

Evaluating the Efficacy of Incentives in Enhancing Voluntary Blood Donation: A Behavioral and Operational Approach in Bangladesh

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A thesis submitted to the Department of Computer Science and Engineering
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Declaration

It is hereby declared that

1. The thesis submitted is our own original work while completing degree at Brac University.
2. The thesis does not contain material previously published or written by a third party, except where this is appropriately cited through full and accurate referencing.
3. The thesis does not contain material which has been accepted, or submitted, for any other degree or diploma at a university or other institution.
4. We have acknowledged all main sources of help.

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Abstract

Blood donation is a vital component of public health, yet many regions, including Bangladesh, face challenges with insufficient voluntary donations due to various practical and motivational barriers. This thesis investigates a hybrid model that retains the humanitarian essence of donation while introducing strategic incentives, such as transportation reimbursements and potential e-commerce benefits, to overcome logistical and financial deterrents. To validate this framework, the study involved the development of a functional mobile application, *Shebok*, designed to transparently manage these rewards and streamline the donor-recipient matching process. The research further explores the operational efficiency of requiring donors to submit recent donation history, aiming to reduce the time spent on health screenings and ease the burden on medical staff. Based on qualitative data gathered from ($N = 53$) participants (50 general users and 3 institutional stakeholders) via semi-structured interviews, findings confirm that non-monetary incentives are an effective mechanism to significantly increase donor motivation without compromising ethical standards. Ultimately, this research outlines a sustainable, donor-friendly system that balances humanitarian values with practical incentives to improve the overall effectiveness of blood donation programs in Bangladesh.

Keywords: Blood donation, Incentive, Ethics, Altruism, Healthcare, Screening.

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Chapter 1

Introduction

1.1 Background

Blood transfusion is an indispensable component of modern healthcare, playing a critical role in saving lives during surgeries, trauma care, and the management of chronic diseases such as thalassemia and cancer. As there is no artificial substitute for human blood, healthcare systems rely entirely on the generosity of human donors. The World Health Organization (WHO) advocates for 100% Voluntary Non-Remunerated Blood Donation (VNRBD) as the safest and most sustainable method of blood collection, as it significantly reduces the risk of transfusion-transmissible infections compared to paid or replacement donation systems [16].

However, ensuring a consistent and safe blood supply remains a formidable challenge for many developing nations. In Bangladesh, the blood donation landscape is characterized by a fragmented system that relies heavily on family replacement donors and, alarmingly, paid donors [24]. While voluntary donation movements exist, they are often sporadic and insufficient to meet the national demand. Consequently, when a medical emergency arises, the burden falls upon the patient’s relatives to secure blood immediately. This leads to high-stress situations and a reliance on unregulated blood brokers. This dependency on replacement and paid donation not only compromises blood safety but also creates significant operational inefficiencies within hospitals.

The hesitation to donate voluntarily in Bangladesh is often driven by a complex mix of fear, misconceptions, logistical barriers, and a lack of trust in the healthcare infrastructure [22], [38]. Potential donors are frequently deterred by the inconvenience of the process or the fear of health complications. To address these behavioral barriers, there is growing global interest in the use of incentives, ranging from non-monetary tokens of appreciation to health screenings, combined with digital interventions. Modern mobile technologies offer a pathway to streamline the donation process, improve donor convenience, and transparently manage rewards. Exploring how these incentive-based models can be adapted to the socio-economic and cultural context of Bangladesh is essential for transitioning from a crisis-driven replacement system to a sustainable, voluntary one.

1.2 Problem Statement

Bangladesh currently faces a dire shortage of blood, with only around 31% of donations originating from voluntary donors, while an annual shortage of 25% exists between what is required and what is collected [24]. This shortage imperils lives, especially in emergencies such as traffic accidents, surgeries, and maternal health crises [22], [36]. Compounding matters further, the country continues to struggle with a reliance on replacement and paid donations, which raises severe concerns regarding safety and sustainability [16], [37]. Numerous public hospitals struggle with restricted blood storage and delayed screenings, and the unregulated use of blood brokers exacerbates problems by frequently compromising the quality of supplied blood [22]. One of the biggest challenges in Bangladesh is the inadequate infrastructure despite numerous medical facilities, where lack of knowledge of the procedure and social taboos present major obstacles [34], [39]. The blood supply system will continue falling short of fulfilling needs if no actions are taken. This analysis seeks to introduce a hybrid incentive model capable of overcoming these barriers and providing non-monetary incentives, such as transportation reimbursements and health screenings, aiming to render the blood donation process more accessible, sustainable, and safe [11], [25].

1.3 Rationale of the Study or Motivation

While voluntary blood donations in Bangladesh have historically relied upon humanitarian goodwill to meet transfusion needs, persistent shortfalls necessitate novel solutions. Logistical hurdles, time constraints, and the lack of direct compensation continue restricting participation despite people’s life-saving dependency on donations. Research affirms that introducing carefully crafted incentives maintaining altruism’s spirit can elevate donation rates Flanagan, (2019) [28]. Digital platforms and strategic, non-financial inducements have shown promise elsewhere in health-care. For instance, as explored by Li et al. (2023) [35], reward-based phone applications effectively engaged younger donors through discounts and loyalty points. However, integrating such modern approaches within Bangladesh’s traditional donation system warrants deeper investigation. This study aims to explore whether a hybrid model fusing practical, non-monetary incentives with operational streamlining can augment donation volumes and reduce delays throughout the nation’s transfusion services.

1.4 Research Questions

To address the challenges outlined above and evaluate the proposed solution, this study seeks to answer the following research questions:

- **RQ1:** What are the primary barriers preventing the transition to voluntary blood donation in Bangladesh?
- **RQ2:** To what extent do non-monetary incentives influence the willingness of donors to participate in blood donation programs?

- **RQ3:** How can a digital platform be designed to effectively streamline donor-recipient matching while mitigating fraudulent activities and ensuring operational security?
- **RQ4:** What is the perceived efficacy of a "hybrid model" combining digital accessibility with structured incentives in improving donor retention rates?

1.5 Methodology in Brief

The research follows a systematic, multi-phase approach as illustrated in the study's procedural flow figure. It begins with an Exploratory Phase, where a comprehensive literature review from both local and global scenarios are conducted to understand the current landscape. This will establish the rhetorical foundation. In the next phase, semi structured interview among participants are conducted to identify specific barriers to donation and validate the appeal of non-monetary incentives. These findings will further enhance the understanding of a solution design, which utilizes an agile lifecycle to design high-fidelity prototypes and build a functional "Hybrid Model" mobile application. Finally, the Evaluation Phase validates the system through System Usability Scale(SUS) and behavioral analysis, assessing whether the proposed digital-incentive framework effectively enhances the user's willingness to donate compared to traditional manual processes.

