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Short Paper

Empirical Evaluation of a Scholarship Application Information System Using the DeLone and McLean I.S. Success Model

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Abstract

Purpose – To develop and evaluate a centralized college scholarship management system that addresses technological inefficiencies in applicant record collection, evaluation, and communication processes.

Method – The study employed a mixed-methods approach, utilizing Likert scale questionnaires. Fifty respondents were purposively sampled, including program heads, management committee members, students, and IT professionals. The assessment framework employed the Delone and McLean IS Success Model, evaluating Information Quality, System Quality, Service Quality, Intention to Use, User Satisfaction, and Net System Benefits.

Results – Statistical analysis revealed strong positive correlations across the Delone and McLean IS Success Model dimensions. Information Quality demonstrated significant relationships with Intention to Use ($r = 0.683$, $p < 0.001$) and User Satisfaction ($r = 0.682$, $p < 0.001$). System Quality showed similarly strong correlations with Intention to Use ($r = 0.730$, $p < 0.001$) and User Satisfaction ($r = 0.748$, $p < 0.001$). Service Quality correlated positively with both Intention to Use ($r = 0.562$, $p < 0.001$) and User Satisfaction ($r = 0.684$, $p < 0.001$). The study found robust interconnections between Intention to Use, User Satisfaction, and Net System Benefits ($r > 0.839$, $p < 0.001$).

Conclusion – The research demonstrated that successful scholarship system development requires comprehensive planning, active stakeholder involvement, and robust data integrity measures. The findings emphasized the importance of validation checks and information security protocols in maintaining system reliability.

Recommendations – Organizations should prioritize strategic IS planning, data integrity, and user-centric visualization tools in system development. An iterative development approach is recommended to ensure continuous system improvement and optimal user satisfaction.

Research Implications – This study contributes to the understanding of information systems development within educational contexts, highlighting how service quality, system quality, and information quality collectively determine system success.

Keywords – management information systems, scholarship application, business process improvement, DeLone & McLean's success model, data visualization.

INTRODUCTION

Education enhances cognitive abilities, critical thinking, and problem-solving skills, enabling individuals to achieve their full potential. (Hu et al., 2025). Scholarships are essential in bridging gaps in access to education, particularly for underprivileged students. Numerous universities and colleges in the Philippines offer scholarship programs to support deserving students. Legislative measures, such as the Universal Access to Quality Tertiary Education Act (RA 10931), have further strengthened the government's commitment to providing free education in public institutions, paving the way for a more inclusive educational landscape.

Situated in Central Luzon, La Verdad Christian College (LVCC) is a private, non-stock, non-profit, and non-sectarian educational institution established on March 3, 2005, in Apalit, Pampanga, Philippines. LVCC offers scholarships to deserving students, granting them tuition-free education (Cueto et al., 2018, as cited in Calingasan et al., 2019). LVCC is one of the educational institutions in the Philippines that provides accessible education within its community (Ramirez et al., 2022).

The traditional process of applying for scholarships and subsidies involves cumbersome paperwork, multiple appointments, and manual data handling. Although Information Technology has brought about digitalization, it has also introduced new challenges, such as managing increasing volumes of data and complex evaluation processes. The COVID-19 pandemic further emphasizes the need for automation and centralization of registration and admission systems. Therefore, this research aims to develop a dedicated Scholarship Application System for La Verdad Christian College - Apalit, incorporating data profiling and visualization features to facilitate the application and evaluation processes. Furthermore, the study "The effectiveness of online academic application and registration procedures during COVID-19 pandemic at higher education institutions (HEIs)" evaluates the effectiveness of digital application and registration processes during the pandemic, highlighting the necessity for efficient and centralized systems in higher education institutions (Kgarose et al., 2023).

The institution's evaluation process involves manual data entry and needs a dedicated view for assessing individual scholarship eligibility. The increasing number of applicants and enrolled students highlights the need for a more efficient system. To address these issues, a centralized system will be developed to streamline the application, examination, interview, orientation, and enrollment processes. Additionally, the system will provide valuable insights through data analysis.

The existing review process relies on Google applications. It involves manual copying, pasting, and emailing, leading to inefficiencies and tech clutter or digital clutter, making information hard to locate and manage. A study by Dinneen and Julien (2021) highlights that computer users engage daily in file management activities, including downloading, moving, naming, and searching for files. These tasks, especially when performed manually, can lead to disorganization and inefficiencies. The authors emphasize the importance of effective file management to mitigate the negative impacts of digital clutter. The proposed system will eliminate these manual tasks, providing a user-friendly interface for program heads, evaluators, and applicants by automating the review process and integrating data visualization, enhancing efficiency and decision-making.

METHODOLOGY

The research design for this study employed a mixed-method approach, integrating applied, quantitative, and descriptive research designs to collect data concurrently within a limited timeframe. The methodology involved purposive sampling, where 50 respondents were selected to participate in the study in accordance with their knowledge of and potential system usage. Tongco (2007) discusses the robustness of purposive sampling, particularly in ethnobotanical research, where selecting knowledgeable informants is critical. This principle is equally applicable to studies involving system usage, as it ensures that the sample comprises individuals with relevant expertise. A Likert scale questionnaire was also administered to gather the required data.

