today, computers are powerful and flexible machines that pave the way for traditional methods to be converted into digital ones, which, in turn, makes it possible for companies to handle information about projects, products, clients, and suppliers in a way that is both effective and efficient. Computers, laptops, and other digital devices that are capable of data processing have simply made information management a very fast and efficient task.

Regardless of what kind of an organization it may be, systems are always the key elements for the purpose of managing and directing undertakings. On the other hand, the latter sometimes find it hard to understand the performance, conduct, and results of the departments. For instance, a Human Resource Management System

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(HRMS) is able to collect data and thus give the total picture of a business in terms of existing employees, candidates, clients, and suppliers, which, by supporting performance, strategy, and long-term growth, leads to organizational development. The most successful turn of all resources to good account is not only the surest way of achieving stabilization but also of bettering the operational outcomes.

Not stopping there, HR divisions make good use of these mechanisms to weigh the performance of workers and discover the possibilities of career advancement, such as promotion and change of department or even induction in other departments. Thus, online HR software takes this task to a new level by offering live and up-to-the-minute features that can be accessed through any internet-enabled gadget. HR departments perform the operations of gathering, storing, and authenticating information more efficiently and at a lesser cost of equipment and software through these tools. Summarily, online platforms are an ideal and efficient way of handling data, thus providing great service to the society on both the individual and collective levels.

In addition, the adoption of network-based HR solutions contributes to openness, responsibility, and the use of data as the basis for decisions made by organizations. By removing the routine nature of the administrative activities from the plate of HR executors, they are given the chance to devote more time to progressive planning, talent development, and worker motivation. This progression not only brings about operational efficiency, but it also enhances the organization's capacity to change with the business environment, hence leading to the creation of a continuous improvement and innovation culture.

RELATED STUDIES

In recent years, emerging technologies offer great value for systems as it converts a hard task into a smooth and easy one. Human resource management has witnessed significant advancements in recent years, with the integration of related technologies, it can turn a problem into an advantage with the use of proper tools. In such cases, businesses have become more and more accustomed to using digital technologies for managing their human resources. These products provide a variety of advantages, such as higher productivity, enhanced accuracy, and improved worker engagement. This engagement and options of opportunity open a huge pool of possibilities to choose from. However, not every stem fits a client need as where clients tend to create its own tailor maid systems for its own use.

The capacity of digital HR technologies to automate many of the time- consuming procedures involved with HR administration is one of their main benefits. For instance, automating the procedure of gathering and evaluating workers' data, HR managers find it simpler to spot errors and make wise choices. In such cases, companies use it to enhance its functionality and effectiveness. Some of these technologies include use of off the shelf systems.

BambooHR is a widely-used web-based HRMS that offers features such as employee data management, time-off tracking, performance management, applicant tracking, and reporting. It provides a user-friendly interface and integrates with other HR tools offering multi-level control to manage, develop, and optimize human capital from a single workers management software. It also runs on Android platform.

Another HRMS software is ADP Workforce Now: ADP Workforce Now is a web-based HRMS designed for small to mid-sized businesses. It offers features like payroll processing, time and attendance tracking, benefits administration, talent management, and compliance management. It offers management to workers' profiles, leaves, contracts, timesheets, and handle attendances. Compared to BambooHR, ADP Workforce Now is a free, open-source program but only Ubuntu, Debian, RPM and Windows. Even though Odoo is free, it also offers a paid version for more functionality such as multi-company and support for external API. Additionally, it may automate processes like hiring, performance reviews, and benefits management, freeing up HR professionals to concentrate on more strategic objectives.

Even though each software offers a basic HRM module to support the system. Converting traditional methods into a new digital one does not instantly come with all the functions of an HR personnel can do. On the other hand, web-based applications do not limit themselves. Thus, it can embed other things like artificial intelligence, cloud computing, analytics, and the hardest of it all, decision-making.

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By definition, decision-making is constructing choices by identifying a decision, collecting information, and evaluating alternative resolutions. This process requires little to no errors as mistakes might lead to potential loss and damages. Where it was used in the Implementation of decision support personnel recruitment system for Laguna State Polytechnic University-San Pablo City Campus.