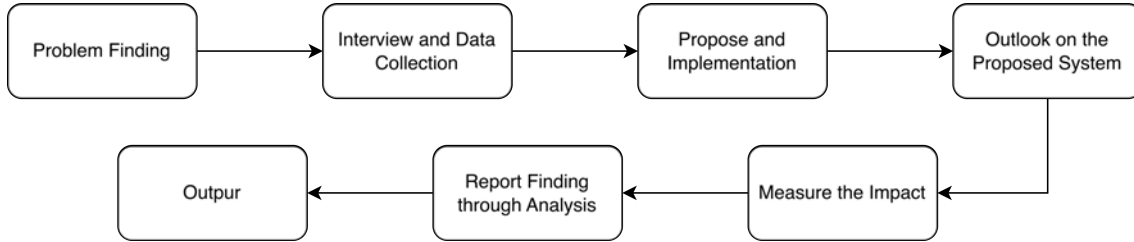


Figure 1.1: Probable workflow

1.6 Scopes and Challenges

This study aims to explore the challenges and opportunities surrounding blood donation in Bangladesh. Despite having access to donation centers, healthcare services, and technology, making the process of donating blood is still not relatively straightforward. People still face significant barriers such as limited awareness, inadequate infrastructure, and risk of fraudulent activities, all of which make blood donation much harder. One of the key challenges in this research is addressing the resistance to financial incentives, as some may feel that monetary rewards could undermine the voluntary nature of blood donation. To mitigate this, the study will emphasize non-monetary incentives, such as offering transportation assistance and health checkups, to make the donation process more accessible without compromising its altruistic foundation. Additionally, the study will address cultural barriers, health issues and misconceptions, where people may not have full information or may hold concerns rooted in social norms. Finally, implementing a nationwide solution will require overcoming grand challenges, including improving technological infrastructure

and fostering better coordination between health authorities. While these obstacles are significant, they also present a valuable opportunity to create a more inclusive, effective, and sustainable blood donation system across Bangladesh.

Chapter 2

Literature Review

This chapter reviews previous studies and research relevant to blood donation and incentive systems. The goal is to examine what has already been accomplished in this field, identify what still needs to be addressed, and understand the limitations or gaps in current research. By doing so, we aim to build a strong academic foundation for our study. We begin by exploring core concepts to clarify the key terms and processes involved. We then look into literature from both global sources and the specific context of Bangladesh to identify where current systems may be falling short and where new solutions are required.

2.1 Preliminaries

Blood Donation

Blood donation refers to the voluntary act of giving blood for medical purposes, such as transfusions for patients undergoing surgery or those suffering from trauma. Individuals with chronic medical conditions like anemia also receive donated blood. There are two broad categories for donations. Voluntary donations have people provide blood without expecting compensation in return, driven purely by goodwill and humanity [42]. Replacement donations are given to replace blood needed by a friend or family member going through a medical crisis. Voluntary donations are seen as the ethical form, as they are motivated by altruism and involve no financial transactions of any kind [40]. Sustainably meeting the ongoing need for blood relies on individuals voluntarily rolling up their sleeves out of care, concern, and compassion for those in their community who may require it [22].

Screening Time

Screening time refers to the duration required to assess a potential donor's health and suitability to donate blood. This includes reviewing their medical history, conducting a physical exam, and testing for conditions such as anemia or infections (e.g., HIV, Hepatitis) [42]. Reducing screening time is a significant operational goal in blood donation systems to improve efficiency and reduce waiting times for donors. Operational improvements, such as pre-screening via recent blood reports or leveraging digital tools, are explored in this study as potential methods to streamline the process [27].

Incentive-Based Behavior

Incentive-based behavior refers to the use of rewards or benefits to encourage individuals to perform certain actions, in this case, donating blood. Incentives can be monetary (e.g., financial rewards) or non-monetary (e.g., recognition, health screenings, or time off from work) [25]. While monetary incentives have been shown to increase short-term blood donations, non-monetary incentives are more ethically aligned with voluntary donation systems, as they do not undermine the altruistic motivations for blood donation [28]. Research has shown that well-designed incentives can increase both donor participation and retention, particularly when they are framed within the context of altruism and social responsibility [33].

Mobile Apps/Softwares for Blood Donation

Mobile applications and digital systems have increasingly helped blood donation programs, facilitating easier access to information. These tools work to improve involvement and streamline the process [32]. Apps like "Blood Hero" are intended to log donation history, deliver reminders, and provide incentive-based rewards to motivate repeated donations [35]. Additionally, some services provide instant updates on local blood needs and allow users to find nearby donation centers. By using motivational systems, mobile apps aim to attract younger, technically-skilled donors and involve them for the long haul, addressing a major hurdle to blood donation. This examination explores utilizing digital platforms in Bangladesh to gauge feasibility and influence on boosting voluntary blood donations, determining if such programs could aid the nation's ability to meet medical needs through the generosity of citizens.

2.2 Review of Existing Research

Existing research on blood donation spans across behavioral psychology, public health, and human-computer interaction. This section critically reviews these works to identify the intersection between donor motivation and operational efficiency. The literature is segmented to first understand the underlying reasons behind donor behavior by focusing on intrinsic versus extrinsic motivations. It then moves to an examination of technological solutions and gamification strategies. Finally, by reviewing studies specific to Bangladesh, this review highlights the contextual gaps that necessitate a localized and incentive-based digital intervention.

2.2.1 Psychosocial Barriers and Intrinsic Motivations

Monteiro et al. (2024) [40] provide an integrative review examining the barriers and motivations surrounding blood donation. The study focuses on both donors' perspectives and the role of health professionals in improving donor retention. Altruism was identified as the primary motivation for voluntary donations, with people wanting to save lives. However, fears, lack of time, and misinformation deter potential donors, according to the findings. The review highlighted the critical function of education and clear communication in overcoming apprehensions and misconceptions about the process. Furthermore, attitudes of health professionals and the level of care provided significantly impact donor loyalty and willingness to return. The study also emphasized the value of strategic campaigns and utilizing social media platforms to enhance donor involvement and awareness.

This study by Yusof et al. (2025) [43] investigates the psychosocial factors influencing blood donation during the COVID-19 pandemic in Malaysia. The research highlights a significant reduction in blood supply, mainly due to movement restrictions and public fear of infection. The study identifies key themes: reduced donation rates, intrinsic motivation for donating blood, trends in blood donation, and challenges faced by one-off, occasional, and non-donors. The findings reveal that intrinsic motives, such as empathy and the desire to help others, were more prominent during the pandemic, although fear of infection and logistical barriers, such as movement restrictions and work commitments, discouraged donation. The study proposes strategies such as creating a centralized blood donor database and offering innovative donation facilities to address these challenges.

Mohammed and Essel (2018) [26] explored the motivators and barriers influencing first time and repeat blood donors at Tamale Teaching Hospital in northern Ghana. Their research revealed that the primary motivator was a benevolent desire to help others in need, particularly friends and family, as cited by the vast majority of donors. Additionally, the investigation determined that positive attitudes from staff played a pivotal role according to 83.4% of the participants. However, barriers such as impolite behavior from staff (63.7%), anxieties about privacy during screening (54.6%), and fears that blood could be commercially sold (50.9%) proved to be considerable deterrents. Novice donors tended to be more dissuaded by issues of confidentiality and worries over profiteering than repeat contributors. The findings propose that tackling these impediments through civic education and enhancing staff’s interactions with donors could help bolster recruitment and retention.