The analysis techniques employed in this study encompassed Spearman's rank correlation, Cronbach's alpha, and descriptive analysis. Spearman's rank correlation was used to examine the relationships between variables, Cronbach's alpha was employed to assess the internal consistency of the questionnaire items based on the Delone & McLean IS Success Model, and descriptive analysis was conducted to summarize and interpret the collected data.

Utilizing this mixed-method approach, the study aimed to obtain comprehensive insights and explore the relationships between variables of interest. The combination of quantitative and descriptive research designs, along with the chosen analysis techniques, allowed for the examination of the six critical dimensions of the Delone & McLean IS Success Model and provided an understanding of the data collected. This study aligns with best practices in IS research, as highlighted by Venkatesh, Brown, and Bala (2013), who emphasize the value of mixed methods in capturing both the breadth and depth of user experiences and outcomes.

THEORETICAL FRAMEWORK

A theoretical framework is a foundational structure that guides research by providing a lens through which to analyze and interpret data. It connects the study to existing knowledge, justifies the research approach, and helps explain the findings (Lederman & Lederman, 2015). This model has been extensively used in previous studies on information systems, including e-commerce, knowledge management, and e-government systems. It has also been successfully applied to evaluate the effectiveness of hospital information systems (Ojo, 2017).

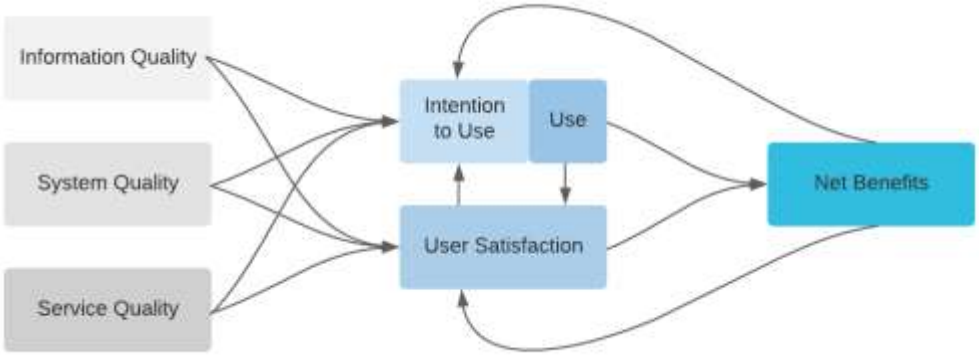

Figure 1. DeLone and McLean Model

The DeLone and McLean Model comprises six interrelated components known as quality dimensions: system quality, information quality, service quality, system usage satisfaction, net benefits, and user satisfaction, as shown in Figure 1. These dimensions contributed to the success and effectiveness of information systems (Ojo, 2017). The key strength of this framework is its ability to provide a comprehensive structure for evaluating

the success of an information system (Petter et al., 2008). By employing this model, the researchers aimed to assess the success of the information system implementation at La Verdad Christian College, aligning with the organization's specific needs and objectives.

By adopting the DeLone and McLean Model as the theoretical framework, this study leveraged existing research and proven models to analyze the impact of information systems on organizational success. The model's application provided a solid foundation for examining the quality dimensions and their influence on system usage, net benefits, and user satisfaction.

Given its well-established reputation, comprehensive methodology, and agreement with SAIS goals, the Delone and McLean Information Systems Success Model (D&M Model) was chosen as the Scholarship Application Information System (SAIS) evaluation framework. This well-known model provides a comprehensive view of information system success, including System Quality, Information Quality, Service Quality, Intention to Use, User Satisfaction, and Net Benefits. SAIS seeks to create an efficient and user-friendly platform, including dimensions like information quality and user satisfaction in the D&M model that closely correspond to the developed system's goals. As a result, by employing the D&M Model, SAIS may ultimately measure its success, considering technological functioning, data quality, and user experience, among other aspects, to ensure that it effectively serves its intended purposes.

THE DEVELOPED SYSTEM

The Scholarship Application Information System offers streamlined scholarship application processes, user-friendly interfaces for applicants, robust administrative tools for evaluators, and centralized data management. It provides visualized reports for informed decision-making and enhances communication through notifications. The system's core features include an applicant dashboard, evaluation tools, program-specific views, and data export options. These capabilities simplify scholarship applications, improve eligibility determinations, and enhance efficiency while ensuring data accuracy and accessibility.

UML Use Case Diagram

This section discusses how different users will be using the system as modelled in the use case diagram in Figure 2. The Program Head role can review applicants' information when evaluating an applicant during the initial evaluation or the interview. Program heads can view the exam results and are the ones who administer interviews for the applicants, having access to view the applicant's application process, view attached files and exam results, place initial evaluations and remarks during or after the interview process, and access settings to change their passwords.

