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Blood Donation Management System: Streamlining Donor Registration, Appointment Scheduling and Blood Collection through a Web Interface

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ABSTRACT: The Blood Donation Management System is designed to streamline and modernize the process of blood donation and distribution. This system addresses common issues such as the difficulty in locating eligible donors during emergencies, time-consuming manual processes, and lack of real-time data access. By providing an automated and centralized platform, it enables blood banks, hospitals, and donors to connect efficiently, ensuring a faster and more reliable response to blood supply demands. It allows donors to register, schedule appointments, and receive updates on blood needs and availability. It keeps track of donor information, blood types, and donation history, ensuring that blood resources are used effectively and that donations do not go to waste. The system features a secure database for storing donor and recipient information, real-time tracking of donations, and automated notifications to remind donors of their eligibility. It also facilitates communication between stakeholders, reducing delays and improving the coordination of resources. Additionally, transparency in blood usage is enhanced, building trust among donors and recipients.

Keywords: blood donors, blood bank, ISO 25010, usability

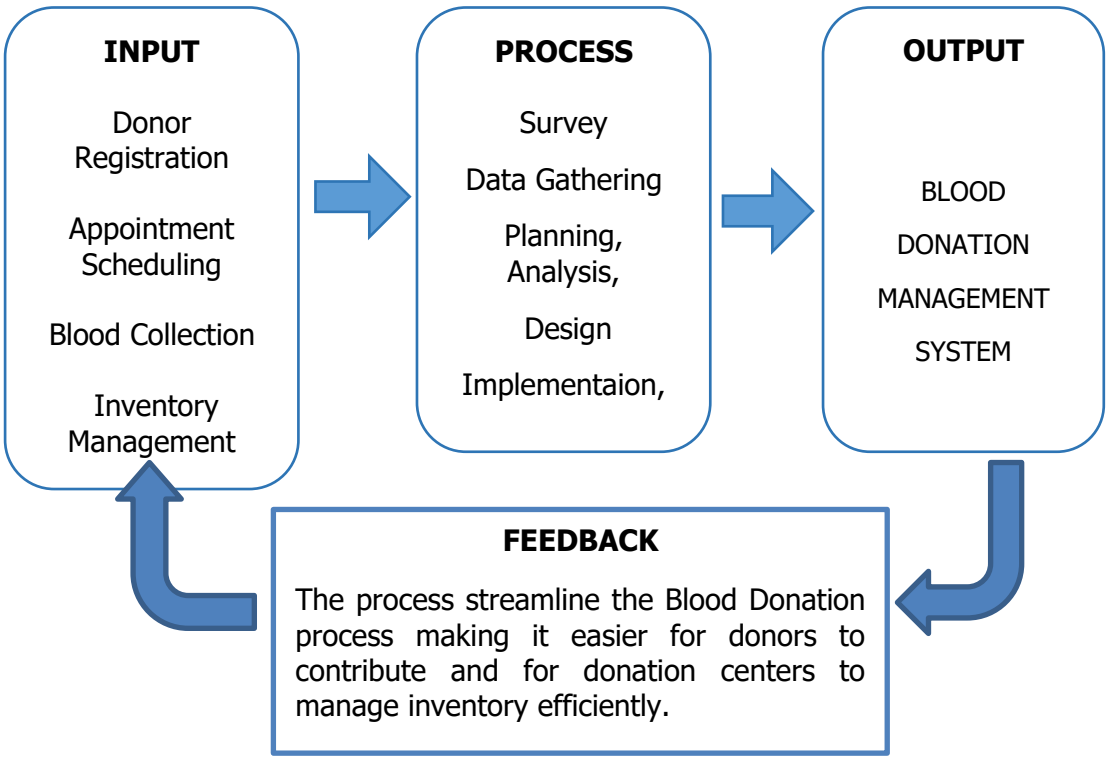
I. INTRODUCTION

Blood donation is a crucial aspect of healthcare systems worldwide. It served as a lifeline for countless patients in need of blood transfusions due to surgeries, accidents, or medical conditions. Despite its importance, Blood Donation Management System aims to address this need by providing a comprehensive solution for blood seekers, facilitating seamless donor registration, appointment scheduling, and blood collection processes.

