Development of Web Application for Breastmilk Request and Donation

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Abstract: Challenges with donors, health screening process, retrieval of donor information, and managing donation schedules and inventory. This Capstone Project aims to address these gaps by developing a web-based application to support the Human Milk Bank and Lactation Support Center (HMBLSC) at J.R. Borja General Hospital. The system is a web-based application. The system chose the Agile Methodology, an SDLC that allows continuous iterations based on feedback. Laravel for the web framework, PHP language, MySQL for database management. Figma for UI design, Draw.io for diagrams, Trello as project management tool, and SUS for usability. Intended users of the system are the HMBLSC staff, breastmilk donors, mothers, and infants in need. The key features includes online health screening, donation and request scheduling, home collection with location sharing, along with inventory monitoring and tracking, validation of records, and report generations. The testing indicates the good performance is good across modules, with all of the test cases passed. The system is effective with a SUS score of 77.9(excellent), showing higher user satisfaction. The web application improves breastmilk donation and request processes, offering reliability, usability, and efficient workflow. Future enhancements include a module for admins to publish announcements, and adding sms notifications for scalability.

Keywords: Breastmilk Donation; Breastmilk Request; Health Screening; Human Milk Bank; Agile; Laravel; Web Application.

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I. INTRODUCTION

Information technology now serves as a core aspect of modern healthcare, significantly influencing the way medical care is delivered and health is managed. This shift towards digitalization is making it easier to tackle challenges in healthcare, such as access to services, patient care, and simplifying healthcare processes (Stoumpos, Kitsios, & Talias, n.d., 2023). Despite this, the common individual barriers were time requirements for breastmilk donation (BMD), personal dislike of the process, lack of knowledge, negative opinions, and lack of information (Mathias et al., 2023). The process and acquisition of breastmilk in J.R. Borja General Hospital often relied mostly on milk letting activities and lacks a structured platform to cater potential donors, making it difficult for the unit to connect with potential donors. Mothers who are unable to donate may be better supported, being able to donate could elicit feelings of pride and achievement but when mothers were not able to do

so, this denied them this opportunity and risked instead eliciting negative emotions (Brown et al., 2024). The breastmilk donation process previously relied on manual logbooks, paper-based forms, and google forms for data collection, which presented challenges such as delays and inconsistencies. Human milk bank staff face significant difficulties in tracking breastmilk supply and allocating donor history due to the reliance on manual systems such as logbooks.

This study aimed to develop a web application to facilitate breastmilk requests and donations and to address and aid challenges faced by the Human Milk Bank and Lactation Support Center (HMBLSC). Primarily, this study aims to develop a web-based application that facilitates the records of donors and recipients. It also aims to implement an inventory tracking module for monitoring both unpasteurized and pasteurized breastmilk volume, expiration, and dispensing, and to implement an appointment and scheduling

module for facilitating breastmilk donation and pasteurized breastmilk requests.

This study aims to develop a web application to facilitate breastmilk requests and donations and to address the challenges faced by the Human Milk Bank and Lactation Support Center. Particularly, the study aims to:

➢ To develop a web-based system that facilitates the records and validation of donors and recipients.
➢ To implement an inventory tracking module for monitoring pasteurized breastmilk volume, expiration, and dispensing.
➢ To integrate a scheduling and appointment to facilitate breastmilk donation (walk-in/home collection) and pasteurized breastmilk requests.
➢ To generate automated paper-based health screenings and monthly reports for donations and dispensing.
➢ To evaluate the developed system's usability and reliability through user acceptance testing and feedback.

II. REVIEW OF RELATED WORK

The review of literature supported the proposed study by identifying the gaps and presenting a fundamental foundation of the study by examining the methodologies, tools, and outcomes of each study. The selected literature, consisting of both foreign and local studies, was grouped accordingly based on user-centered approach and structured methodology. Organizing and presenting these studies based on their development methodologies provides a clearer understanding of current practices, while also highlighting patterns, gaps, and potential areas for improvement.

