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Optimizing Municipal Resource Allocation: The Development and Evaluation of ACE-J, a Local Government Scheduling System

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Abstract:

The study presents a comprehensive investigation into the design, development, and evaluation of a web-based scheduling system aimed at optimizing the allocation and borrowing of municipal resources within the Municipality of Jaen, Nueva Ecija. The primary goal of the ACE-J system is to enhance citizens' accessibility and efficiency in utilizing various resources provided by the local government, while also improving administrative processes and transparency. The study employed the Agile Database Development Life Cycle (AGILE-DBLC) methodology, incorporating JavaScript, PHP, and PHP MySQL as back-end technologies to develop the ACE-J system. The evaluation of ACE-J was conducted based on ISO/IEC 25010 Software Quality Standards, demonstrating its adherence to functional suitability, performance efficiency, compatibility, usability, reliability, security, maintainability, and portability. The study also identified the limitations of the existing manual resource management system in the Municipality of Jaen, emphasizing the need for a more efficient and secure scheduling system. The findings of the study highlight the potential impact of ACE-J on resource allocation, transparency, and user experience, providing valuable insights for the implementation and future scalability of the system. The study's recommendations emphasize the importance of user training, data security measures, user feedback, and future scalability planning to ensure the effective utilization and continuous improvement of the ACE-J system. Overall, the study contributes to the advancement of local government resource management practices and the potential impact of technology in enhancing resource scheduling systems.

Keywords — **Resource Allocation System, Web-based Scheduling, Local Government Unit (LGU),Agile Database Development Life Cycle (AGILE-DBLC), ISO/IEC 25010, Software Quality Standards, Functional Suitability, Performance Efficiency, Inventory Management, QR Code Confirmation**

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I. INTRODUCTION

The rapid growth of technology has led to significant advancements that simplify and improve daily life, particularly through digital technologies that reshape how individuals interact and perform tasks. In local government, technology offers opportunities to enhance resource management, community engagement, and resource allocation efficiency. However, many local governments still depend on manual systems that are inefficient and error-prone. Digital technology adoption in local governments can improve service efficiency, accountability, and transparency by fostering public participation, enhancing employee skills, and enabling better decision-making processes [1][2]. Moreover, digital tools empower local governments to balance efficiency and equity in governance while

optimizing environmental management through innovation and public involvement [3].

Despite these benefits, challenges such as limited capacity, knowledge gaps, and the need for strategic implementation remain critical barriers to fully leveraging technology in local government operations. Furthermore, a significant research gap exists regarding the implementation of localized, automated scheduling systems specifically tailored for municipal units in developing regions. While global literature extensively explores resource optimization in industrial or cloud-based environments, there is a lack of focus on the unique operational constraints and citizen-facing requirements of smaller local government units (LGUs). This creates a disconnect between high-level technological theory and the practical need for accessible, transparent resource management at the grassroots level. [4] [5].

To address these limitations, this study presents the design and development of ACE-J: A Local Government Resources Scheduling Management System. The system is aimed at enhancing the efficiency and accessibility of resource allocation within the Municipality of Jaen, Nueva Ecija. The study employs the Agile Database Life Cycle (AGILE-DBLC) methodology for the design and development of the ACE-J system, which offers a user-friendly interface and complies with ISO/IEC 25010 Software Product Quality Standards.

The ACE-J system offers several features, including CRUD (Create, Read, Update, Delete) operations, inventory management, report generation, data analytics, dashboard visualization, email notifications, and QR code confirmation. The system also includes a built-in camera that scans the QR code, making it easier for users to access and borrow resources. The system's compliance with software quality standards and its user-friendly interface contribute to improved community engagement, resource availability, and optimized resource allocation within the local government.

The study aims to improve resource availability, increase community engagement, and make it easier to maintain valued local assets. The findings highlight the positive user feedback and satisfaction with the ACE-J system, emphasizing its potential to streamline resource borrowing processes and enhance overall efficiency. The study provides recommendations for the system's implementation, user training, data security, and future scalability, contributing to the advancement of local government resource management practices.

II. LITERATURE REVIEW

The review of related literature provides valuable insights into the existing body of knowledge and research relevant to local government resource management, software quality standards, and the impact of technology on resource scheduling systems. The literature review serves as a foundation for understanding the current state of research and practice in the field, informing the development and evaluation of the ACE-J system.

Khan et al. conducted a systematic literature review on security risks and practices in secure software development, emphasizing the importance of robust security measures in software systems. The findings of this study underscore the significance of integrating strong security measures within the ACE-J system to ensure the protection of user data and system integrity [6].