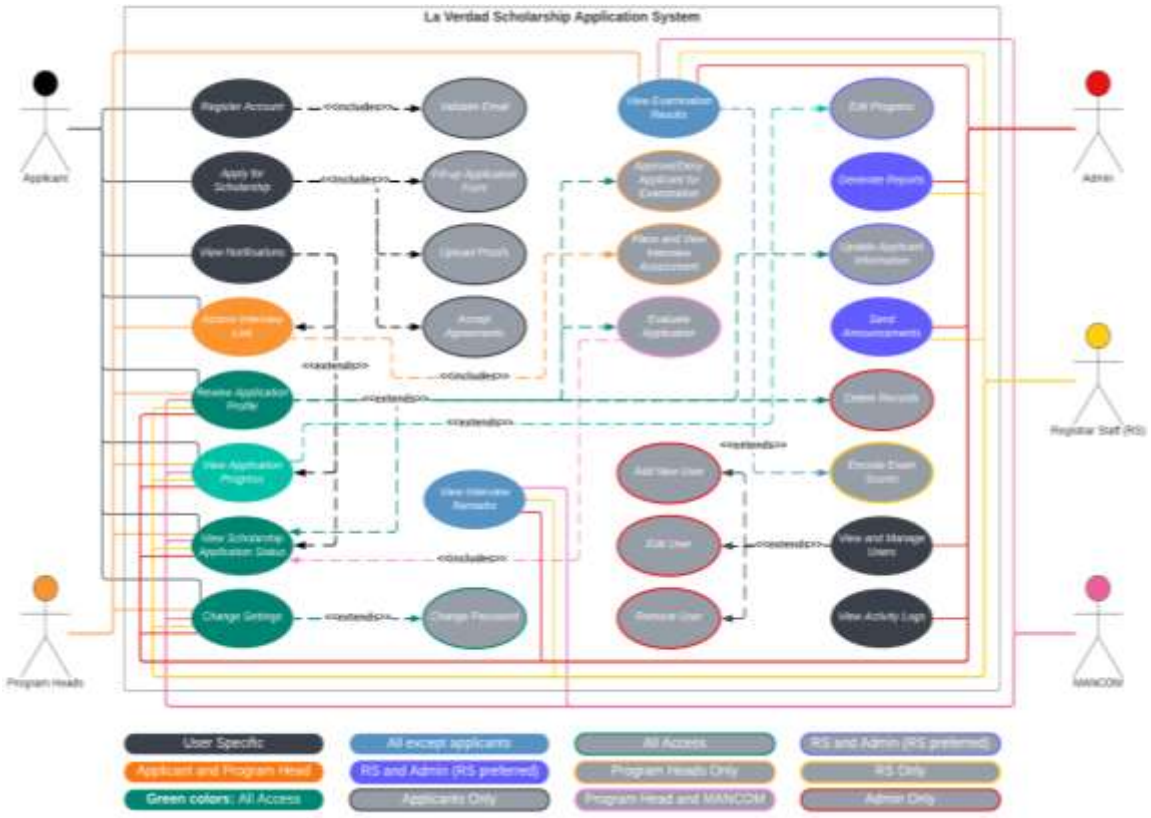

Figure 2. Use Case Diagram of La Verdad Scholarship Application System

The MANCOM role can also view the applicant's information, which can be utilized to evaluate applicants for final decisions. MANCOM can also view the applicant's exam results, interview remarks, and application progress, view attached files and exam results, place final evaluation and remarks to serve as the applicant's final scholarship status, and access settings to change their passwords.

The registrar staff uses the system to review student application forms, update student information with permission from the admins, view and encode exam results, view interview remarks, application progress, and status, make notifications for announcements, generate reports, and change their passwords in the settings.

The admin role has complete control over the system's database, including CRUD functions for user roles, user information viewing, exam results, interview remarks, and scholarship statuses for applicants. Admins also manage other user roles, such as program heads, MANCOM, and registrar staff. They can change passwords and monitor system activities through activity logs, focusing on applicant record deletions when performed by registrar staff.

System Architecture

The significance of system architecture diagrams is further emphasized in the IEEE framework for information systems architecture, which outlines best practices for defining system structures in a way that supports modularity and interoperability (Zachman, 1987).

Figure 3 shows the system architecture and explains the application management system flow. Applicants fill out a form, which is stored in a database. Applicants can access the form responses through their profiles, and program heads can evaluate and assess applicants through their profiles. The management committee (MANCOM) can access profiles to make final decision remarks. An administrator manages users and system content, with the ability to add, edit, and delete user accounts. The registrar staff updates application statuses, inputs exam scores, and generates reports. The system involves data input, storage, retrieval, and utilization for evaluations, assessments, and decision-making.