The core concept of our system was the development of a platform for breastmilk requests and donations, aimed at connecting potential donors and requestee with the human milk bank staff. The proposed tools include Laravel framework, MySQL, and PHP that are used to build a web application. These tools supported key functions such as user sign-up and login, submission, real-time communication and notification between users and staff, and secure donation records. However, challenges include a reliance on stable internet connections.

The adopted agile methodologies, highlighting similarities in their iterative, feedback-driven approaches. For instance, Gaspe et al. (2022), Sanchez et al. (2022), Luciano (2025), and Villanueva et al. (2022) all used Scrum or Agile methodologies for continuous improvement through regular iterations and user feedback. Similarly, Sani and Rejab (2024) emphasized the adaptability of the iterative approach for complex scopes. A shared focus among these studies is user engagement and functionality Luciano (2025) and Sanchez et al. (2022) reported high acceptability and usability, while Muri et al. (2023) stressed user-centered design to meet real-world needs. However, the platform focus differs: Gaspe et al. (2022) limited their system to web access, while others like Bossi (2020), Sani and Rejab (2024), and Muri et al. (2023) developed mobile applications with cross-platform compatibility using tools like Flutter, React Native, or native development environments.

Additionally, other systems integrated backend services like Firebase (Bossi, 2020; Villanueva et al., 2022) for real-time functionality, whereas others relied on PHP and MySQL (Luciano, 2025; Gaspe et al., 2022). While functionality and user interface were widely recognized, studies like Luciano (2025) also acknowledged areas for improvement such as performance efficiency and maintainability, and Muri et al. (2023) identified a need to enhance the application's motivational aspects.

The studies by Gonzales et al., (2024), Badieah et al., (2022), Babu et al., (2025), Nag et al., (2023), and Muhammad et al., (2020) share several similarities in their structured approaches. Each study employs a linear approach, ensuring a systematic process in building their applications. Additionally, they prioritized user-friendly and accessible interfaces, whether through web-based systems (Gonzales et al., 2024), mobile apps (Nag et al., 2023; Muhammad et al., 2020), or both (Babu et al., 2025). Many of the studies also integrated backend technologies such as PHP, Firebase, and MySQL for smooth data exchange and secure management (Badieah et al., 2022; Babu et al., 2025). However, their findings differ: while some, like Babu et al., (2025), focused on real-time inventory management and donor engagement through mobile applications, others, like Gonzales et al., (2024), emphasized trust-building features to address donor engagement. Additionally, Nag et al., (2023) and Muhammad et al., (2020) focused heavily on mobile solutions, whereas Gonzales et al., (2024) and Badieah et al., (2022) developed web-based systems with considerations for scalability and integration, highlighting varied approaches to platform and the technology being used.

The reviewed studies revealed a global effort to enhance donor engagement, particularly in healthcare sectors, blood donation, and charitable organizations. These studies utilize either user-centered approaches often based on Agile or Scrum methodologies or structured methodologies such as Waterfall. While both approaches demonstrated success, several recurring weaknesses and limitations remain evident across existing systems.

One common limitation is the restricted platform accessibility, where the system is only web-based, limiting access for users who rely on mobile devices. Additionally, although user-centered, these systems fall short in continued donor engagement and fail to integrate features that connect users to the cause. Moreover, systems built using structured methodologies lack flexibility in adapting to evolving user needs due to their linear development process, making iterative enhancements difficult once development is underway. Despite numerous advancements, gaps remain in addressing mobile accessibility, real-time feedback integration, and motivational reinforcement for donors. Many systems focus primarily on functional usability but fall short in sustaining long-term donor participation or providing adaptive feedback loops that evolve with user behavior and stakeholder requirements.

The proposed study aimed to address these gaps by developing a responsive web application for breastmilk request and donation that adapted the Agile methodology to

ensure adaptability to the needs of both human milk bank staff and end users The tools that will be used includes the Laravel framework, MySQL, PHP, HTML, and CSS, these tools ensured responsiveness, scalability, and ease of access, which are essential for users like mothers who rely on mobile devices and healthcare professionals who may operate in time-sensitive situations. This study is not a duplication of existing works, as it introduces a donation platform specifically focused on human milk bank. It aimed to address gaps identified in related studies, such as the lack of mobile accessibility, absence of donation history or statistics for