Kusimo et al. explored the optimization of resource management in construction projects using a big data approach. The study highlighted the potential of data-driven approaches in enhancing resource allocation and management practices, providing valuable insights into the application of data analytics in resource scheduling systems. The findings of this study inform the potential for integrating data analytics capabilities within the ACE-J system to optimize resource allocation and utilization [7].

Kuvaja-Köllner et al. investigated municipal resources to promote adult physical activity, emphasizing the role of resource allocation in supporting community health and well-being. The study provides insights into the importance of efficient resource management in achieving community development goals, highlighting the relevance of effective resource scheduling systems in local government settings. The findings of this study inform the potential impact of the ACE-J system on promoting greater community engagement and transparency in resource allocation [8].

Landau provided a comprehensive overview of resource allocation practices, emphasizing the importance of effective resource management in project settings. The insights from this literature contribute to understanding the principles of resource allocation and their relevance to local government resource scheduling systems. The study informs the design and development of the ACE-J system by highlighting key considerations in resource allocation practices [9].

Liu et al. conducted a study on scheduling in cloud manufacturing, addressing state-of-the-art practices and research challenges in resource scheduling systems. The findings of this study provide valuable insights into the latest advancements in resource scheduling technologies, informing the design and development of the ACE-J system with contemporary scheduling capabilities. The study contributes to understanding the evolving landscape of resource scheduling systems and their potential applications in local government settings [10].

Lu et al. explored transparency and resource allocation in grassroots nonprofits, highlighting the significance of transparent resource allocation practices in organizational settings. The insights from this study inform the potential impact of transparent resource allocation practices in local government resource scheduling systems, emphasizing the importance of accountability and transparency in resource management. The study contributes to understanding the principles of transparent resource allocation and their relevance to the design and development of the ACE-J system [11].

The review of related literature provides a comprehensive understanding of the current state of research and practice in local government resource management, software quality standards, and the impact of technology on resource scheduling systems. The insights from the literature review inform the development and evaluation of the ACE-J system, contributing to its alignment with best practices and contemporary research in the field.

III. RESULTS AND DISCUSSION

The study on ACE-J: A Local Government Resources Scheduling Management System highlights the importance of efficient resource management practices in promoting economic development and good governance. The study emphasizes the potential impact of technology in enhancing resource management practices, particularly in local government units.

The study employed a developmental research design, utilizing the Agile Database Development Life Cycle (AGILE-DBLC) methodology, which aligns with the principles of developmental software development. The use of this methodology facilitated continuous improvement and adaptation based on user input, contributing to the effectiveness and user acceptance of the ACE-J system.

Fig. 1 Project Design and Development

The context diagram (Figure 1) and DFD Level 1 (Figure 2) below provide a visual representation of the ACE-J system's overall structure and functionality. The context diagram illustrates the system's external entities, including users, administrators, and resources, and their interactions with the system. The DFD Level 1 provides a high-level overview of the system's processes and data flows, highlighting the system's core functionalities, such as resource borrowing and inventory management. The diagrams support the discussion of system development by providing a clear understanding of the system's overall structure and functionality, informing the design and development of the system's processes and data flows.