The Laguna State Polytechnic University-San Pablo City Campus faced a major problem in the recruitment process for new employees due to the "old school" approach or the lack of technological touches. The human resource department had to manually advertise job postings, source candidates, screen applicants, conduct preliminary interviews, and coordinate hiring efforts with directors, deans, and administration heads for making the final selection of candidates. This process could take a month or two, which was viewed as a major problem by the university administration due to the growing population of the campus and the need for additional workforce including new professors/instructors, administrative staff, and utility workers. The study's major goal is to implement a web-based decision support system for staff's recruiting system that can screen qualified applicants, aid human resource personnel by ranking each applicant, and provide reports. This key implementation of decision-making opens new opportunities to further enhance and develop other web- based applications.

DESIGN AND METHODOLOGY

Research Design

In this project, a mixed-method research design will be implemented to obtain both qualitative and quantitative data. The combination of these two methods will allow the researchers to gain a better understanding of their research problems as well as provide more reliable information than would otherwise be possible if only one method were used to collect data.

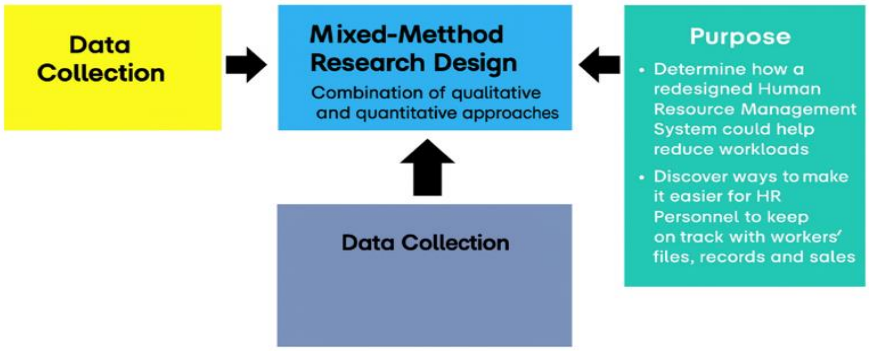

Fig. 1 Research Design of the Study

Figure 1 The study utilizes a developmental research design employing a prototyping model to create the system as well as an experimental research design using predictive modelling to assess planting sustainability and soil moisture stress, and a quantitative research design for evaluating the system.

Context Diagram

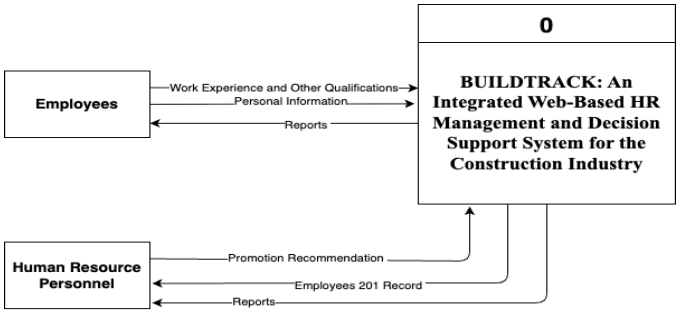

Fig. 2 Context Diagram

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Fig. 2 represents the Context Level (Level 0) Data Flow Diagram (DFD) for BUILDTRACK: An Integrated Web-Based HR Management and Decision Support System for the Construction Industry. As a Level 0 diagram, it presents a high-level overview of how external entities interact with the system and what information flows between them. The diagram identifies two main external actors, Employees and Human Resource Personnel, and shows how data moves in and out of the BUILDTRACK system.

The context diagram clearly illustrates how BUILDTRACK serves as a centralized platform connecting employees and HR personnel within a construction company. Employees provide raw data, HR personnel manage and evaluate this data, and the system acts as the processing engine that produces reports and structured information. Overall, the diagram demonstrates how BUILDTRACK integrates HR management functions with a decision-support mechanism to streamline workflows, enhance accuracy, and support data-driven HR operations.