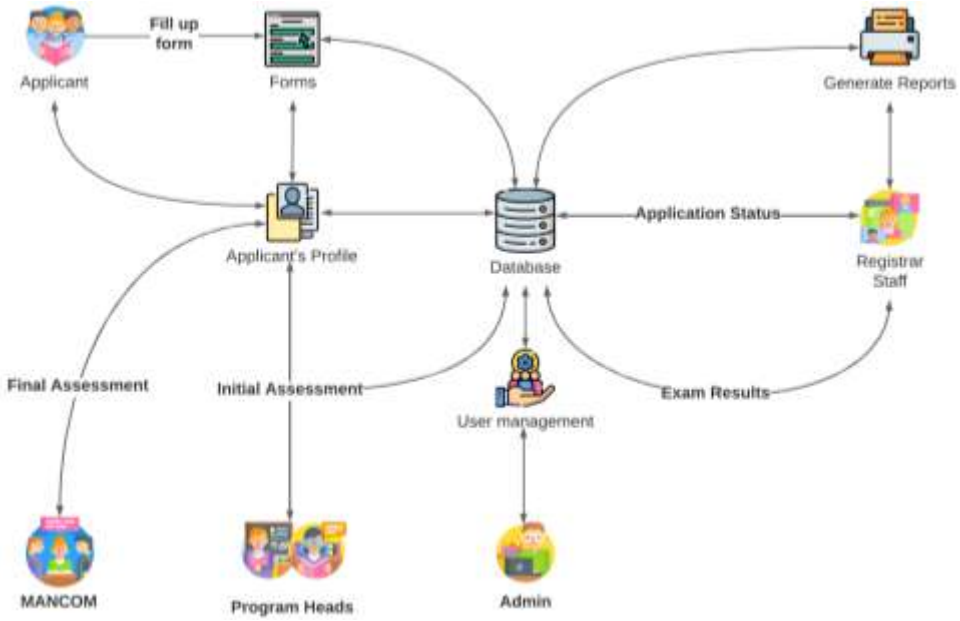

Figure 3. System Architecture

Database Diagram

The Entity-Relationship Diagram (ERD) in Figure 4 showcases the system's database structure with 19 tables. ERD represents the blueprint for database design, showing the entities and their relationships within the system, and enabling stakeholders to understand the system's overall structure. In their work, Bagui and Earp (2022) emphasize that ERDs are instrumental in developing relational databases, aiding in the visualization of data structures and relationships. They highlight the importance of ERDs in mapping complex data interactions, which is crucial for effective database design. Among the main tables are "applicants," "users," "programs," and "roles," which are managed using the Laravel Spatie package. These tables are meticulously designed, featuring foreign and primary keys to establish meaningful relationships between entities. Foreign keys link one table's columns to another table's primary key, enabling connectivity between data stored in various tables and facilitating efficient data retrieval and manipulation. For example, the "applicants" table may include a foreign key referencing the "programs" table, representing the association between applicants and specific programs.

