International Journal of Informatics Technology (INJIT)
Vol. 1., No. 1, February 2022
e-ISSN : 2985-9646
https://jurnal.amrillah.net/index.php/injit

Optimization of Web-Based Information Systems for Enhancing Academic Service Efficiency in Higher Education

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ABSTRACT

This study aims to develop and implement a web-based information system to enhance the efficiency of academic services in higher education institutions. The research includes an in-depth exploration of user requirements through iterative interviews, creation of a responsive and dynamic interface using modern web technologies, integration of multi-departmental databases for seamless data flow, and comprehensive system evaluation employing User Experience Questionnaire (UEQ) metrics. Results indicate that the web-based information system reduces service time by up to 40%, significantly boosts user satisfaction levels, enhances operational transparency, and fosters a collaborative administrative environment.

KEYWORDS
Cloud computing, data security, encryption, homomorphic encryption, quantum-resistant algorithms.

1. Introduction

Academic services are pivotal in higher education institutions, serving as the backbone for facilitating the teaching-learning process, managing vast amounts of student and academic data, and ensuring smooth administrative operations. Despite their importance, numerous institutions encounter persistent challenges, primarily due to the reliance on outdated, manual systems that are inefficient, error-prone, and time-consuming. These limitations often result in delays, data inconsistencies, poor user satisfaction, and restricted scalability.

The inefficiencies of manual processes manifest in various forms, including redundant paperwork, lack of real-time data access, and limited interoperability between departments. Moreover, as higher education institutions expand their programs and student intake, the pressure on administrative resources becomes unsustainable without leveraging technology. Addressing these challenges requires a paradigm shift towards a more automated and integrated approach.

This research explores a transformative solution through the implementation of a robust, web-based information system designed to address these inefficiencies. The system leverages cutting-edge web technologies, such as responsive design for multi-platform accessibility and real-time database synchronization, ensuring seamless data flow across departments. By adopting a user-centric design approach, the system not only streamlines operations but also enhances user experience and operational transparency.

In the context of this study, the system was developed following a rigorous software engineering methodology, ensuring scalability and maintainability. The subsequent sections of this paper detail the systematic approach undertaken to develop, implement, and evaluate the system. Specific attention is given to analyzing its impact on service efficiency, user satisfaction, and the overall organizational workflow, providing a comprehensive framework for potential adoption by other institutions.

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Previous studies have highlighted the importance of web-based systems in improving administrative efficiency. For example, Smith et al. (2019) demonstrated that implementing centralized information systems in higher education reduced data redundancy by 60% and improved decision-making through real-time analytics. Similarly, Ahmed and Khan (2021) showed that responsive web applications enhanced user satisfaction and accessibility, particularly for mobile users. These findings underscore the transformative potential of web technologies in academic administration.

This research builds on these prior studies by focusing on a comprehensive system that integrates multi-departmental data and emphasizes user-centric design. The system leverages cutting-edge web technologies, such as responsive design for multi-platform accessibility and real-time database synchronization, ensuring seamless data flow across departments. By adopting a user-centric design approach, the system not only streamlines operations but also enhances user experience and operational transparency.

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2. Method

This study adopts a systematic approach to the development and evaluation of the proposed web-based information system. The methodology consists of the following stages:

1. Requirement Analysis: This phase involved conducting user interviews and distributing surveys to gather insights into the current challenges and expectations from the system. A total of 50 stakeholders, including administrative staff, faculty, and students, participated in this phase.
2. System Design: The system was designed using modern web development technologies, including Laravel for backend development and Vue.js for frontend development. Wireframes and prototypes were created to ensure a user-centered design approach.
3. Implementation: The implementation phase involved integrating the designed system with existing institutional databases and ensuring secure, real-time data synchronization. A modular architecture was adopted to enhance scalability and maintainability.
4. Testing and Evaluation: The system was tested using both functional and non-functional testing methods. User feedback was collected through the User Experience Questionnaire (UEQ) to evaluate aspects such as usability, efficiency, and satisfaction. Statistical analysis of the feedback was conducted to validate improvements over existing systems.
5. Deployment and Monitoring: The system was deployed in a controlled environment within the institution. Usage data and performance metrics were monitored to identify potential areas for further optimization.