2.2.2 Efficacy and Ethics of Incentive Models

Machado (2018) [29] analyzes the impact of an indirect monetary benefit, namely the waiver of user fees in Portugal’s public healthcare system, on voluntary blood donation behavior. The results show that a one euro increase in the waived fee leads to a 1.8% increase in donations per 10,000 inhabitants. These effects are primarily driven by repeat donors, with little to no increase in new donor participation. Following the removal of the benefit in 2012, the donation rates dropped by an estimated 18%. In response, the Portuguese Blood Institute increased the number of blood drives by more than 20%, leading to substantial increases in overtime compensation for physicians and nurses, ultimately increasing operational costs and reducing efficiency. This study provides strong empirical evidence that indirect monetary incentives can enhance repeat blood donation, but highlights the limitations regarding long-term behavioral responses.

Chell et al. (2017) [25] conducted a systematic review to investigate the effectiveness of monetary and nonmonetary incentives in blood donation. They found mixed results, with some studies suggesting that incentives like vouchers, tickets, and paid time off work were effective in improving donor retention. However, other studies indicated that cash incentives might negatively affect blood donation rates, with some donors in countries with voluntary systems reporting that they would stop donating if offered monetary rewards (Lacetera et al., 2010). Moreover, the review underscored worries regarding blood safety, noting that while motivators like vouchers and gifts exhibited no unfavorable impacts on blood safety, pecuniary rewards could attract higher-risk donors who might conceal critical health information. In

conclusion, Chell et al. (2017) [25] stresses that incentives have the capability to enhance donor recruitment, but necessitates policies that balance effective recruitment with the ethical considerations of voluntary donation systems.

Graf et al. (2021) [33] examine the role of social norms in explaining the inconsistent effects of incentives on prosocial behavior, specifically blood donation. Drawing on information from a review directed in 28 European nations, the creators discover that money related benefits are contrarily related with blood donation, yet this impact is attenuated by social standards. In nations where perspectives supporting monetary rewards are more positive, motivators expanded commitment rates. Then again, time rewards are decidedly associated with blood donation when the social standards encompassing them are positive. What’s more, the investigation demonstrates that intrinsic inspiration decidedly affects the probability of giving, proposing that unselfish reasons for contributing are more grounded drivers than outside prizes. The discoveries highlight the job of social setting in shaping how motivators influence prosocial behavior.

Flanagan (2019) [28] studies the incentivization and ethical dilemmas surrounding blood donation prompting complex discussion on upholding voluntary, non-remunerated donation(VNRD). He argues that while blood services must maintain an adequate donor pool to meet demands, they must ensure donation’s altruistic essence remains. Flanagan highlights the Nuffield Council on Bioethics’ (2014) [17] ”Intervention Ladder” for assessing incentive types. This model categorizes altruism-focused interventions like information or recognition as ethically acceptable, viewing pecuniary incentives cautiously as they can undermine donation’s voluntary nature. He also supports the findings of Ferguson et al. (2012) [18], who argue altruism remains the primary motivator for most blood donors. Non-monetary incentives like time off work or recognition are found more effective than financial rewards, especially for first-time or younger donors.

2.2.3 Digital Interventions and Gamification in Healthcare

Li et al.(2023) [35] shows a group developed a system called “Blood Hero” with a reward based gaming feature aiming to increase the number of blood donations. Besides, another group developed an app which could successfully acknowledge 80% of its users who had zero knowledge about the blood donation process. The research results show that 73% of people who joined the survey showed willingness to use mobile apps for blood donations. Throughout this research observation, we see that people are comfortable to use mobile apps and if we want to increase the number of blood donations, reward based features will play a vital role. Li et al.(2023) [35] states, “most of the time, when a patient requires a blood donation, the donor is typically a patient’s friend or a family member”.

Smartphone Donation Assistant (MDA), a context-aware smartphone application that uses GPS, NFC, and real-time notifications to expedite blood donation procedures in Malaysia, is presented by Sugijarto et al, (2018) [27]. By digitizing donor records and automating incentive monitoring systems while also providing location-specific warnings, the app aims to address impactful inefficiencies. To boost donor participation and loyalty over time, key features involve geofenced campaign alerts, a rewards-based incentive program, and NFC-tagged donation milestones. Notably, when considering non-financial motivators, donors expressed a strong interest in

health updates including screening results. The study underscores how integrated digital tools can alleviate administrative burdens and enhance the donor experience, recommending that applications benefit from adopting context-sensitive reminders and incentives.

Batis and Albarrak (2021) [32] conducted a mixed-methods study in Riyadh, Saudi Arabia, to find out what donors and medical professionals thought about the features and functionality of smartphone apps for blood donation. The most well-liked app features included locating nearby donation sites on maps (67.8%), asking for donors in an emergency scenario (70.8%), and receiving notifications about blood drives or shortages (52.2%). Nonetheless, donors additionally expressed substantive issues: 65.8% have been anxious about acquiring an excessive amount of notifications, and 67.3% feared their private data being misapplied. The study determined that to optimize healthcare efficiency and donor involvement, successful blood donation apps must ensure data privacy and clear communication.

Al Yami et al. (2020) [31] evaluates the effectiveness of various blood donation recruitment strategies. The authors found that targeted digital advertising led to a 20% increase in donations, primarily attracting first-time donors. Social media campaigns resulted in a 15% increase, while community outreach and email reminders led to 10% and 7% increases, respectively. Digital strategies were more effective for recruiting new donors, while traditional methods were better at retaining repeat donors. The study highlights the importance of using a mix of both digital and traditional methods to maximize donation rates, though noting that digital advertising had the highest cost per donation.

2.2.4 The Bangladeshi Context: Knowledge, Attitudes, and Infrastructure

Akhter et al. (2016) [22] investigate the barriers to timely and safe blood transfusion for patients suffering from postpartum hemorrhage (PPH) in Bangladesh. The research highlights two critical issues: the frequent shortage of available blood and the dependency on unregulated blood brokers to supply blood in emergencies. The authors stress that patients' family members are often unaware of the necessity to arrange a donor ahead of hospitalization, contributing to delays in obtaining transfusions. Consequently, blood is commonly sourced from outside blood banks, leaving patients at the mercy of uncertified blood brokers. While fulfilling an important role, these brokers introduce significant risks as the blood may avoid screening and regulation. The study determines that technological advances like the Blood Information Management Application (BIMA) could potentially improve transfusion processes but actions must reduce reliance on uncertified brokers while guaranteeing collected blood's safe handling and management.