Blood Donation Management System offers a comprehensive solution to the challenges faced in traditional blood donation processes. By enhancing the donor experience, improving data management, streamlining appointment scheduling, and by providing a user-friendly web interface, the system promotes donor engagement and facilitates efficient communication between donors, healthcare providers, and blood banks. Its scalability and expandability ensure that it can adapt to future needs and advancements, making it a valuable investment for organizations dedicated to improving blood availability and patient care. This project aims to develop and implement a Blood Donation Management System that streamlines donor registration, appointment scheduling, and blood collection processes through a user-friendly web interface. The system aims to leverage technology to improve efficiency, enhance donor experiences, and optimize blood inventory management within the organization.

Objectives of the Study

The study generally aimed to develop and implement a Blood Donation Management System that streamlines donor registration, appointment scheduling, and blood collection processes through a user-friendly web interface. The study involved various stakeholders in the assessment and evaluation over its compliance with ISO 25010:2015 software quality standards and the indicators of the Unified Theory of Acceptability and Usability of Technology (UTAUT). The project is guided by the framework presented in Figure 1.0.



II. MATERIALS AND METHODS

Research Design

The researchers used the descriptive and development research design for this study. The descriptive aspects focused on understanding and analyzing the manual system's existing state and how the system have contributed to a simpler method of capturing and managing Blood Donation Management. The prototyping model (development aspect) was applied to the system's design, development and testing. It includes the following key phases; Requirements, Quick Design, Build Prototype, User Evaluation, Refining Prototype and Implement and Maintain. The prototyping model as adopted as it provided benefits to the project team in terms of managing IT systems, resources, and delivery of expected outputs with references to project management principles, software engineering principles, risk management, and assessment using ISO 25010:2011 software quality characteristics and the Unified Theory of Acceptability and Usability of Technology (UTAUT2).

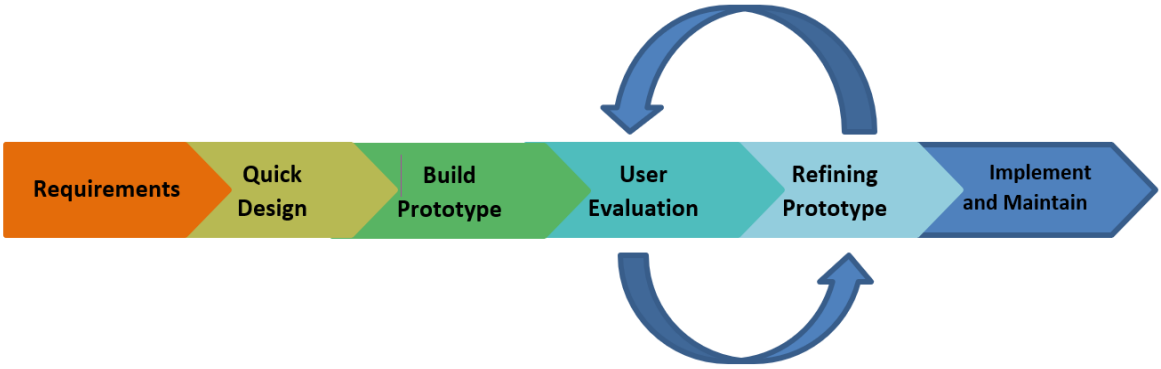


Figure 2 Prototyping Model

Population and Sampling Technique

The twenty-five (25) participants of this study comprised various stakeholders affiliated with Municipal Health Office (MHO) of the Local Government Unit of Aparri. The population was first categorized into strata based on participants' roles and affiliations: (5) Blood Donors, five (5) Blood Seekers, ten (10) MHO staff, five (5) IT experts. The inclusive criteria adopted the context of relevance, specialization, and experiences in handling data related to the study and the information systems.

Research Instruments

The study utilized several data collection methods, including assessment questionnaires, document reviews, observations, and interviews. The assessment questionnaires adopted that of the: (1) the ISO 25010:2011 Evaluation Questionnaire for IT experts to assess software quality and (2) the User Acceptability and Usability Questionnaire for end-users to evaluate system adoption. The interview guide consisted of 10 quantitative questions to supplement the need to obtain data and responses to the assessment. The document checklist also gave the researchers a clearer understanding of the reports and forms that needed to be produced.