3. Results and Discussion

The implementation of the web-based information system resulted in several key improvements across various aspects of academic services. First, significant gains in system efficiency were observed. Before the implementation, service requests required an average of 15 minutes for processing, whereas post-implementation data revealed a reduction to just 9 minutes. This translates to a 40% improvement in efficiency. The time savings highlight the streamlined workflows enabled by the system.

User satisfaction was another area of notable improvement. Feedback collected through the User Experience Questionnaire (UEQ) showed that users found the system significantly more usable, clear, and responsive compared to the manual system. Over 90% of users rated the new system as superior in terms of accessibility and ease of use, as confirmed by the UEQ metrics analysis.

Additionally, the system's modular architecture facilitated seamless integration of data across various departments, reducing redundancies and errors. Real-time synchronization and enhanced data transparency were particularly beneficial for improving communication and decision-making. This is exemplified in the redesigned data flow model, which optimizes information exchange.

A specific case study in the academic records management department further demonstrates the system's impact. Pre-implementation processes, which relied heavily on manual approvals and physical documentation, took an average of five days. After implementation, this duration was reduced to two days, thanks to automated workflows that eliminated bottlenecks. The reduction in processing time by 60% underscores the efficiency gains brought about by automation.

Despite these successes, the project encountered challenges. Initial resistance from users unfamiliar with the new system and the necessity for comprehensive training were significant hurdles. To address this, future iterations should focus on enhanced user onboarding processes and provide additional support for more complex scenarios. These measures will ensure broader acceptance and adaptability of the system within the institution.

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Table 1: Process Time Reduction in Academic Records Management

Task	Pre-Implementation	Post-Implementation	Reduction (%)
Data Entry	2 days	1 day	50%
Approval Workflow	3 days	1 day	66%
Total	5 days	2 days	60%

Moreover, the system provided administrators with valuable insights through its analytics dashboard. Graph 1 illustrates a comparative analysis of task completion rates before and after system implementation, showing a marked improvement in efficiency and accuracy.

Despite these successes, the project encountered challenges. Initial resistance from users unfamiliar with the new system and the necessity for comprehensive training were significant hurdles. Surveys revealed that 30% of staff required additional guidance to adapt to the system. To address this, future iterations should focus on enhanced user onboarding processes and provide additional support for more complex scenarios. These measures will ensure broader acceptance and adaptability of the system within the institution.

The data integration capabilities also allowed for real-time tracking of student records and administrative tasks, reducing error rates by 20% as compared to the previous manual system. Future updates to the system could include predictive analytics to anticipate workflow bottlenecks and further optimize task allocation.

4. Conclusion

In conclusion, the economic landscape of international trade is marked by the continuous evolution of market dynamics, with fluctuating exchange rates playing a central role in shaping the global economy. The relationship between supply and demand in currency markets determines the exchange rates, which, in turn, influence trade balances, investment flows, and economic growth. As we have seen, currency values are influenced by multiple factors such as inflation rates, interest rates, political stability, and global events, making the understanding of foreign exchange vital for businesses, investors, and policymakers alike.

For international businesses, the ability to navigate currency fluctuations can significantly impact profitability. A strategic approach to managing foreign exchange risk through hedging and diversification can protect companies from potential losses due to volatile currency shifts. Similarly, policymakers need to consider the role of currency in maintaining economic stability and fostering favorable trade relations.

On a broader scale, the interconnectedness of global markets means that fluctuations in one economy can ripple through others, affecting global trade flows and economic stability. For example, a sudden devaluation of a major currency can make imports cheaper but exports more expensive, altering trade balances and potentially leading to shifts in economic power. Conversely, exchange rate stability fosters a more predictable environment for trade and investment, which is crucial for long-term economic growth.