Easmin et al. (2024) [38] studied interventions to enhance voluntary blood donation. A part of the study was held in Dhaka University in Bangladesh where 82% of the participants had a positive impression towards blood donation and a significant number like 92% of respondents showed negative attitude towards paid blood donation. Physical harm and fear are the common reasons for not donating blood among non-donors. They state that in order to increase blood donation rates, successful community mobilization sessions are crucial when paired with media campaigns and reminder systems. Their complex strategy emphasizes how crucial ongoing commu-

nity involvement is to donor recruiting. These studies demonstrate how localized, participatory interventions can successfully dispel myths and encourage donations. Khan et al.'s (2024) [39] cross-sectional survey of over 500 Khulna city residents illuminates the public's understanding, views, and donation habits concerning voluntary blood donation in Bangladesh. While over 93% expressed approval of donation, only 68% demonstrated comprehension and around 65% had donated before, highlighting a major difference between positive perspectives and real participation. Higher education strongly correlated with better comprehension. Significantly, learning of donation through social media made locals more likely to grasp it, look upon it favorably, and actually donate - underscoring platforms' role. The study concludes stressing the need for targeted digital campaigns to bridge the chasm between exposure and action, especially for younger, less educated groups.

Nahid Salma (2021) [34] studied the attitudes of Jahangirnagar University students in Bangladesh on blood donation. According to the study, the majority of the students who participated in the survey were male (80.39%), and slightly more than half (50.74%) had donated blood. The majority of students (67%) stated that they contributed to save lives, while another 28% responded that it was their social duty. The largest obstacles for those who hadn't donated were lack of time (14%), followed by health concerns (71%). Although 43.14% of donors still endorsed the notion, the study did not find a significant correlation between receiving token gifts as incentives and the decision to donate. These findings are consistent with recent research that suggests that in order to better attract and keep contributors, contemporary, tech-based solutions such as web or app platforms with reward systems are necessary.

2.3 Summary of Key Findings

The literature review reveals many interesting findings. Most of the studies focus on the barriers and motivation behind voluntary blood donation. The reviews highlight numerous financial, logistical, and operational barriers that hinder the collection of sufficient blood. While most donors reported fear of contracting disease and fear of needles, lack of time and misinformation are the most common barriers reported by potential donors. Lack of clear information from health professionals exacerbates these fears. Monteiro et al. (2024) [40] mentions that providing clear information through public health professionals and public campaigns can help reduce these barriers and improve donor engagement.

As cited by most papers, altruism is the major reason behind blood donation. The desire to help others and contribute to saving lives aligns with humanitarian interests. This intrinsic motivation is crucial to promote voluntary donations as donors are not expecting something in return for their help. While the humanitarian aspect drives the most, studies suggest that incentives, both monetary and non-monetary, can also positively influence donation rates. Non-monetary incentives such as recognition, health screenings, or time off work were found to be effective in encouraging repeat donations without compromising the altruistic nature of blood donation [25], [28]. These findings support the idea that incentives can be integrated into the process. Another study by Chell et al. (2017) [25] provides us with the different side of the coin. While incentives can influence the donation rate, they can possibly raise concerns such as donors hiding critical health information for the sake of financial gains.

Another important aspect discussed in the literature is the role of digital tools to enhance blood donation efforts. Several studies here discussed the effectiveness of digital health platforms to engage with the donors. Apps like “Blood Hero” from the study of Li et al. (2023) [35] show that initiatives like this have been able to successfully engage users offering reward-based features that incentivize blood donation. These platforms have been particularly effective in attracting younger populations and first-time donors, thus improving the reach of donation programs. While digital solutions show promise, integrating such technologies in regions like Bangladesh presents challenges regarding infrastructure and access. In addition, operational issues merit scrutiny. Studies show operational inefficiencies compromise timely blood availability. Delays in screening and off-site storage pose serious problems. Akhter et al. (2016) [22] highlighted that public hospitals in Bangladesh face delays due to deficient storage and unregulated blood brokers. Though brokers address pressing needs urgently, they jeopardize blood safety in the process. The integration of new technologies and optimization of traditional operations both warrant attention to strengthen this life-saving resource where it is sorely needed.

The literature also highlights the importance of the attitudes of health professionals and their role in donor retention. Positive interactions between health professionals and donors can significantly influence the likelihood of repeat donations. However, poor treatment or lack of proper guidance during the donation process can lead to a decrease in donor loyalty [40]. These findings emphasize the need for better training and support for healthcare staff involved in blood donation programs to ensure a positive donor experience and to encourage ongoing participation. Furthermore, social norms and cultural beliefs significantly influence both the willingness to donate blood and the effectiveness of donation campaigns. Graf et al. (2021) [33] demonstrated how social norms, particularly the cultural context of a country, can affect the success of incentive-based donation strategies.

Despite various researches being conducted on blood donation globally, Bangladesh clearly lacks research on these models. Many international studies have explored different models combining incentives, digital tools like mobile applications, and operational improvements, yet the application of such models remains unexplored in Bangladesh. Bangladesh, like many other countries in the South Asian region, relies heavily on traditional practices. There is limited research on the impact of modern technologies and incentive-based models in the country. Furthermore, while the literature identifies key barriers such as fear and lack of time, there is insufficient focus on how these barriers are perceived and addressed within the Bangladeshi context. The lack of on-site blood storage and the heavy reliance on paid donations remain pressing concerns that are specific to Bangladesh and require further investigation. To capture and understand these themes better, an overview of the most noteworthy findings from the studies is presented in Table 2.1. Upon review of these results, it appears that incentive approaches have been effective in terms of increasing participation, especially for new and lapsed donors. Yet, as pointed out by Flanagan (2019) [28] and Chell et al. (2017) [25], the ethics of monetary rewards are still a cause for concern as they could potentially compromise the altruistic spirit of donating blood. Simultaneously, operational challenges such as delays in screening and absence of stored donations on-site continue to impede donation rates (Akhter et al., 2016 [22]; Easmin et al., 2024 [38]). The literature implies that digital tools like “Blood Hero” can address these issues and attract younger donors (Li et al., 2023

[35]; Batis and Albarrak, 2021 [32]). Given that social norms and cultures constitute key dimensions in the formation of donation attitudes (Graf et al., 2021 [33]), we can infer that incentive-based models must be adapted to local realities. Looking at the rows of the table, a key observation is that there is little research about the specific logistical and cultural challenges of Bangladesh. Further investigation is therefore necessary to study models hybridizing practical incentives and operational measures; such models will help to overcome those barriers and lead to the development of a safe, consistent supply of blood within the Bangladeshi healthcare system.