Developmental Research Design

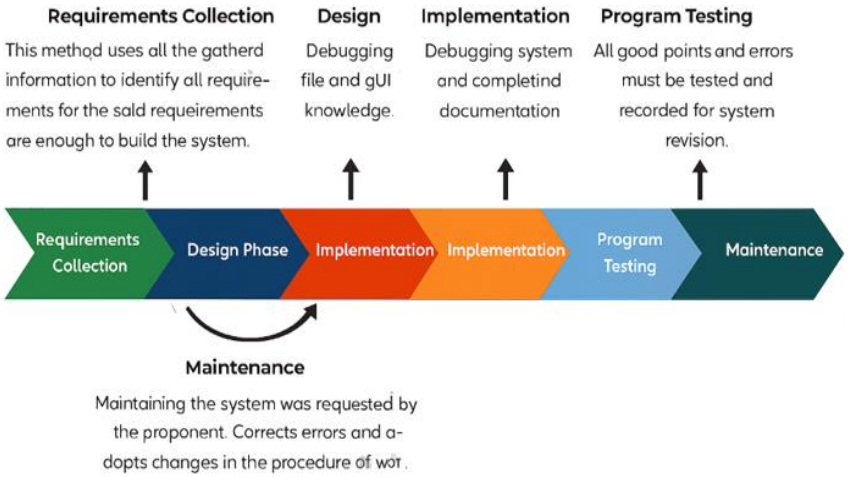

Fig. 3 Development Process Diagram

This study employs a prototyping model in the developmental research design. The Figure below illustrates the process and the expected outputs in every phase of the prototyping model.

Requirements:

This method uses all the gathered information to identify all requirements for the system and also analyse if the said requirements are enough to build the system.

Quick Design:

The key of this method was the programmer's skill and knowledge. The system design was the basis of the program. The programmer asked the side of the qualified user for the appearance of the GUI in the system. Visualization was also part of this method that relies on the designer and that was the programmer.

Implementation:

For this method, debugging of the system and documentations had already been completed. Authorization to execute needed at this point. The objective of the implementation phase is to deliver a complete function and documented data system.

Program Testing:

Now the developed software must be tested at this point. All good points and errors must be recorded and documented for system revision if needed.

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Maintenance:

Maintaining the quality of the system was requested by the proponent. Keeping the system functional at acceptable manners, corrects errors and adapts changes in the procedure of work.

Experimental Design

To evaluate the performance, quality, and overall effectiveness of the developed web-based Human Resource Management System (HRMS), the researchers implemented an experimental methodology grounded in the ISO 25010 Software Quality Model. This framework was selected because it provides a comprehensive set of software quality characteristics, including functional suitability, usability, reliability, performance efficiency, and security. Through this evaluation, the researchers aimed to determine whether the HRMS meets the functional and performance requirements expected of a modern HR system, and whether it offers improvements in record management, data accessibility, and decision-making, particularly in relation to promotion processes.