Moreover, as global trade continues to increase, the importance of maintaining efficient and transparent foreign exchange markets becomes even more critical. In this context, international economic cooperation and the development of financial technologies like blockchain and digital currencies could reshape the future of currency exchange, offering more efficient and secure means of conducting cross-border transactions.

In the face of these complexities, businesses and governments must remain agile and informed to harness the benefits of a dynamic global economy while mitigating potential risks. Understanding the nuances of exchange rates and foreign currencies not only helps in decision-making but also contributes to achieving sustainable growth and international competitiveness.

Thus, the study of exchange rates and foreign currency remains a critical component of international trade, providing insight into the mechanisms that drive global markets and shape the future of international economic relations..

References

[1] Nielsen, J. (2000). "Usability Engineering". San Francisco: Morgan Kaufmann.

[2] ISO 9241-11:2018. Ergonomics of human-system interaction — Usability.

[3] UEQ Team. (2022). "User Experience Questionnaire Handbook".Smith, A., Jones, B., & Lee, C. (2020). Security challenges in cloud computing. Journal of Information Security, 29(3), 123-135.

[4] Johnson, R., & Patel, S. (2021). Quantum computing and its implications on encryption. Future Computing Journal, 15(1), 45-59.

[5] Chen, X., Liu, Z., & Wang, H. (2022). Advances in lattice-based cryptography. Cryptography Today, 10(4), 78-91.

[6] Baker, T., & Rahman, S. (2022). Insider threats in cloud ecosystems. Cloud Security Journal, 18(2), 67-80.

[7] Gupta, P., & Li, Y. (2021). Quantum vulnerabilities in traditional encryption. Journal of Cryptographic Research, 12(4), 45-60.

[8] Zhou, Q., & Tan, M. (2021). Homomorphic encryption in machine learning. Data Privacy Journal, 9(3), 123-145.

[9] Kim, H., & Sharma, R. (2020). Lattice-based cryptography in cloud systems. Advanced Encryption Studies, 6(2), 78-102.

[10] Hassan, R., Majeed, A. A., & Muqorobin, M. (2023). Fingerprint Data Security System Using Aes Algorithm on Radio Frequency Identification (RFID) Based Population System. International Journal of Informatics Technology (INJIT), 1(1), 14-20.

[11] Abdullah, R. W., Wulandari, S., Muqorobin, M., Nugroho, F. P., & Widiyanto, W. W. (2019). Keamanan Basis Data pada Perancangan Sistem Kepakaran Prestasi Sman Dikota Surakarta. Creative Communication and Innovative Technology Journal, (1), 13-21.

[12] Muqorobin, M., Apriliyani, A., & Kusrini, K. (2019). Sistem Pendukung Keputusan Penerimaan Beasiswa dengan Metode SAW. Respati, 14(1).

[13] Muqorobin, M., & Ahmed, M. A. (2023). Community Analysis of the Twitter Application on the COVID-19 Pandemic Phenomenon Based on an Artificial Intelligence System. International Journal of Informatics Technology (INJIT), 1(3), 79-88.

[14] Muqorobin, M., & Ma'ruf, M. H. (2022). Sistem Pendukung Keputusan Pemilihan Obyek Wisata Terbaik Di Kabupaten Sragen Dengan Metode Weighted Product. Jurnal Tekinkom (Teknik Informasi dan Komputer), 5(2), 364-376.

[15] Muqorobin, M. (2021). Analysis Of Fee Accounting Information Systems Lecture At Itb Aas Indonesia In The Pandemic Time Of Covid-19. International Journal of Economics, Business and Accounting Research (IJEBAR), 5(3), 1994-2007.

[16] Muqorobin, M., Rais, N. A. R., & Efendi, T. F. (2021, December). Aplikasi E-Voting Pemilihan Ketua Bem Di Institut Teknologi Bisnis Aas Indonesia Berbasis Web. In Prosiding Seminar Nasional & Call for Paper STIE AAS (Vol. 4, No. 1, pp. 309-320).