Finding	Summary	Referenced
Barriers to Blood Donation	Key barriers include logistical, financial, and operational issues such as transportation costs, time constraints, lack of blood storage, and safety concerns with paid donations.	Monteiro et al. [40], Yusof et al. [43], Akhter et al. [22]
Motivational Factors for Donors	Altruism is the primary motivator, with many donors expressing a desire to help others. Non-monetary incentives (e.g., recognition, health checks) are more ethically aligned with voluntary donation.	Flanagan [28], Mohammed & Essel [26], Monteiro et al. [40]
Impact of Incentives	Both monetary and non-monetary incentives can boost donation rates, particularly for new or infrequent donors. However, monetary incentives could undermine altruistic motivations.	Chell et al. [25], Machado [29], Flanagan [28], Li et al. [35]
Role of Digital Tools	Mobile applications and digital platforms like "Blood Hero" show promise in engaging younger donors, offering rewards, reminders, and easy access to donation information.	Li et al. [35], Batis & Albarak [32], Easmin et al. [38]
Operational Challenges	Operational inefficiencies, such as delays in screening and the absence of on-site storage, exacerbate blood shortages. Digital solutions and strategic incentives can improve efficiency.	Akhter et al. [22], Easmin et al. [38], Graf et al. [33]
Cultural and Social Norms	Social norms play a significant role in blood donation behavior, and incentives may be more effective in regions with supportive social norms.	Graf et al. [33], Flanagan [28], Monteiro et al. [40]
Ethical Considerations	Incentives must be carefully balanced with ethical concerns to avoid undermining the voluntary nature of blood donation. Non-financial incentives are more aligned with ethical standards.	Flanagan [28], Chell et al. [25], Graf et al. [33]
Effectiveness of Community Outreach	Community events and public campaigns significantly improve donor engagement and knowledge, particularly in rural or underserved areas.	Easmin et al. [38], Khan et al. [39], Salma [34]
Knowledge Gap in Bangladesh	While international models of incentivized blood donation have shown promise, Bangladesh lacks sufficient research on applying such models in the local context.	Easmin et al. [38], Khan et al. [39], Akhter et al. [22]

Table 2.1: Summary of Key Findings and References

Chapter 3

Methodology

This chapter outlines the research methodology employed to investigate voluntary blood donation in Bangladesh, with the primary objective of bridging the gap between donor intention and the actual act of donating. Adopting a Human-Centered Design (HCD) approach grounded in established HCI principles [9], [19], the study utilizes a dual-perspective framework. It examines both the behavioral drivers of general users and the operational challenges faced by medical institutions to build the *Shebok* verified donation platform.

The research is methodologically segmented into three sequential phases: a formative mixed-method inquiry, an iterative design and development phase, and a summative evaluation. The complete methodological framework and the flow of information between these phases are illustrated in **Figure 3.1**. While this chapter details the procedural framework and instruments used, the resulting empirical findings and system specifications are cross-referenced to their respective chapters.

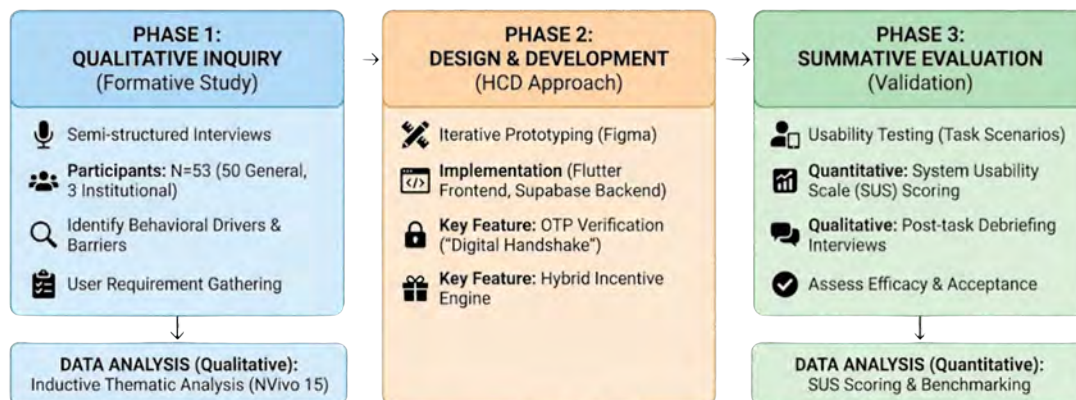


Figure 3.1: Overview of the Research Methodology and Phased Approach

3.1 Phase 1: Qualitative study (Semi structured Interview)

The first phase centered on a formative inquiry designed to empirically validate the research questions regarding donor retention. To move beyond theoretical assump-

tions and understand why high donor intent does not translate into action, the study was structured around three key methodological components.

Sampling Strategy: We employed purposive sampling [15] to recruit a diverse cohort of **53 participants** ($N = 50$ general users, $N = 3$ institutional stakeholders). The group was stratified to include both active donors and non-donors, capturing a full spectrum of motivators ranging from frequent altruism to fear-based hesitation.

Data Collection Instrument: The primary tool was the *semi-structured interview* [21], selected for its flexibility. This method allowed for the collection of rich, contextual narratives regarding trust deficits and social anxieties, while simultaneously capturing essential quantitative baseline data such as demographic distributions and trust metrics.

Instrument Validation: Prior to the main study, a pilot study was conducted with a small cohort ($N = 5$). This served to refine the interview guide and ensure the clarity of sensitive questions before wider deployment, adhering to best practices in qualitative inquiry [20].

For a detailed presentation of the participant demographics, quantitative baselines, and the thematic analysis derived from this phase, please refer to Chapter 4.

3.2 Phase 2: Design and Development of Proposed Platform

Drawing on the behavioral insights derived from Phase 1, the second phase focused on the technical realization of the *Shebok* platform. The qualitative data guided the translation of psychological needs, specifically trust and recognition, into concrete functional requirements.

Conceptual Framework: The design was grounded in Donald Norman’s Seven Stages of Action model [8], prioritizing high-contrast visuals for emergency accessibility and clear system feedback loops to reduce cognitive load [5].

Technology Stack: The system was built using a robust cross-platform architecture, utilizing **Flutter** for the frontend (ensuring Android/iOS accessibility) and **Supabase** for the backend (managing real-time authentication and data security) [12].

Functional Modules: The development culminated in three core engines: the *Discovery Engine* for filtering requests, the *Verification Loop* for ensuring physical validation of donations, and the *Incentive Engine* for managing ethical rewards.

The complete system architecture, UI/UX design specifications, and implementation details resulting from this phase are documented in Chapter 5.

3.3 Phase 3: Evaluation of Proposed Platform

The final phase was a summative evaluation aimed at validating the system’s efficacy. To verify whether the ”Digital Handshake” and incentive model actually improved user confidence compared to traditional methods, we employed a mixed-method evaluation strategy.

Quantitative Metric (SUS): A subset of the original cohort was re-engaged to test the functional prototype. The **System Usability Scale (SUS)** [4] was ad-

ministered to provide a standardized quantitative metric of the system’s learnability and ease of use.

Qualitative Feedback (Post-SUS): Immediately following the survey, **Post-SUS Interviews** were conducted. These sessions gathered feedback on specific features, ensuring that the quantitative scores were contextualized by user sentiment regarding trust and security [2].