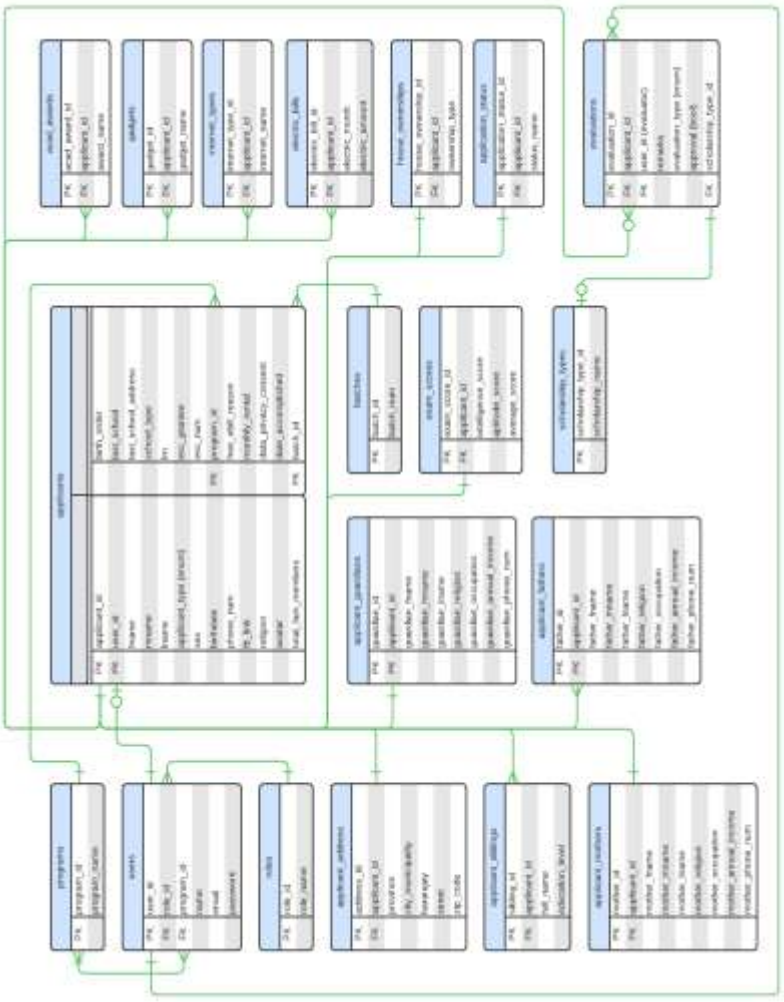

Figure 4. The System's Database Tables' Entity Relationship Model

Simultaneously, primary keys are unique identifiers assigned to each record in a table, ensuring the uniqueness of rows and serving as reference points in other tables through foreign keys. In the ERD, primary keys such as "applicants_id," "users_id," "programs_id," and "roles_id" are employed in their respective tables to maintain data integrity and enable seamless data retrieval and referencing across the database. Incorporating foreign and primary keys in the database design ensures data consistency, accuracy, and meaningful relationships. This supports the research study's objectives in analyzing and optimizing the system's database structure for improved performance and effectiveness.

Centralized Scholarship Application System for a Unified Platform Access to Required Features and Services

This section describes the how different offices within the organization use a centralized system as shown in Figure 5. The La Verdad Scholarship Application System (LVSAS) provides a user-friendly platform for applicants to register and monitor their progress through a dashboard, eliminating the need for constant email or SMS notifications.

For evaluators and the Management Committee (MANCOM), the system streamlines the review process and categorizes applicants based on their respective programs, with access given to program heads and MANCOMs. Additionally, the system enables crucial information dissemination and offers visualized reports based on scholarship applications.

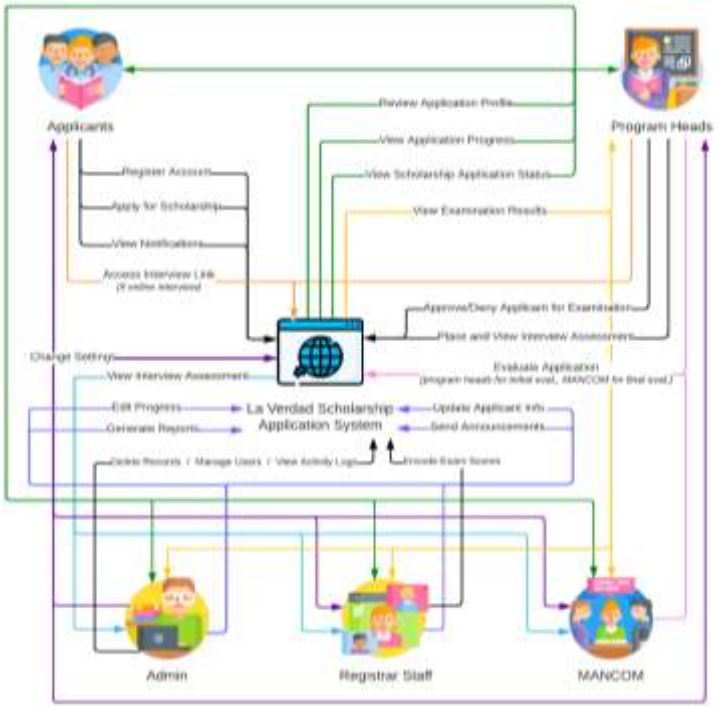

Figure 5. Diagram showing the centralization of all user types' usage in the system

Administrators efficiently manage user roles and permissions with a unified platform and central database. Program heads access specific applicant data, reports, and evaluation functions, while MANCOMs oversee all programs and provide final evaluations and remarks. Registrar staff update applicant information, encode examination scores, and send notifications. Administrators retain complete user management control and can delete applicant records as needed.

Applicant Profiling, Same-page Profile Assessment, Evaluation, and Remarks Input for a More Convenient Records and Performance Appraisal

To model the scholarship applicant profiling business process, Figure 6 illustrates that the system follows a step-by-step procedure for evaluating scholarship applications. Completed application forms are stored in the system and accessible for review. Evaluators can easily access and review applicants' profiles from the list of Pending Applicants. Evaluators can input remarks, approve exam results, and provide evaluations within the profile, as shown in Figures 7 and 8. The Registrar Staff can also view the applicant's profile and input exam scores. The Management Committee Member reviews the profile and provides the final evaluation status.

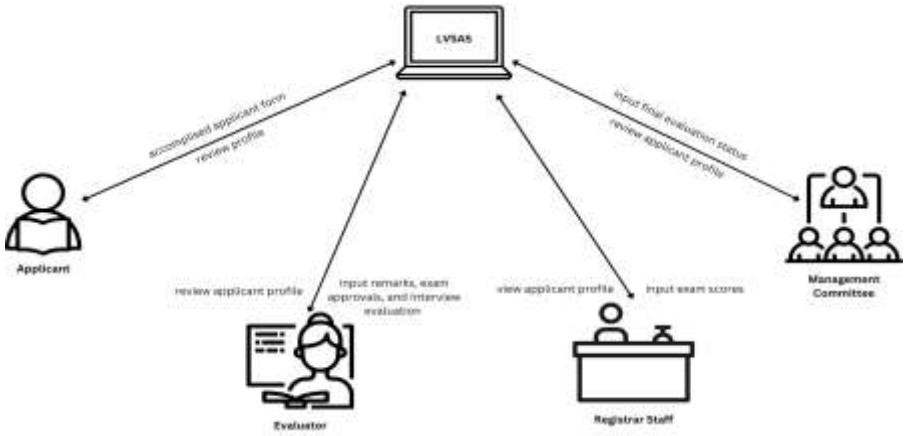

Figure 6. Diagram of Applicant Profiling, Profile Assessment, Exam Score input, Initial and Final Assessment.