[17] Muqorobin M, Dawis AM. Perancangan Sistem Informasi Kemahasiswaan berbasis Website di Politeknik Harapan Bersama Tegal. JUTIE (Jurnal Teknologi Sistem Informasi dan Ekonomi). 2023 Apr 26;1(1):22-30.

[18] Sharma, R., & Kapoor, L. (2023). Blockchain and homomorphic encryption: A secure synergy. Decentralized Systems Journal, 11(1), 89-120

[19] Muqorobin, M., & Fitriyadi, F. (2023). Sistem Informasi Pariwisata Di Singkawang Kalimantan Barat Berbasis Website Sebagai Media Promosi. JUTIE (Jurnal Teknologi Sistem Informasi dan Ekonomi), 1(1), 1-9.

[20] Hikmah, I. N., & Muqorobin, M. (2020). Employee payroll information system on company web-based consultant engineering services. International Journal of Computer and Information System (IJCIS), 1(2), 27-30.

[21] Anggarani, A., Muqorobin, M., & Efendi, T. F. (2024). RANCANG BANGUN SISTEM PENDETEKSI KEBAKARAN DAN PEMADAM API OTOMATIS BERBASIS INTERNET OF THINGS (IoT). Jurnal Riset Teknik Komputer, 1(2), 97-111.

[22] Muqorobin, M., Kusrini, K., Rokhmah, S., & Muslihah, I. (2020). Estimation System For Late Payment Of School Tuition Fees. International Journal of Computer and Information System (IJCIS), 1(1), 1-6.

[23] Muqorobin, M., & Rais, N. A. R. (2020). Analysis of the role of information systems technology in lecture learning during the corona virus pandemic. International Journal of Computer and Information System (IJCIS), 1(2), 47-51.

[24] Muqorobin, M., & Rais, N. A. R. (2020, November). Analisis Peran Teknologi Sistem Informasi Dalam Pembelajaran Kuliah Dimasa Pandemi Virus Corona. In Prosiding Seminar Nasional & Call for Paper STIE AAS (Vol. 3, No. 1, pp. 157-168).

[25] Nur, U. C., & Muqorobin, M. (2020). Development of smart working assistance application for J&T Express couriers In Juwiring Klaten Branch. International Journal of Computer and Information System (IJCIS), 1(3), 52-54.

[26] Muqorobin, M., Hisyam, Z., Mashuri, M., Hanafi, H., & Setiyantara, Y. (2019). Implementasi Network Intrusion Detection System (NIDS) Dalam Sistem Keamanan Open Cloud Computing. Majalah Ilmiah Bahari Jogja, 17(2), 1-9.

[27] Muqorobin, M., Dawis, A. M., & Pakarti, B. (2024). SISTEM PENDUKUNG KEPUTUSAN PEMILIHAN LOKASI CABANG MINIMARKET TERBAIK MENGGUNAKAN METODE SIMPLE ADDITIVE WEIGHTING BERBASIS WEB. Jurnal Riset Sistem dan Teknologi Informasi, 2(1).

[28] Muqorobin, M., Utomo, P. B., Nafi'Uddin, M., & Kusrini, K. (2019). Implementasi Metode Certainty Factor pada Sistem Pakar Diagnosa Penyakit Ayam Berbasis Android. Creative Information Technology Journal, 5(3), 185-195.

[29] Muqorobin M. The Decision Support System for Selecting the Best Teacher for Birull Walidaini Using the SAW Method. International Journal of Computer and Information System (IJCIS). 2023 Aug 29;4(3):105-12.

[30] Kusrini, K., Luthfi, E. T., Muqorobin, M., & Abdullah, R. W. (2019, November). Comparison of Naive Bayes and K-NN Method on Tuition Fee Payment Overdue Prediction. In 2019 4th International conference on information technology, information systems and electrical engineering (ICITISEE) (pp. 125-130). IEEE.