The empirical results of this evaluation, including the calculated SUS scores and user feedback on the incentive mechanism, are analyzed in Chapter 6.

3.4 Data Analysis Protocol

To ensure rigorous findings, distinct analysis protocols were applied to the data gathered across the phases. The analysis was divided into two distinct categories:

3.4.1 Quantitative Analysis

Quantitative data gathered from the Phase 1 demographic survey and the Phase 3 usability testing was analyzed using standard statistical methods [14].

- **Descriptive Statistics (Phase 1):** Frequency distribution and percentage analysis were used to establish baseline user concerns, such as the specific percentage of users who fear social media fraud.
- **Inferential Scoring (Phase 3):** Responses were converted to the standard 0-100 SUS scale using the alternating odd-even scoring logic [13]. The Mean and Standard Deviation were calculated to determine the overall usability percentile and consistency of the user experience.

3.4.2 Qualitative Analysis

Conversely, the textual data from the semi-structured interviews and Post-SUS feedback was analyzed using a systematic, inductive approach supported by **NVivo 15** software [41].

- **Coding Strategy:** The process began with a dual-logging protocol combining digital audio recordings for verbatim accuracy and manual field notes for contextual nuance [30]. An open coding strategy was employed to generate initial tags from the transcripts, which were then clustered to identify recurring themes like *“Technical Anxiety”* following the thematic analysis framework by Braun and Clarke [10].
- **Consensus Validation:** To mitigate subjective bias, a dual-coder strategy was used where two researchers coded the dataset independently. Any discrepancies in code application were resolved through discussion until 100% consensus was reached [23].

3.5 Ethical Considerations

Strict ethical protocols were observed throughout the study, encompassing both the interview and evaluation phases. Explicit **informed consent** was obtained from all participants prior to data collection, with a clear explanation of the study’s purpose and their right to withdraw at any stage without penalty. To protect privacy, all Personally Identifiable Information (PII) was anonymized in the transcripts. During the Phase 3 prototype testing, dummy data was utilized to ensure that no real contact information was exposed or stored. All audio recordings, digital logs, and analysis files were stored in encrypted environments accessible strictly to the primary research team for academic purposes only.

Chapter 4

Phase 1: Qualitative study (Semi structured Interview)

This chapter details the key findings from the first phase of the study. We analyzed data from 53 participants to understand the real-world challenges of voluntary blood donation in Bangladesh. The discussion starts with a breakdown of participant demographics, followed by statistical insights into user trust and the acceptance of incentives. The core of the chapter focuses on the recurring themes found in the semi-structured interviews, identifying exactly what motivates people to donate and what holds them back. Finally, we incorporate feedback from hospital administrators and stakeholders to assess the practical feasibility of the solution. These insights directly guided the design and development of the *Shebok* platform.

4.1 Participant Recruitment and Demographics

We employed purposive sampling to recruit a diverse cohort of 50 general participants ($N = 50$) and 3 institutional stakeholders ($N = 3$) for a combined qualitative and quantitative analysis. The sampling strategy was designed to capture a wide spectrum of socio-economic profiles and operational perspectives:

- **Age and Gender Composition:** As detailed in Table 4.1, the cohort was predominantly young adults, with 62% of participants aged 18–24. The gender distribution skewed towards males (82%), reflecting the current demographic reality of voluntary blood donation in Bangladesh where social barriers often limit female participation.
- **Donor Experience Ratio:** To ensure balanced insights, the study recruited 29 donors (58%) and 21 non-donors (42%). This near-even split allowed us to contrast the *retention factors* of existing donors against the *entry barriers* faced by non-donors.
- **Professional Domain:** As illustrated in Figure 4.1, the sample includes a mix of students and educators (27), general/corporate employees (11), technology professionals (6), health professionals (3) and others (3). This diversity validates that the proposed mobile solution caters to both tech-savvy youth and time-constrained working professionals.

Age Range	Count (N)	Percentage (%)	Male	Female
18–24	31	62%	27	4
25–34	14	28%	11	3
35–44	2	4%	1	1
45+	3	6%	2	1
Total	50	100%	41	9

Table 4.1: Demographic Distribution of Study Participants by Age and Gender ($N = 50$)

Experience	Count(N)	Percentage (%)
Donor	29	58%
Non-donor	21	42%
Total	50	100%

Table 4.2: Donor vs Non-Donor ($N = 50$)

4.2 Key Themes and Behavioral Insights from General Participants

This section presents the analysis of the interview data. Through an iterative coding process, we identified six primary themes illustrating the behavioral patterns, motivations, and barriers associated with blood donation. These themes have been further classified into sub-themes to provide a granular understanding of the participant responses. Table 4.3 summarizes the frequency of references for each sub-theme identified during the analysis and Figure 4.2 visualizes the themes and sub-themes explored. Figure 4.3 visualizes codes compared by number of coding references.

4.2.1 Barriers to Donation

This theme delineates the multifaceted impediments that deter individuals from participating in blood donation. We coded the responses into categories reflecting physical, psychological, and systemic obstacles.

The analysis reveals that potential donors are often restrained by **Misconceptions** regarding their physiological well-being. For instance, participant P9 highlighted a prevalent physiological fallacy, noting:

“They think, there will be shortage of blood in their body.”

Furthermore, we identified specific **Personal or Health Issues** as tangible constraints. Participant P27 expressed their cause for non-participation stating that:

“I have been advised against donating due to specific allergy-related health concerns”

This qualitative finding aligns with our quantitative data regarding gender-specific barriers. Out of the nine female participants, four (44%) reported weakness-related