donors, and the inclusion of key features like donation expiry and tracking. Additionally, the design also prioritized a user-friendly interface, a crucial aspect highlighted by previous study. Mobile accessibility ensures ease of use and accessibility for potential donors, while language translation features expanded the system's reach to a broader, more diverse donors. Furthermore, the system included educational content based on scientific evidence, promoting awareness, trust, and engagement within the donation process and among mothers.
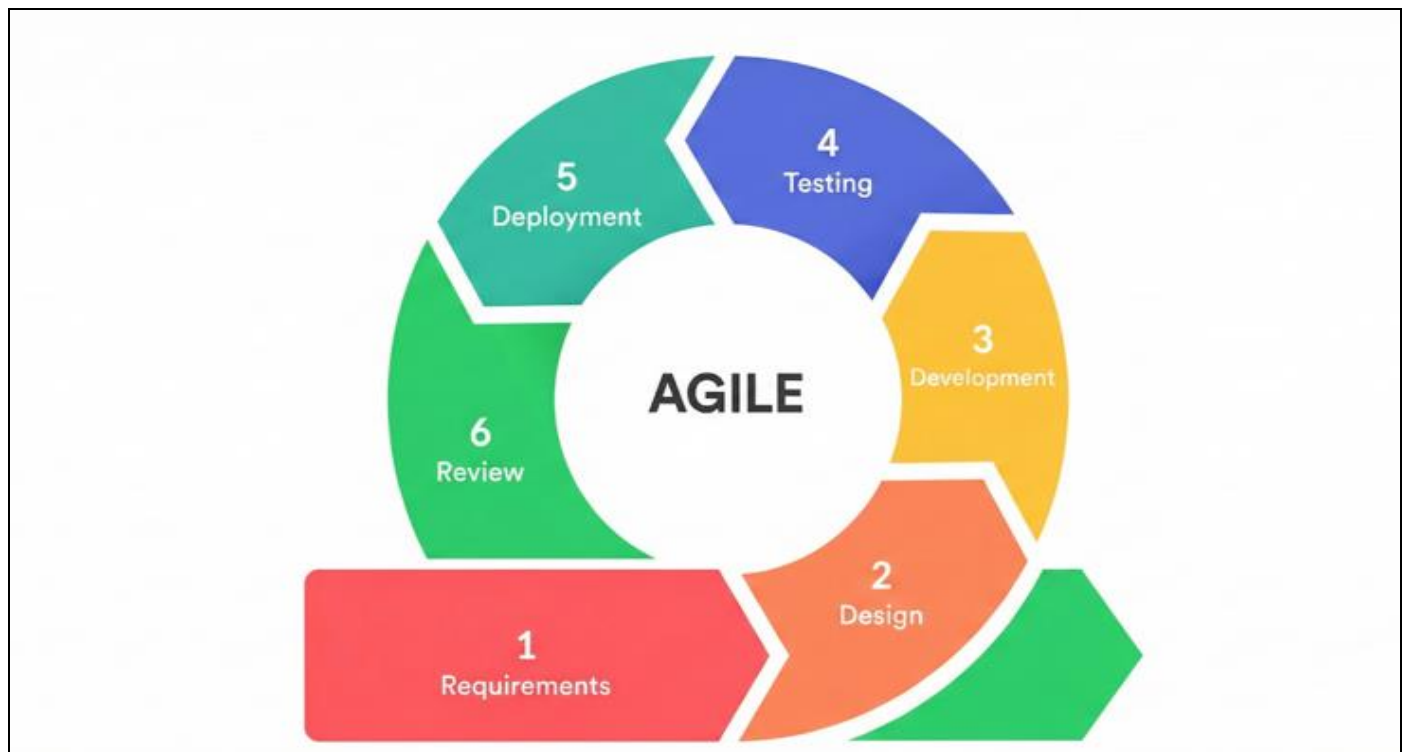
Fig 1 Agile Life Cycle Method Sanchez et al. (2022)

III. METHODOLOGY

This section presents the methodology adopted for the proposed development of web application for breastmilk request and donation. This chapter also presented the activities and tools used in each distinct phase of the methodology. The researchers utilized the use of Agile

➢ *Requirements Gathering:*

The initial phase involved identifying the challenges and workflows of the Human Milk Bank (HMB) at J.R. Borja General Hospital through interviews with staff. These sessions defined key system features such as user roles and donation processes. Trello was utilized as a project management tool to maintain a product backlog of functional and non-functional requirements.