The introduction of applicant profiling improves user-friendliness by allowing evaluators, MANCOM members, registrar staff, and administrators to assess, evaluate, and provide remarks on the applicant's profile on the same page. Applicant profiles are structured with essential information and additional tabs for personal details and educational background. Evaluators can conveniently assess eligibility, record exam scores, and input evaluations. This consolidated view simplifies the review process and eliminates the need to switch between multiple sheets or platforms. LVSAS streamlines the evaluation process by providing all the necessary functions and information within a single page, eliminating the tediousness of scrolling through numerous rows and columns of data—the same view as when applicants review their provided information when they initially filled out the application form. However, the tabs with evaluation fields dedicated to evaluators and super admins are absent.

Figure 7. Screenshot of Applicant Profile with two-tab sets:

Profile Assessment tabs (top set) and Applicant Information (bottom set)

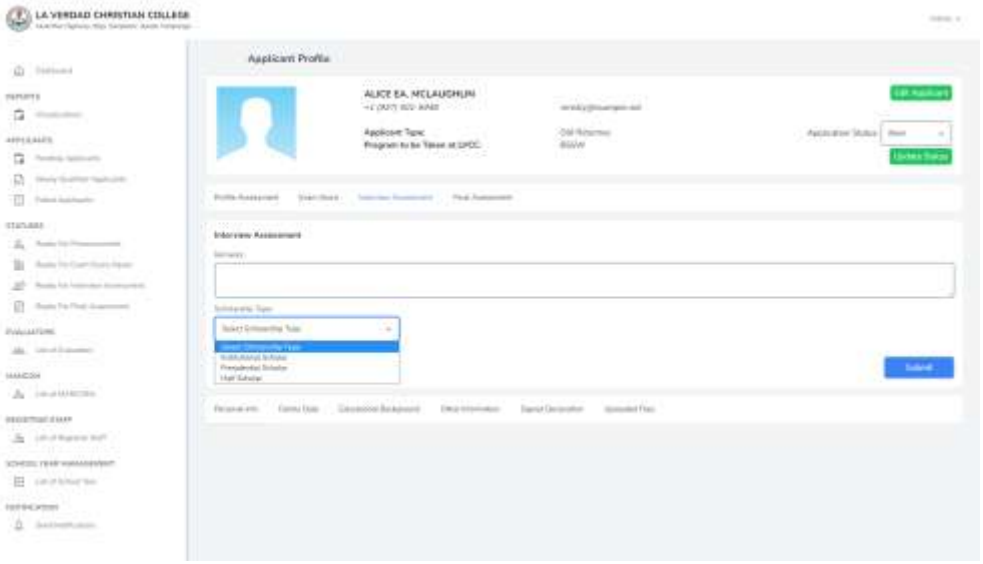

Figure 8. Screenshot of Applicant Profile Evaluation Tabs: Interview Assessment, where program heads put their interview remarks of the applicant and the suggested scholarship status to grant the applicant

Notification Feature for Batch and School Year Announcement Dissemination

The notification feature of the system allows the Administrator and Registrar Staff to send batch-specific updates, including scholarship announcements, deadline reminders, and other important notifications as depicted in Figure 9. These messages are targeted exclusively to students within a specific batch of a school year. The system delivers these notifications to the intended recipients, who can conveniently access them in their notification tab within their account. This centralized notification system makes the communication process more efficient, eliminating the need for applicants to constantly check multiple channels like emails or text messages. It replaces the previous use of external tools like MailMerge. It ensures that all applicants receive timely updates regarding their examination and interview schedules directly through the system, minimizing their effort and increasing their awareness.

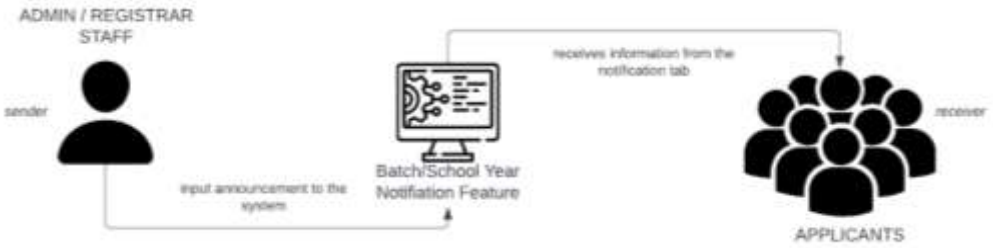

Figure 9. Notification feature diagram for batch and school year

Notification Feature: Custom for Exclusive Notice Towards Specific Applicants

LVSAS also allows customized notifications to be sent to specific recipients, providing targeted communication within the system as pictured in Figure 10. This feature, available in the notification tab of the admin and registrar staff roles, utilizes the database notification functionality of the Laravel framework. It proves valuable for various scenarios, including follow-ups or requests for specific file submissions and individual reminders to complete the application process. The feature ensures that the registrar staff can promptly notify applicants about completion, preventing confusion or missed updates, especially considering that applicants may complete the process at different times and dates.