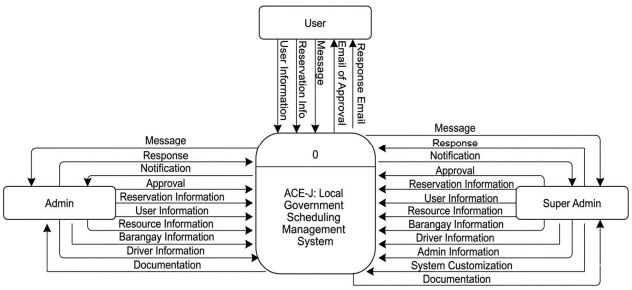

Fig. 2 Context Diagram

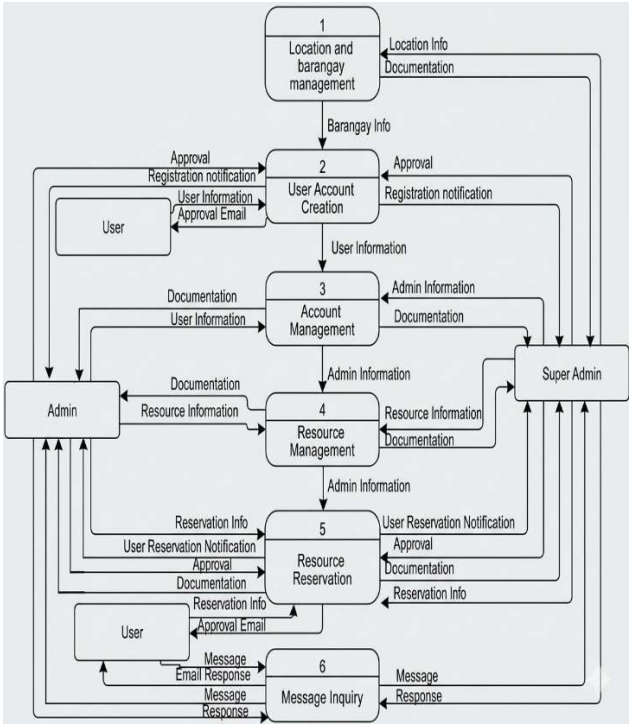

Fig. 3 DFD Level 1

Figure 4 below shows the user interfaces of the ACE-J system, which was designed to provide a seamless and user-friendly experience for resource allocation within the local government. The homepage serves as the entry point to the system, providing access to sign up and login. Essential pages such as user profiles, admin controls, resource reservations, and profile management were included to ensure a smooth user experience. Super admins and admins had specialized pages for managing user registrations and system analytics. The interface was designed for clear navigation and efficient resource allocation, with a comprehensive tutorial page available to guide users in both English and Filipino.

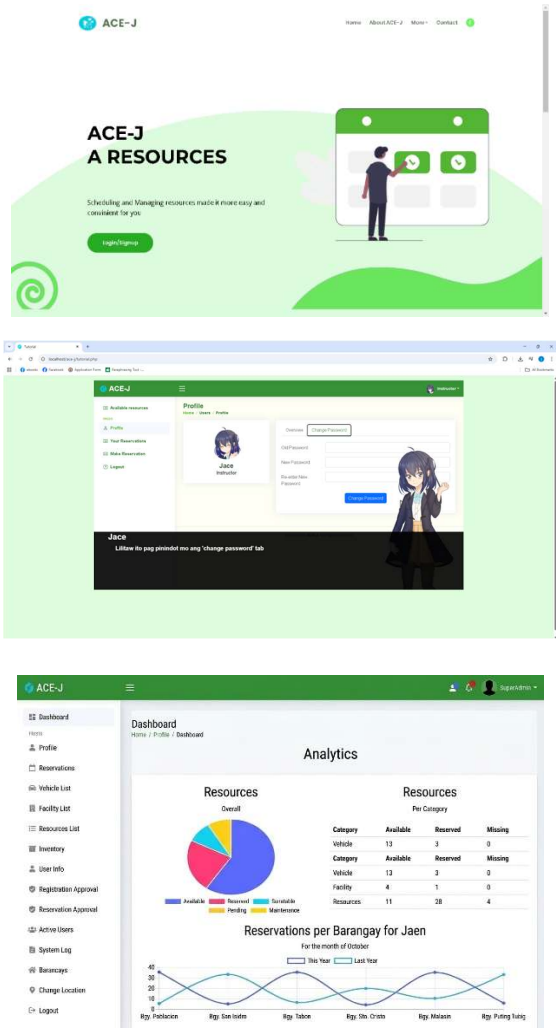

Fig. 4 ACE-J System's User Interfaces

The evaluation of the ACE-J system was conducted based on ISO/IEC 25010 standards for software quality, encompassing functional suitability, performance efficiency, compatibility, usability, reliability, security, maintainability, and portability. The results of the evaluation indicated that the ACE-J system was highly effective in meeting the needs and requirements of the local government and its stakeholders.

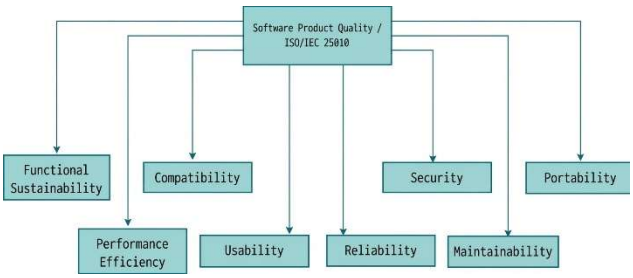

Fig. 5 ISO/IEC 25010 Diagram

The IT experts rated the functional suitability of ACE-J with a weighted mean of 3.93 (Very Functional), the performance efficiency with a weighted mean of 4 (Very Efficient), the compatibility with a weighted mean of 3.9 (Very Compatible), the usability with a weighted mean of 3.93 (Very Usable), the reliability with a weighted mean of 3.87 (Very Reliable), the security with a weighted mean of 3.87 (Very Secured), the maintainability with a weighted mean of 3.92 (Very Maintainable), and the portability with a weighted mean of 3.87 (Very Portable).