Analysis of the Data/Statistical Instrument

The study employed descriptive statistics, including frequency counts, weighted mean, and standard deviation. The data were collected using a 4-point Likert Scale with the ratings ranging from Compliant to Very High Extent to Very Least Extent, and from Acceptable and Usable to Very High Extent to Very Least Extent.

Ethical Considerations

Data used in the actual testing of the system were dummy or test data only. No actual data from non-consented participants were used. The data or information provided by the participants in this study were made thru a consent form. The same data were removed as part of the compliance to Data Privacy Act of 2012. During the turnover, the MHO would be implementing the necessary data protection strategies, while adhering to data management principles as developers gaining access to the system, providing only technical support.

III. RESULTS AND DISCUSSIONS

The current practices problems, processes and procedure, and policies involved in current system and organization includes:

(a) Records data management relies on manual, paper-based records, making it difficult to blood inventory, manage donations efficiently;

(b) Manual records are prone to damage, loss, and unauthorized access, risking data confidentiality;

(c) Lack of secure and centralized system, making it difficult to retrieve, analyze, and produce accurate reports efficiently. This results in delays and hinders effective decision-making and monitoring;

(d) Partner agency faces challenges in monitoring blood bank donations due to fragmented records and manual processes, hindering effective law enforcement and compliance assessment; and

(e) The existing data repository heavily relies on traditional filing and storage management.

Additionally, reports are stored in physical archives, making retrieval time-consuming. Paper records are prone to damage from natural disasters, such as typhoons, and risk of misplacement or deterioration over time. Project documentation lacks uniformity, making it challenging to maintain and provide data-driven insights accurately. The absence of a centralized system hampers collaboration among departments and hinders the sharing of regulated data to public.

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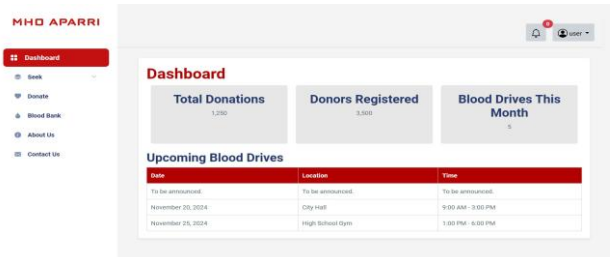
The system features a secure database for storing donor and recipient information, real-time tracking of donations, and automated notifications to remind donors of their eligibility. It also facilitates communication between stakeholders, reducing delays and improving the coordination of resources. Additionally, transparency in blood usage is enhanced, building trust among donors and recipients.

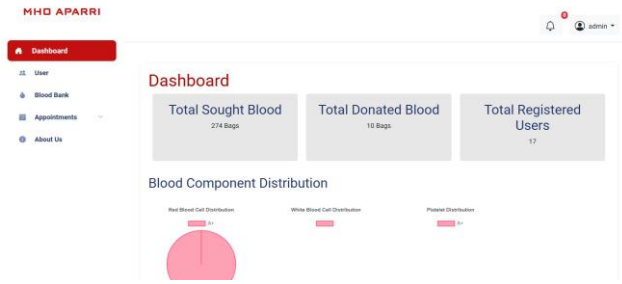


Each user is able to navigate on the dashboard of the project, which provides an overview of the Blood Donation Management and their connection to Municipal Health Office Aparri

Figure 3 Dashboard of the Blood Donation Management

The figure 4 highlights the specific location of a project initiated by Municipal Health Office-Aparri (MHO) that aligns with the objectives of the Blood Donation Management. It also provides a way to visualize the pinned location of the different research projects, programs, and studies.

Figure 4 BDMS Contributions per Project/Research Location



The monitoring dashboard (fig 5.0) at the admin page, a central hub designed to manage and displays an overview blood donation including the total sought blood, donated blood, registered users and the interactive charts showing the blood component distribution.

Figure 5 Monitoring Dashboard by the MHO-Aparri

Extent of compliance with ISO 25010 Software Quality Standards as assessed by the IT Experts.