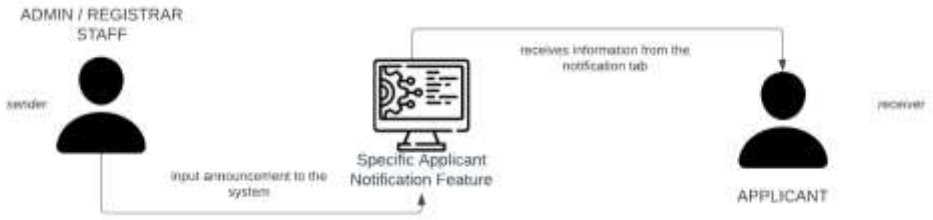

Figure 10. Notification feature diagram for specific applicants

Administrators can choose specific applicants to whom they want to send notifications for a particular purpose. Once the recipients have been chosen, the administrators can input the title and content of the notification they wish to send. This level of customization and control allows administrators to effectively communicate important information to the intended recipients in a targeted and efficient manner.

Data Visualization

The researchers incorporated the Highcharts library as a powerful tool for data visualization as shown in Figures 11 and 12. Leveraging its capabilities, they created visually informative representations of key applicant data, including summaries based on program, gender, religious affiliation, school types, region, and gender per program. The library's export features allowed the researchers to generate PNG, XLS, and CSV files, providing data sharing and analysis flexibility. Additionally, the ability to print the visualizations further enhanced the accessibility and utilization of the data.

The purpose of data visualization in this context is to provide administrators with clear and concise insights into the scholarship application system's performance and applicant demographics by showing graphics to display data. Statistical summaries can be shown in a histogram (Unwin, 2020). The visualizations, which include bar charts for the religious affiliation of applicants, pie charts for applicants' school type and applicants' percentage per gender, column charts for the gender of applicants per program, variable radius pie charts for application ratio by program, and semi-circle doughnut charts for total applicants per region, serve as comprehensive summaries that aid in decision-making

processes, resource allocation, and strategic planning. Having access to well-organized and visually appealing data enables administrators to make informed choices efficiently, ensuring the smooth and effective management of the scholarship application process.

Figure 11. Screenshot of the interface for the visualization tab

Figure 12. Screenshot of the interface for visualization scrolled down

RESULTS AND DISCUSSION

Competent respondents for the Likert scale survey were selected through purposive sampling based on specific criteria. This included individuals with knowledge and experience related to the Scholarship Application Information System (SAIS), such as administrators, program heads, and evaluators, ensuring that they had substantial interaction with SAIS. The criteria also considered diverse perspectives within the SAIS user community to capture varied experiences. Additionally, willingness to participate was a prerequisite. This approach aimed to gather informed and diverse feedback from individuals closely involved with SAIS, enhancing the survey's relevance and validity.

Table 1. Descriptive Analysis of the Likert Scale based on the Delone & Mclean IS Success Model

DESCRIPTIVE ANALYSIS	Information Quality	System Quality	Service Quality	Intention to Use	User Satisfaction	Net System Benefits
MEAN	4.313	4.330	4.080	4.193	4.140	4.060
MEDIAN	4.333	4.500	4	4	4	4
MODE	5	5	4	4	4	4
VARIANCE	0.623	0.588	0.737	0.504	0.582	0.565
STDEV	0.79	0.77	0.86	0.71	0.76	0.75

The Scholarship Application Information System demonstrates overall success based on the Delone and McLean IS Success Model, supported by descriptive analysis and reliability testing. The analysis reveals strong user agreement regarding information quality, system quality, service quality, intention to use, user satisfaction, and net system benefits. Users perceive the system as providing accurate and valuable information, being easy to use, and effectively meeting their needs. These findings align with prior research that emphasizes the importance of these dimensions in evaluating information system success (Nancyprabha Pushparaj et al., 2023). Affirming the system's effectiveness in managing scholarship applications, improving communication, and streamlining processes, creating a basis for future analyses and interpretation of intra-research model relationships.

Table 2. Reliability Testing of the Six Dimensions

Delone & Mclean IS Success Model	No. of Items	Cronbach's Alpha	Interpretation
System Quality	3	0.965	Excellent
Information Quality	4	0.958	Excellent
Service Quality	3	0.977	Excellent
Intention to Use/System Use	3	0.852	Very Good
User Satisfaction	2	0.913	Excellent
Excellent Net Benefits	3	0.934	Excellent

Table 3. Hypothesis testing based on the Delone and McLean IS Success Model.