➢ *Design:*

To begin the development process, requirements gathering was conducted through interviews using questionnaires with the Human Milk Bank staff. This step was essential for identifying challenges and workflows within the Human Milk Bank (HMB) and the overall breastmilk donation process. Insights from this activity helped define the key features of the proposed system. With

methodology. Agile supports continuous and iterative development, allowing for flexibility and adaptability to feedback throughout every stage. *Figure 1. Agile Life Cycle Method*, was adapted from the study of Sanchez et al. (2022). This model was selected for its clear and comprehensive illustration of the Agile development process.

the client's permission, mobile phones were also used to record audio during interviews to ensure accurate documentation of details.

➢ *Development:*

The system was developed using the Laravel Framework (PHP) due to its Model-View-Controller (MVC) architecture, which facilitates clean code and scalability. MySQL served as the database management system for secure storage of donor profiles and milk inventory.

➢ *Testing:*

Usability was evaluated using the System Usability Scale (SUS), a standardized assessment to gather subjective feedback on the system's efficiency and user satisfaction. Participants navigated the application, performing tasks such

as health screening submissions and inventory tracking, before completing a 5-point Likert scale questionnaire.

> *Deployment:*

The Deployment Phase involved the final preparation and release of the system for real-world use. The responsive web-based application for both the end-user and the admin will be prepared for hosting, ensuring that it will be accessible for both web and mobile browsers. Training sessions will also be conducted for all users involved. These sessions aim to familiarize both end users and administrators with the features and navigation of the web application. In addition to training sessions, user manuals will also be provided as reference guides to support users.

> *Review:*

During the Review Phase, the researchers evaluated the progress made and assessed the system's performance based on feedback and testing outcomes. This phase involved conducting a phase review to demonstrate the features that had been implemented, verify their functionality, and gather feedback from key stakeholders such as Human Milk Bank

(HMB) staff and donors. The review process included revisiting the documented requirements, test results, and deployed features to ensure that the system remained aligned with the goals set during the planning and requirements-gathering phases.