TABLE I
IT EXPERTS EVALUATION SUMMARY RESULT

Software Product Categories	Mean	Verbal Interpretation
Functional Suitability	3.93	Very Functional
Performance Efficiency	4.00	Very Efficient
Compatibility	3.90	Very Compatible
Usability	3.93	Very Usable
Reliability	3.87	Very Reliable
Security	3.87	Very Secured
Maintainability	3.92	Very Maintainable
Portability	3.87	Very Portable
Overall	**3.91**	**Excellent**

The end-users rated the functional suitability of ACE-J with a weighted mean of 3.99 (Very Functional), the performance efficiency with a weighted mean of 3.98 (Very Efficient), and the usability with a weighted mean of 3.87 (Very Usable) as shown in Table 2 below.

TABLE III
END-USERS EVALUATION SUMMARY RESULT

Software Product Categories	Mean	Verbal Interpretation
Functional Suitability	3.99	Very Functional
Performance Efficiency	3.98	Very Efficient
Usability	3.87	Very Usable
Overall	**3.95**	**Excellent**

The study also highlighted the potential impact of the ACE-J system on local government resource management practices. The system has the potential to enhance efficiency, improve decision-making, and increase overall satisfaction among citizens. The study emphasizes the importance of user engagement and training in ensuring effective implementation and utilization of the ACE-J system.

The study recommends the implementation of the ACE-J system in the Municipality of Jaen without delay, considering the identified limitations and inefficiencies of the existing manual resource management system. The study also recommends the implementation of a comprehensive user training program to empower administrators, staff, and residents with the knowledge and skills needed to effectively utilize the ACE-J system. The study emphasizes the need to address the identified data security drawbacks of the existing manual system by implementing strong security measures within the ACE-J system. The study also recommends encouraging users to provide feedback on their experiences with the ACE-J system and utilizing this feedback to identify areas for improvement and enhancement, ensuring that the system remains user-friendly and efficient. The study recommends planning for the future scalability of the ACE-J system to accommodate potential increases in users and resource management needs.

IV. CONCLUSIONS

The study on ACE-J: A Local Government Resources Scheduling Management System concludes that the development and implementation of the system have the potential to significantly enhance resource management practices within the Municipality of Jaen, Nueva Ecija. The system's adherence to ISO/IEC 25010 Software Quality Standards, including functional suitability, performance efficiency, compatibility, usability, reliability, security, maintainability, and portability, demonstrates its effectiveness in meeting the needs of the local government and its stakeholders.

The use of the Agile Database Development Life Cycle (AGILE-DBLC) methodology facilitated iterative development, collaboration between cross-functional teams, and the flexibility to adapt to changing requirements, contributing to the

effectiveness and user acceptance of the ACE-J system. The study emphasizes the importance of user engagement and training in ensuring effective implementation and utilization of the system.

The potential impact of the ACE-J system on local government resource management practices is highlighted, emphasizing its capacity to enhance efficiency, improve decision-making, and increase overall satisfaction among citizens. The study underscores the significance of technology in promoting economic development and good governance through efficient resource management practices.

In conclusion, the study provides valuable insights into the importance of efficient resource management practices and the potential impact of technology in local government resource management. The ACE-J system represents a significant advancement in local government resource scheduling and management, offering a user-friendly, secure, and efficient platform for residents to access and utilize various resources provided by the local government.

The study's findings and conclusions serve as a foundation for future research and development related to local government resource management systems, emphasizing the need for continuous improvement, user engagement, and the integration of technology to enhance resource management practices.

V. RECOMMENDATIONS

Recommendations

In light of the comprehensive findings and conclusions presented the following recommendations for the ACE-J: A Local Government Resources Scheduling Management System are proposed:

1. Consider the identified limitations and inefficiencies of the existing manual resource management system. Initiate the implementation of the ACE-J system in the Municipality of Jaen without delay. This transition to an online web-based system will significantly improve the resource borrowing process, reduce the need for physical presence, and enhance overall efficiency.

2. Implement a comprehensive user training program to empower administrators, staff, and residents with the knowledge and skills needed to effectively utilize the ACE-J system.

3. Address the identified data security drawbacks of the existing manual system by implementing strong security measures within the ACE-J system. Continuously assess and update these measures to maintain a secure environment for user data.

4. Encourage users to provide feedback on their experiences with the ACE-J system. Utilize this feedback to identify areas for improvement and enhancement, ensuring that the system remains user-friendly and efficient.

5. Plan for the future scalability of the ACE-J system to accommodate potential increases in users and resource management needs. Ensure the system can adapt to changing requirements and support the growing demands of the community.

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