Correlation Testing	r	T statistic	df	p-value	Remarks
There exists a significant positive correlation between Information Quality and Intention to Use, as measured by the Delone and McLean IS Success Model.	0.683	6.48	48	$p < 0.001$	Supported
There exists a significant positive correlation between Information Quality and User Satisfaction, as measured by the Delone and McLean IS Success Model.	0.682	6.469	48	$p < 0.001$	Supported
There exists a significant positive correlation between System Quality and Intention to Use, as measured by the Delone and McLean IS Success Model.	0.730	7.408	48	$p < 0.001$	Supported
There exists a significant positive correlation between System Quality and User Satisfaction, as measured by the Delone and McLean IS Success Model.	0.748	7.809	48	$p < 0.001$	Supported
There exists a significant positive correlation between Service Quality and Intention to Use, as measured by the Delone and McLean IS Success Model.	0.562	4.707	48	$p < 0.001$	Supported
There exists a significant positive correlation between Service Quality and User Satisfaction, as measured by the Delone and McLean IS Success Model.	0.684	6.488	48	$p < 0.001$	Supported
There exists a significant positive correlation between Intention to Use and User Satisfaction, as measured by the Delone and McLean IS Success Model.	0.835	10.499	48	$p < 0.001$	Supported
There exists a significant positive correlation between Intention to Use and Net System Benefits, as measured by the Delone and McLean IS Success Model.	0.823	10.047	48	$p < 0.001$	Supported
There exists a significant positive correlation between User Satisfaction and Net System Benefits, as measured by the Delone and McLean IS Success Model.	0.839	10.674	48	$p < 0.001$	Supported

The correlation testing and Spearman's rank correlation analysis of the Scholarship Application Information System reveal significant positive relationships among key success dimensions. Notably, Information Quality, System Quality, and Service Quality positively correlate with both Intention to Use and User Satisfaction. Furthermore, Intention to Use and User Satisfaction demonstrate strong associations with Net System Benefits. These

findings align with the Delone and McLean IS Success Model, reinforcing the interdependence of system effectiveness factors in driving overall success.

The developed system is crucial for applicants, the Registration and Admission Department, and evaluators. It provides accurate and user-friendly information, enhancing applicants' satisfaction and intention to use. Likewise, it improves the department's satisfaction and efficiency, streamlining processes and evaluations. The system's positive impact is vital for optimizing the scholarship application process and improving outcomes.

CONCLUSION

The developed system is essential for applicants, the Registration and Admission Department, and evaluators. It provides accurate and easily understandable information for applicants, positively influencing their intention to use the system and enhancing their satisfaction with the application process. Similarly, for the Registration and Admission Department and evaluators, the user-friendly interface and reliable support services contribute to higher satisfaction and intention to use the system. The system streamlines administrative processes, improving efficiency and facilitating practical evaluation. Thus, the system's beneficial impact on stakeholders emphasizes its importance in optimizing the scholarship application process and increasing educational outcomes. Incorporating the suggested enhancements will increase its contribution to the field of system development, resulting in a more robust and specialized solution for academic institutions.

Throughout the development of the scholarship application system with data profiling and visualization, valuable insights and realizations have been gained, providing a deeper understanding of the challenges and considerations in this domain. Thorough planning and requirements gathering emerged as crucial factors in developing a complex system, ensuring a clear understanding of stakeholders' needs. The significance of data integrity became evident, emphasizing the importance of accurate and reliable data collection through validation checks. Information security took center stage, highlighting the need for robust measures to safeguard applicant information and prevent unauthorized access. User-friendly data visualization was recognized as vital for effective decision-making, considering the target audience's preferences. The iterative nature of systems development and research writing was acknowledged, emphasizing the importance of continuous improvement and adaptation. These realizations have shaped the researchers' understanding of conducting systems development projects, enabling the delivery of high-quality systems that meet evolving stakeholder needs.

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through scholarships. We thank Dr. Luzviminda E. Cruz for supporting our study within the school and to the respondents and testers, including various school departments and junior students, whose active participation refined the system. We are also thankful to our families and friends for their enduring support. This research project stands as a collaborative testament to meaningful contributions to the scholarship application process, and we express our deepest gratitude to everyone involved.

DECLARATIONS

Conflict of Interest

No Conflict of Interest.

Informed Consent

Before gathering the client's information, notice and consent regarding data privacy were supplied to ensure their comprehension and agreement to the handling of their personal information.

Ethics Approval

The Bachelor of Science in Information Systems Program faculty at La Verdad Christian College, Apalit, Pampanga, has approved this research project. This endorsement encompasses various facets of the study, such as the research design, informed consent procedures, and data collection methods. This endorsement underscores the commitment to ethical principles, the prioritization of participants' well-being and rights, and the preservation of confidentiality throughout the research process.

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