IV. RESULTS AND DISCUSSION

> *Requirements Gathering:*

The requirements gathering phase provided an insight such as the Human Milk Bank reliance on manual processes such as logbooks, questionnaires, and Google Forms. The interviews identified inefficiencies in scheduling, documentation, and monitoring, which made operations time-consuming. Concerns regarding confidentiality were also noted, emphasizing the need for secure handling of donor information. At the same time, features such as profiling, appointment scheduling, and educational materials. These findings provided the necessary inputs for defining the functional requirements of the system and served as the basis for its design and development.
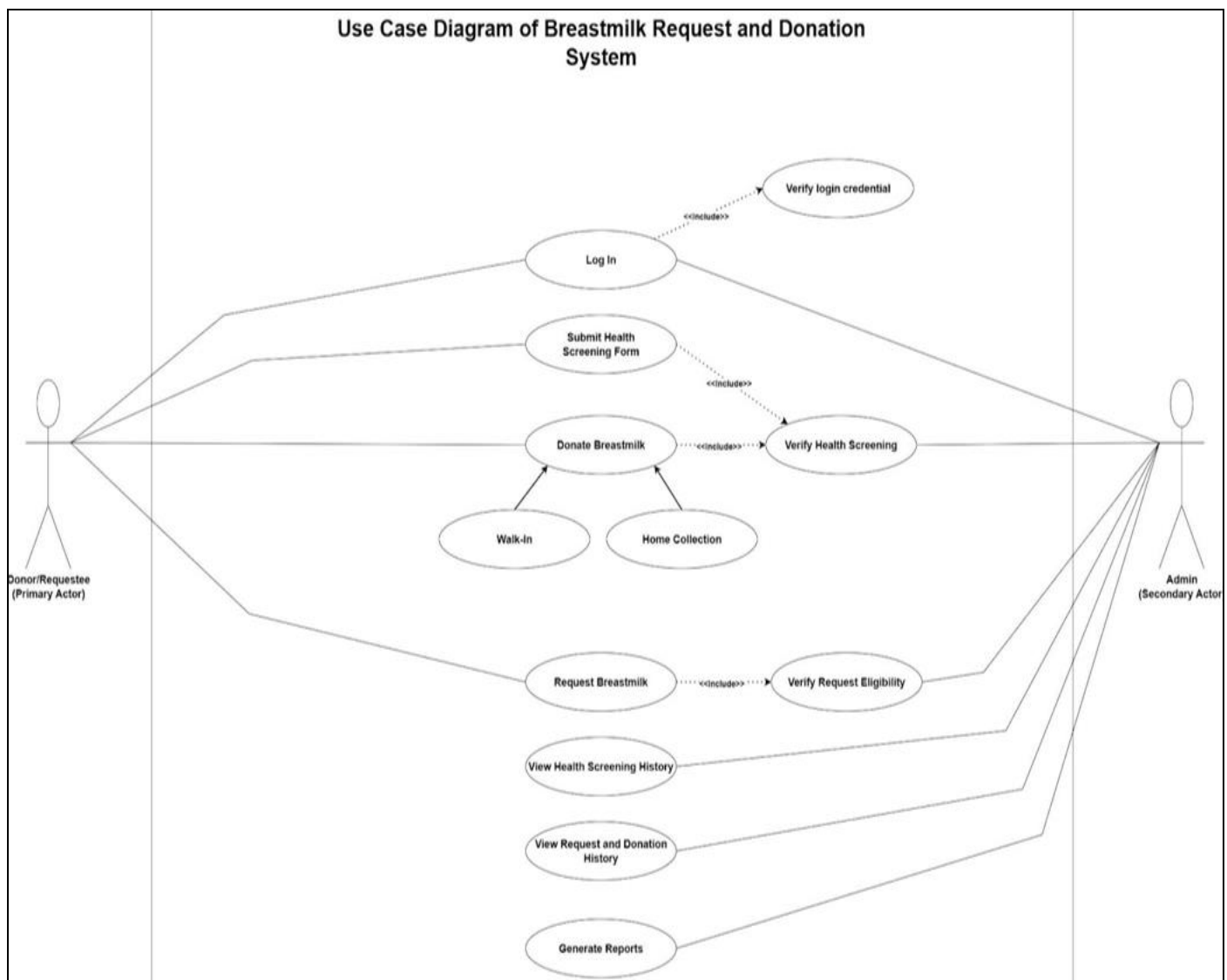
> *Design:*

Fig 2 Use Case Diagram of the Breastmilk Request and Donation

In figure 2 shows the Use Case Diagram for the web application of Breastmilk Request and Donation System. In order to create, Draw.io was the tool used to create the diagram, this diagram illustrates the interactions of the two different users, the donor/requestee which is the primary actor and the admin which is the secondary actor. It defines the system and the specific core actions and the role being performed.

➤ *Development:*

The results of this phase will show the developed web-based application for breastmilk request and donation. This section shows the system's key admin staff interface.

Fig 3 Health Screening Page

In figure 3, this page shows the list of Health Screenings for the admin staff. This lists all the screening forms that have been submitted by the donors with its designated tabs either pending, accepted, or declined. Where staff can review who is eligible to donate breastmilk. The table displays the name of the donor, contact number, the date and time the form was submitted, and the date and time it was accepted.

A view button for each record is also provided in case the admin needs to check the details again. This keeps the list of all accepted screenings organized, easy to follow, and well documented for safe and smooth monitoring. Also, a print empty form button can also be clicked if the admin staff wants to print an empty form.

Fig 4 Donation Page

In figure 4, this page shows the pending donation section under the Breastmilk Donation. This lists all donation entries that still require action from the admin, showing records of the donor's name, donation type, contact number, address, date of donation, and total volume provided. There is also a drop-down button for All Donation and action buttons like Schedule for home collection or validate for walk in donors.