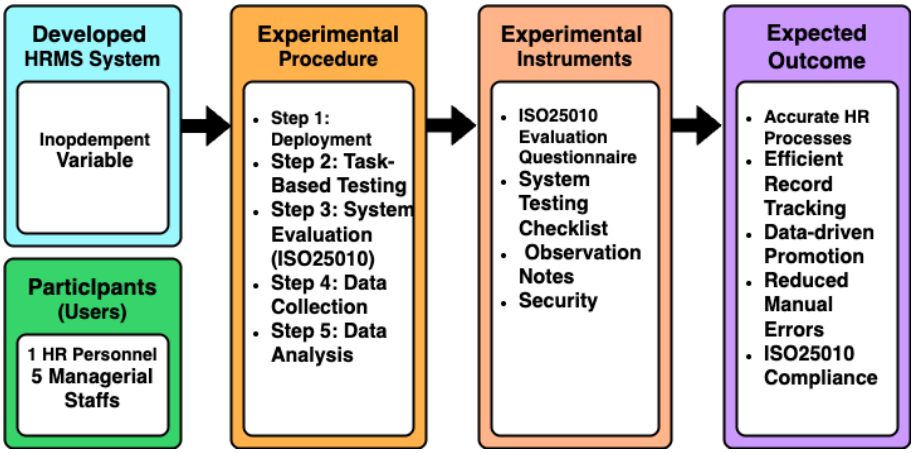

Fig. 4 Experimental Design Flowchart

The study employed a quantitative experimental design, in which the HRMS was developed, deployed, and subjected to structured testing procedures. Standardized questionnaires and task-based assessments were used to determine how the system performs under actual working conditions. By comparing the expected outcomes of the system, based on predefined requirements—with the actual results observed during user testing, the researchers were able to assess the HRMS's strengths, limitations, and readiness for implementation.

The primary variable manipulated in the study was the HRMS itself, which served as the independent variable. Its performance was measured using several dependent variables derived from the ISO 25010 quality characteristics. These dependent variables captured the system's functional suitability, usability, reliability, performance efficiency, and security. Together, they allowed the researchers to evaluate whether the HRMS is effective, efficient, and secure enough for real-world deployment.

The system was evaluated by a purposively selected group of participants consisting of one HR personnel and five managerial staff members. These individuals were chosen because of their direct involvement in HR processes, accessibility, and willingness to participate in the study. Their roles within the organization also ensured they possessed adequate background knowledge and hands-on experience with HR-related tools, making their evaluations both relevant and credible.

To measure the performance and quality of the HRMS, the researchers utilized several experimental instruments. The first was an ISO 25010-based evaluation questionnaire, which used a Likert scale to assess the system's functionality, usability, reliability, performance efficiency, and security. A system testing checklist was also used to validate the proper functioning of key modules such as the login interface, 201 files management, record tracking, and the promotion evaluation module. In addition, observation notes were gathered during system demonstrations to document user experiences, difficulties encountered, and spontaneous feedback that could not be captured through the questionnaire alone.

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The experimental procedure began with the deployment of the HRMS to the participants, during which each user was given access to explore and interact with the system. This was followed by task-based testing, where participants performed realistic HR activities such as adding and editing employee records, tracking worker status, evaluating promotion recommendations, and navigating the system dashboard. Any issues or errors encountered during this stage were documented for analysis.

After completing the assigned tasks, the participants proceeded to the formal system evaluation phase using the ISO 25010 questionnaire. Their responses provided measurable ratings for each quality characteristic and served as the primary data source for determining system acceptability. All evaluation forms, observations, and testing records were then collected and compiled. The researchers analyzed the data using weighted mean calculations to identify system strengths, areas needing improvement, and the overall acceptability of the HRMS.

The expected outcome of the experiment is that the HRMS will demonstrate high accuracy and functionality in performing HR processes, improve efficiency in storing and tracking worker records, and support transparent and data-driven promotion evaluations. Furthermore, the system is anticipated to reduce manual workload and errors while meeting or exceeding the quality thresholds set by the ISO 25010 model. By conducting this structured evaluation, the researchers were able to determine whether the HRMS exhibits the reliability, usability, and security required for long-term organizational use.

RESULT AND DISCUSSION

Survey Findings on Existing HRMS Issues

Based on the gathered survey data, the existing Human Resource Management System (HRMS) shows significant limitations across file management, record security, and the promotional process. Respondents consistently indicated that the current manual or semi-digital processes are insufficient to support their daily workload. All respondents reported reliance on digital devices to perform work tasks, yet the system's lack of structure prevents effective support for digital workflows.

Users rated the handling, organizing, and monitoring of worker files as "hard" to "extremely hard," emphasizing the difficulty of maintaining accurate and updated records in a physical filing environment. Many respondents also expressed concerns regarding the security of worker files, describing the current setup as "vulnerable," indicating potential risks of data loss, unauthorized access, or misplacement of documents.