Table 1. Summary of Assessments ofthe IT Experts

Criteria	Weighted Mean	Descriptive Value
Functionality Suitability	3.60	Very High Extent
Performance Stability	3.33	High Extent
Compatibility	3.67	Very High Extent
Usability	3.53	Very High Extent
Reliability	3.73	Very High Extent
Security	3.40	High Extent
Maintainability	3.60	Very High Extent
Portability	3.60	Very High Extent

Weighted Mean	3.56	Very High Extent

The IT experts generally perceived the developed Blood Donation Managemnet compliant to ISO 25010:2015 software quality standards to a very high extent. The assessment highlights its compatibility and reliability rated highest which conforms to its purpose of being able to be compatible to various used needs, cross-device and platform (see table 1).

Technology Acceptance of the Developed Applicaiton

The table 2 summarizes the user feedback on the system's usability, productivity impact, ease of use, social influence, compatibility, and future usage intentions. With a composite weighted mean of 3.55 and a descriptive value of Strongly Agree, the results indicated overwhelmingly positive perceptions in terms of how usable the system application is.

Table 2: Perceived usability of the developed system

Statements	Weighted Mean	Descriptive Value
I find using the system useful in my daily life	3.75	Strongly Agree
Using the system helps me accomplish things more quickly	3.80	Strongly Agree
Using the system increases my productivity	3.70	Strongly Agree
Learning how to use the system is easy for me	3.65	Strongly Agree
My interaction with the system is clear and understandable	3.55	Strongly Agree
It is easy for me to use and become skillful at using the system	3.70	Strongly Agree
People who are important to me think that I should use the system	3.50	Agree
People who influence my behavior think that I should use the system	3.30	Agree
People whose opinions that I value prefer that I use the system	3.40	Agree
I have the knowledge and resources necessary to use the system	3.55	Strongly Agree
The system is compatible with other technologies I use	3.15	Agree
I can get help from others when I have difficulties using the system	3.30	Agree
I intend to continue using the system in the future	3.90	Strongly Agree
I will always try to use the system in my daily life.	3.50	Agree
I plan to continue to use the system frequently.	3.50	Agree
Weighted Mean	**3.55**	**Strongly Agree**

Users find the system useful, efficient, and easy to learn, with clear and understandable interactions. The system was compatible with other technologies, and users feel supported when encountering difficulties. Social influences also encouraged its use, and there is strong intent to continue using the system regularly. These findings affirmed the system's effectiveness, user-friendliness, and alignment with user expectations.

Additionally, in table 3, users of the BDMS perceived the project to be very useable and functional based on their agreement of the ease of use and usefulness of the project in their respective work processes. This is reckoned on the computed mean of 3.57. This would mean that users find the BDMS usable and effective in improving their work flow allowing them to easily maintain efficiency, flexibility, and faster records management.

Table 3: Perceived ease of use and usefulness as efficacy

Statements	Weighted Mean	Descriptive Value
My interaction with the System would be clear and understandable.	3.95	Strongly Agree
I find the System to be flexible to interact with	3.45	Agree
Using the System would enable me to reserve a facility.	3.50	Strongly Agree
Using the System would improve the quality of reservation.	3.70	Strongly Agree
I am confident in my ability to use the System as it is designed for facility users.	3.60	Strongly Agree
I feel good about my ability to reserve a facility as the System is easy to use.	3.35	Agree
I think the System can keep me inform the availability schedule of the different facilities.	3.55	Strongly Agree
Using the System can help me to minimize my time and efforts in the process of reservation.	3.55	Strongly Agree
Given that I have access to system, I predict that I would use it.	3.50	Agree
Assuming the System is available at the office, I intend to use it.	3.50	Agree
Weighted Mean	**3.57**	**Strongly Agree**

CONCLUSIONS

The Blood Donation Management System could greatly improve the handling of blood donations by making the process easier, faster, and more accurate. With its features, it could enable real-time updates, which proved especially valuable during emergencies. This project highlights the advantages of adopting new technology and the importance of continually refining the system based on user feedback. Despite facing various challenges, the system holds significant promise for enhancing health services by boosting the efficiency of blood donations and encouraging individuals to contribute to saving lives.

RECOMMENDATIONS

Based on the findings, the following are hereby recommended:

a) Project Adoption: Make sure the Municipal Health Office (MHO) to continuously adopt the project.

b) Integration: Municipal Health Office and related groups should integrate the system into their workflows to ensure consistent documentation and monitoring blood donations.
c) System Maintenance: For future developer to continuously update for the development of the system.

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DECLARATION OF NO CONFLICT OF INTEREST

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