An Assist Walk in Donation button will enable the admin to note down quickly from those donors who come directly to the facility. This allows clear visibility for the admin to organize upcoming pickups, confirm walk-in donations, assist on-the-spot entries, and manage all pending donations in an easy manner.

Fig 5 Breastmilk Request Page

In figure 5, this page shows the Pending Requests section under the Breastmilk Request. It lists all breastmilk requests that are still in need of action by the admin. Each record lists the guardian's name, the infant's name, the contact number, the date and time the request was submitted, and the scheduled date for pickup. It also has a view button for each entry so the admin may check the details and decide on further action. At the top, the admin can toggle between Pending, Dispensed, and Declined requests, use the search bar to find a particular request, or click the Assist Walk in Request button to record information from guardians who come directly to the facility. This page helps the admin keep track of all pending requests in a clear and organized way.

➤ *Testing:*

The main objective of the functional testing is to confirm whether the developed web application meets the needs of the end users, works as expected, and to determine the ease of use. Each of the system's modules such as health screening, walk-in donation, home collection donation, inventory monitoring, and report generation was evaluated to determine whether it works based on the documentation and requirements. 28 of test cases were prepared by the researchers for the end users, which are the human milk bank staff and selected mothers, who will serve as the key evaluators in determining the intended functions work properly.

Table 1 Final SUS Score Computation

	System Usability Scale (SUS) Questionnaire							
		P1	**P2**	**P3**	**P4**	**P5**	**P6**	Total
1.	I think that I would like to use this system frequently	4	3	4	4	4	4	
2.	I found the system unnecessarily complex	2	2	3	4	4	4	
3.	I thought the system was easy to use	3	2	4	3	3	3	
4.	I think that I would need support of a technical person to be able to use this system	3	1	2	3	3	3	
5.	I found the various functions in this system were all integrated	4	3	4	3	3	3	
6.	I thought there was too much inconsistency in this system	2	2	3	3	4	4	
7.	I would imagine that most people would learn to use this system very quickly	3	2	3	3	4	4	
8.	I found the system very cumbersome to use	3	1	3	3	4	4	
9.	I felt very confident using the system	3	2	3	4	4	4	
10.	I needed to learn a lot of things before I could get going with this system	2	1	2	4	4	4	
Total		29	19	31	34	37	37	
Total		72.5	47.5	77.5	85	92.5	92.5	467.5
AVERAGE		77.9						

The table 1 shows the final SUS score for the system, calculated using the data from Table 19.0. Specifically, we took each participant's total score, multiplied it by 2.5, and obtained an average score of 77.9, placing the system in the "excellent" category. The participants generally gave high scores, which suggests that the system's design and functionality are conducive to effective performance in real-world scenarios.

V. CONCLUSION

Reflecting upon the study's initial objectives outlined in the study's objectives were all achieved. Particularly encompassed the implementation of the key modules, specifically: the donor eligibility, tracking and monitoring of the donation history, inventory monitoring and management, scheduling, the inclusion of FAQs and short nutritional guidance for mothers, and the successful evaluation of the usability of the system based on the user feedbacks, with the average computed score of 77.9 which can be interpreted as excellent and steps in the acceptable zone. The results imply that with the ease of use and navigation in the system can support the study's objectives of supporting infant health outcomes. By means of making it easier for donors and staff to connect, showing why innovation matters.

The results of the study show that the system improves the existing manual process of the Human Milk Bank by providing a faster and more organized way of managing donors, requests, inventory, and scheduling. This allows staff to process donations and requests more quickly, generate reports anytime, and avoid lost or duplicate records. It improves their workflow and makes the service more efficient for mothers, infants, and the human milk bank staff.

➢ *Recommendations*

Based on the study's conclusion after the testing, several notable recommendations can be proposed to further enhance the system's usability, seamless functionality of the system and for the sake of the future development of the system.

- Integrate an SMS notifications for immediate updates on donation and request statuses and updates.
- Develop a Progressive Web App (PWA) to ensure functionality will maintain in areas with slow internet connectivity or mobile data.
- Incorporate a module to track or reserve a 10% emergency breastmilk allocation for disaster response.
- Add an admin announcement module to push articles and announcements from the admin side.
- Add a donor ID tagging for record retrieval and unique donor identifier.

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