Table I CURRENT HRMS EVALUATION RESULT

HRMS Issue	Very Hard (5)	Hard (4)	Moderate (3)	Easy (2)	Very Easy (1)	Weighted Score	Weighted Mean
File Handling	3	4	0	0	0	31	4.43
Record Monitoring	4	3	0	0	0	32	4.57
Promotion Fairness	2	5	0	0	0	30	4.29
Data Security	3	4	0	0	0	31	4.43

Table I presents an evaluation of several key issues commonly encountered in Human Resource Management Systems (HRMS). Respondents were asked to rate the level of difficulty they experience with each issue using a scale ranging from Very Hard (5) to Very Easy (1). The results, along with the computed weighted scores and weighted means, provide a clearer picture of how challenging these aspects are within the current HR processes.

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The findings reveal that all identified issues, File Handling, Record Monitoring, Promotion Fairness, and Data Security, are generally perceived as difficult by the respondents. This is reflected in the consistently high weighted means, all of which fall above the value of 4.0, indicating that these challenges fall between the "Hard" and "Very Hard" categories.

Among the four issues, Record Monitoring stands out with the highest weighted mean of 4.57, suggesting that respondents consider it the most difficult task to manage. This implies that monitoring employee records, tracking updates, and ensuring accuracy in documents may require improved systems or processes.

File Handling and Data Security both have weighted means of 4.43, showing that they are also seen as major challenges. File handling difficulties may stem from manual processes, disorganized storage, or slow retrieval systems, while concerns in data security highlight issues related to protecting sensitive employee information from unauthorized access or breaches.

Meanwhile, Promotion Fairness, although having the lowest weighted mean of 4.29, is still categorized as a "Hard" issue. This suggests that respondents perceive concerns regarding fair and transparent promotion practices, which may point to the need for more structured evaluation criteria or better decision-support mechanisms.

Overall, the results emphasize that the existing HRMS processes face significant challenges across all key areas. The consistently high difficulty ratings reflect the need for enhanced system functionalities, improved workflows, and reliable digital solutions to address these issues and support more efficient and fair HR operations.

Comparison with Existing HRMS Technologies

A comparison with widely used HRMS platforms such as BambooHR and ADP Workforce Now shows that while these systems offer general HR functions, they lack modules tailored to construction-based operations. Table II summarizes the feature comparison between the proposed UpTracked HRMS and existing platforms.

Table II HRMS COMPARATIVE ANALYSIS RESULT

Feature	**BambooHR**	**ADP Workforce Now**	**BUILDTRACK**
Employee Records	✓	✓	✓ (Enhanced with Tracker)
Promotion Module	×	×	✓
Document Tracking	Limited	Limited	✓ (With Alert Notifications)
Construction Specific Needs	×	×	✓

Table II provides a comparative analysis of three HR management systems, BambooHR, ADP Workforce Now, and BUILDTRACK, based on their available features. The comparison highlights how BUILDTRACK positions itself as a more specialized and comprehensive solution, particularly for organizations in the construction industry.

All three systems, BambooHR, ADP Workforce Now, and BUILDTRACK, offer basic employee records management, showing that they share common foundational HR functionalities. However, BUILDTRACK distinguishes itself by integrating an enhanced employee record tracker, suggesting more detailed monitoring capabilities than those offered by the other two systems.

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A significant difference emerges in the promotion module feature. Both BambooHR and ADP Workforce Now lack this functionality, while BUILDTRACK includes a dedicated promotion module, indicating that it provides structured evaluation, recommendation, and decision-support tools for employee career progression—an area underserved by mainstream HR systems.

In terms of document tracking, BambooHR and ADP offer only limited capabilities. BUILDTRACK, on the other hand, provides a fully developed document tracking system equipped with alert notifications, which improves monitoring efficiency and helps ensure timely submissions and updates—an essential need in HR operations.

Finally, the table underscores BUILDTRACK's unique advantage in addressing construction-specific requirements. While BambooHR and ADP Workforce Now are general HR platforms not tailored to any particular sector, BUILDTRACK is designed to support industry-specific needs, making it more suitable for construction companies that require specialized workflows, documentation, and decision-support features.

Overall, the comparison shows that while all platforms share basic HR functionalities, BUILDTRACK offers more advanced, comprehensive, and industry-focused features, making it a more fitting solution for construction-related HR management and decision support.

System Features Addressing Identified Issues

To resolve the documented challenges, the proposed UpTracked HRMS integrates several modules designed to enhance efficiency and accuracy in HR processes:

Automated 201 File Management

The 201 Files Module enables accurate updating, categorization, and retrieval of employee records, reducing manual workload and minimizing the risk of lost or outdated documents.

Worker Record Tracking with Alerts

The Workers Record Tracker Module provides real-time monitoring of file statuses and document expirations. This directly addresses monitoring problems described in the survey results.

Decision Support for Promotions

The Promotion Module incorporates structured evaluation criteria, enabling HR personnel to recommend qualified workers based on performance history and recorded achievements.

Improved Data Security and Access Control

With secure login authentication and role-based access, the system resolves vulnerabilities highlighted by the respondents.

Overall Assessment

Table III SUMMARY OF SYSTEM IMPROVEMENTS BASED ON SURVEY RESULTS

Identified Issues	Survey Result	System Solution
Difficulty in Handling Files and Record	Hard	Automated 201 File Module
Poor Record Monitoring	Frequent Delays and Outdated Files	Record Tracking with Alert Notifications

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Promotion Inconsistencies	Lack of Fairness	Decision Support Module
Data Security Concerns	Vulnerable	Authentications and Controlled Access

Table III presents a summary of key issues identified from the survey results and the corresponding system improvements designed to address these challenges. The findings show that users encountered several difficulties with the previous HR processes, particularly in managing files, monitoring records, ensuring fair promotions, and maintaining data security.

Survey respondents reported that file and record handling was "Hard," indicating that manual or existing processes were inefficient and prone to errors. To resolve this, the system introduces an Automated 201 File Module, which streamlines file management, reduces manual workload, and ensures easier access to employee records.

For record monitoring, users experienced "frequent delays and outdated files," suggesting that the current system lacked proper tracking mechanisms. In response, the improved system includes a Record Tracking feature with alert notifications, ensuring timely updates and preventing overlooked or outdated documents.

Concerns about promotion inconsistencies emerged as users described the process as lacking fairness. To address this, the system integrates a Decision Support Module, promoting transparency and standardization in promotion evaluations by providing data-driven recommendations.

Finally, the survey indicated that data security was a significant issue, with users perceiving the existing system as vulnerable. To mitigate this, the new system incorporates authentication measures and controlled access, enhancing confidentiality and ensuring that sensitive HR information is accessible only to authorized personnel.

Overall, the table highlights how each survey-identified problem has been carefully matched with an appropriate system enhancement, demonstrating a targeted approach to improving operational efficiency, user experience, and organizational integrity.

CONCLUSION

The results support the contention that the existing HRMS does not adequately meet the organization's administrative needs efficiently. The absence of effective systems for file handling, record monitoring, and functional management indicates that the HRMS still relies heavily on either fully manual or semi-digital processes, which likely contribute to inefficiencies and inconsistencies in data.

The widespread use of mobile devices among staff members demonstrates a strong capacity to adapt to the proposed web-based HRMS model developed by the team. This model is designed to enhance workflow efficiency and provide greater data management capabilities.

Staff members also highlighted additional challenges, including limited system functionality, difficulties in managing legacy records, and concerns regarding the security of sensitive employee information. These findings provide a strong justification for developing and implementing an HRMS that offers:

- Automation: Reducing manual workloads and minimizing the risk of human error.
- Security: Protecting sensitive employee information from unauthorized access.
- User-friendliness: Allowing users to easily locate and manage records, with improved capabilities for tracking and organizing files.
- Comprehensiveness: Providing the tools and functionalities required for a fully functional HR system, such as updating employee records, managing promotions, and maintaining employee documents.

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Furthermore, the survey results validate the use of a mixed-methods research design. Quantitative survey data provided measurable evidence of the current HRMS's deficiencies, while qualitative interview data offered detailed insights into the recurring challenges faced by users when interacting with the system.

In conclusion, the research findings strongly support the need for a web-based HRMS tailored to the organization's specific requirements. A customized system is expected to increase operational efficiency, reduce administrative workload, improve record accuracy, and enhance overall employee satisfaction.

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