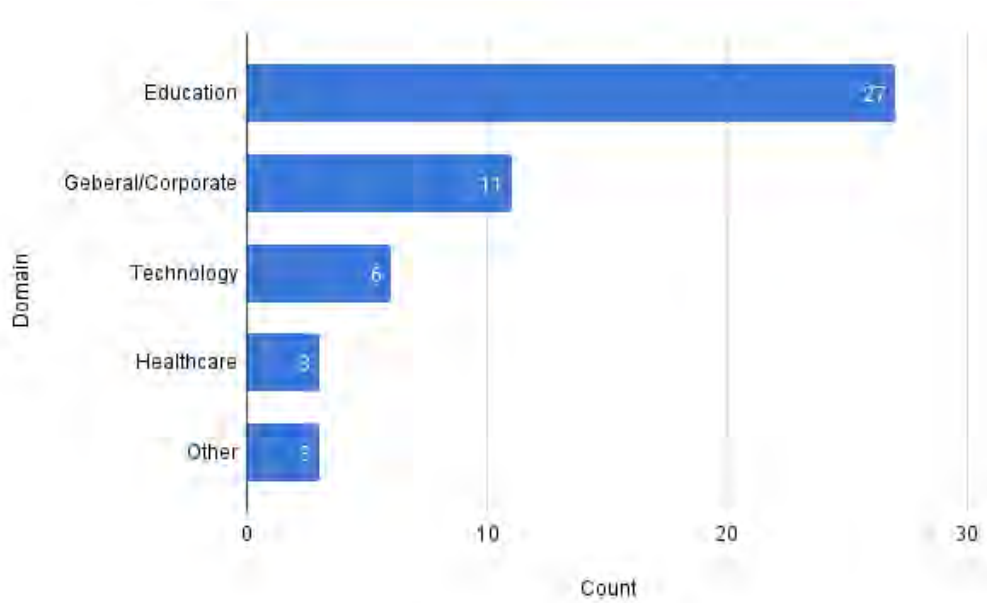


Figure 4.1: Occupation Domain Diversity

Sub-Theme	Reference Count
Incentive Acceptance	30
Technical Anxiety	29
Psychological Barriers	28
Systematic or Environmental	27
Civic Responsibility	24
Cognitive Reframing	24
Personal or Health Issue	20
Environmental Assurance	19
Intrinsic Altruism	19
Social Distrust	15
Personal Choice	12
Misconceptions	10
Psycho-Social Gratification	10
Incentive Resistance	9
Reciprocal and Peer Influence	9
No Particular Reason (Barrier)	2
No Particular Purpose (Motivation)	2

Table 4.3: Frequency of Identified Sub-Themes in Participant Interviews

issues or having “low hemoglobin/thin blood” as a primary reason for not donating, suggesting a need for targeted health screenings.

Beyond physical health, **Psychological Barriers** significantly impact decision-making. Participant P7 candidly admitted to a:

“Fear of needles.”

External factors also play a critical role; **Systemic or Environmental** issues within

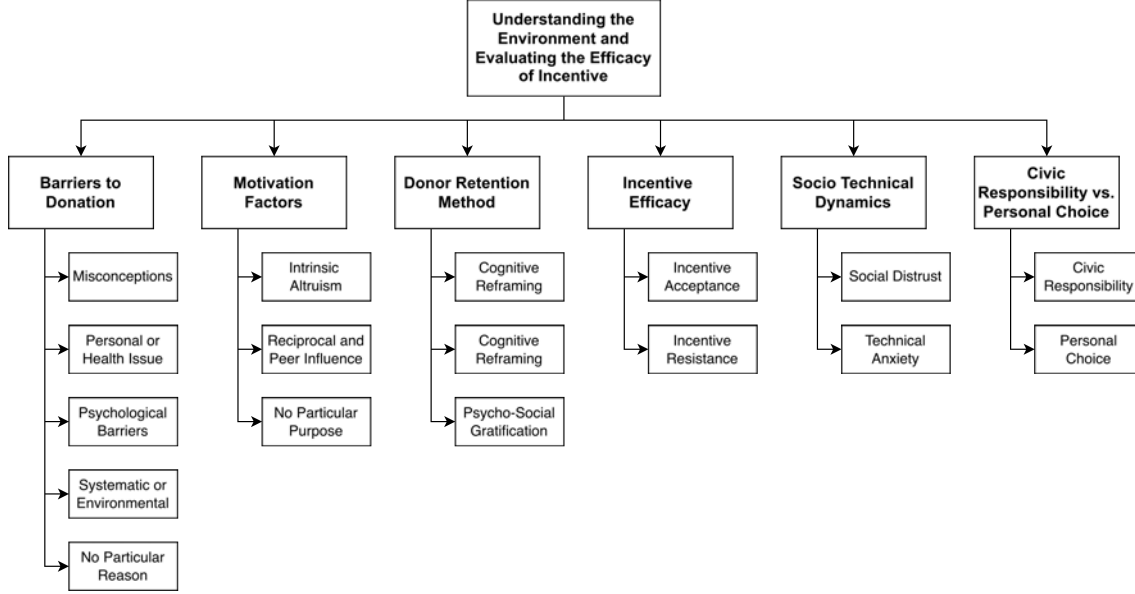


Figure 4.2: Theme Tree

healthcare facilities serve as strong deterrents. Participant P50 criticized the infrastructure, stating:

“Poor hygiene in hospital environment and rude staff are the key barriers.”

The impact of these systemic issues is further evidenced by the quantitative findings, where only 10% ($N = 5$) of participants reported ever purchasing blood from a blood bank, with three of them expressing extreme dissatisfaction due to high pricing and poor service quality.

Finally, some attrition is attributed to **No Particular Reason** other than a lack of prioritization, as P3 remarked:

“I was not available whenever opportunities were there”

Based on the coding frequency, **Psychological Barriers** emerged as the dominant sub-theme with 28 references, followed closely by **Systematic or Environmental** barriers with 27 references highlighting the fact that while psychological fears exist, inadequate infrastructure prevents many from coming forward despite goodwill.

4.2.2 Motivation Factors

This theme examines the underlying drivers that compel individuals to engage in the donation process. We coded the responses into intrinsic, social, and routine-based motivators.

A primary driver identified is **Intrinsic Altruism**, where the decision to donate stems from an internal moral imperative. Participant P4 described this sensation as a natural:

“Urge to help someone in need.”

Social dynamics also influence behavior; the sub-theme of **Reciprocal and Peer Influence** highlights the role of community and family. Participant P37 acknowledged this external influence, citing:

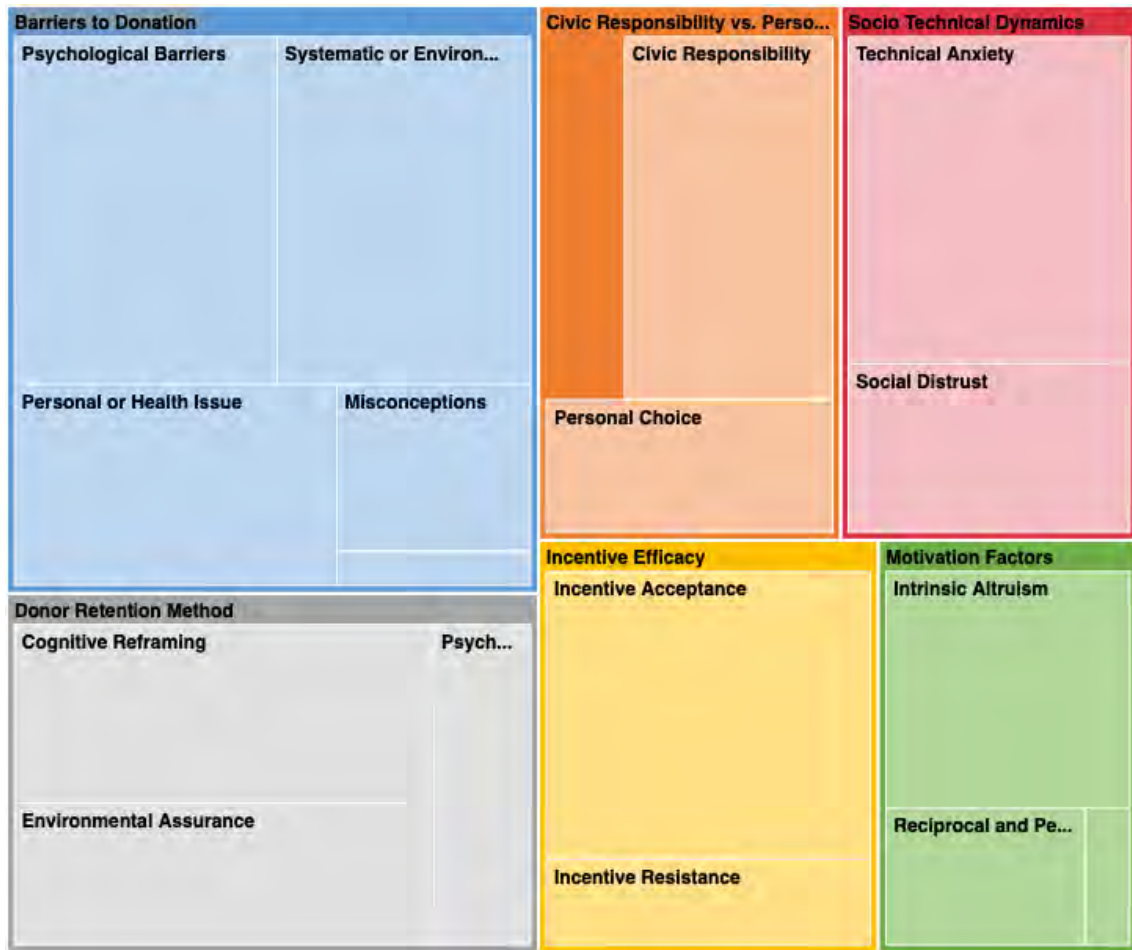


Figure 4.3: Code reference count comparison

“Family motivation.”

Conversely, for long-term donors, the act often evolves into a habit with **No Particular Purpose** other than the routine itself. This was exemplified by P11, who stated simply:

“I just donate.”

The data indicates that **Intrinsic Altruism** was the most recurrent sub-theme, accounting for 19 references, suggesting that internal moral drivers are stronger than external peer influences (9 references).

4.2.3 Donor Retention Method

This theme focuses on the strategies and conditions necessary to sustain donor engagement over time. We coded responses that emphasized the need for supportive environments, education, and psychological rewards.

The findings suggest that **Environmental Assurance** is a prerequisite for retention. Participants expressed a need for comfort and safety, with P50 suggesting the necessity of a:

“Healthy environment and trained staff.”

To ensure continued participation, **Cognitive Reframing** through educational initiatives appears essential. Participant P32 proposed the implementation of:

“Awareness campaigns.”

Additionally, **Psycho-Social Gratification** emerged as a vital component for long-term commitment. Participant P43 emphasized the human need for validation, mentioning the importance of:

“Appreciation from organizations.”

Among the retention strategies, **Cognitive Reframing** was the dominant sub-theme with 24 references, highlighting the critical role of continued education and awareness in maintaining donor interest.

4.2.4 Incentive Efficacy

This theme evaluates the effectiveness and ethical implications of offering rewards to boost donation rates. We coded responses into categories of acceptance and ethical resistance.

There is a notable degree of **Incentive Acceptance** among participants who view rewards as a functional tool. Participant P2 argued that the introduction of incentives:

“will increase the donors motivation.”

This potential is strongly supported by the quantitative data. As illustrated in Figure 4.4, 76% of participants ($N = 38$) explicitly mentioned that the inclusion of incentives would increase their willingness to donate, suggesting that a reward mechanism acts as a significant “nudge” for the majority.

As found in the analysis shown in Table 4.4, the most widely accepted incentive would be health related ones.

Incentive Type	Mentions
Health Checkups & Services	29
Food & Refreshments	16
Transportation Support	14
Recognition & Certificates	6
Monetary Rewards	4
Coupons & Discounts	4
Priority Blood Access	1

Table 4.4: Most Meaningful Incentives for Blood Donation

However, the analysis also uncovers significant **Incentive Resistance**, driven by concerns that monetization might corrupt the altruistic nature of the act. Participant P47 warned of the potential for exploitation and commodification, stating:

“People will start a business around this.”

The coding analysis reveals a strong preference for rewards, with **Incentive Acceptance** being the dominant sub-theme (30 references) compared to **Incentive Resistance** (9 references).

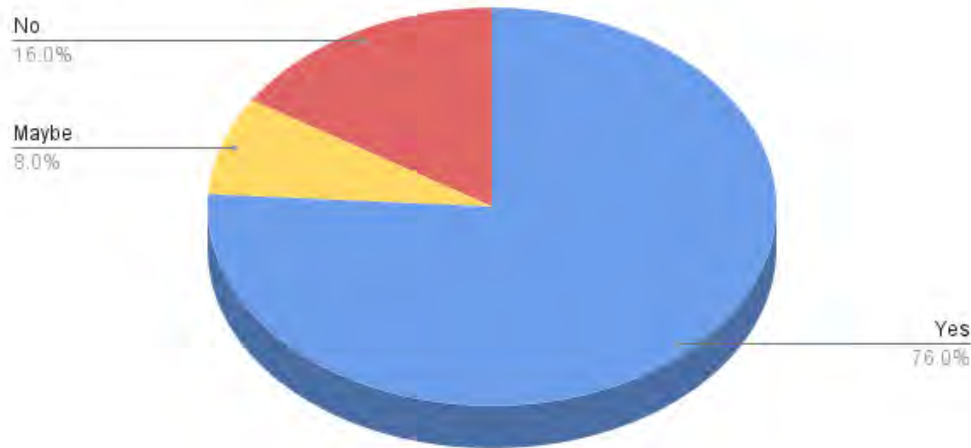


Figure 4.4: Incentive Acceptance

4.2.5 Socio-Technical Dynamics

This theme explores user perceptions regarding the integration of mobile technology in the blood donation ecosystem. We coded responses reflecting skepticism towards digital platforms and concerns over data security.

The data indicates a high level of **Social Distrust**, largely stemming from the prevalence of online fraud. Participant P7 expressed cynicism based on prior observations of:

“Scammers from social media, selling people’s blood.”

These concerns are well-founded in the quantitative results, which show that 36% of participants ($N = 18$) have encountered fraud related to blood donation. Consequently, 56% reported they do not trust social media requests blindly (Figure 4.5), and alarming findings of blood adulteration and crisis exploitation further exacerbate these risks.

This skepticism extends to **Technical Anxiety** regarding the governance of new platforms. Participant P22 articulated a clear concern regarding information security:

“I worry about data privacy, the misuse of personal information, and the app’s credibility.”

In this category, **Technical Anxiety** was the most prevalent concern, appearing in 29 references, significantly outpacing general **Social Distrust** (15 references).

4.2.6 Civic Responsibility vs. Personal Choice

The final theme addresses the philosophical tension between societal obligation and individual autonomy. We coded responses that balanced the collective need for blood supply against the right to bodily integrity.

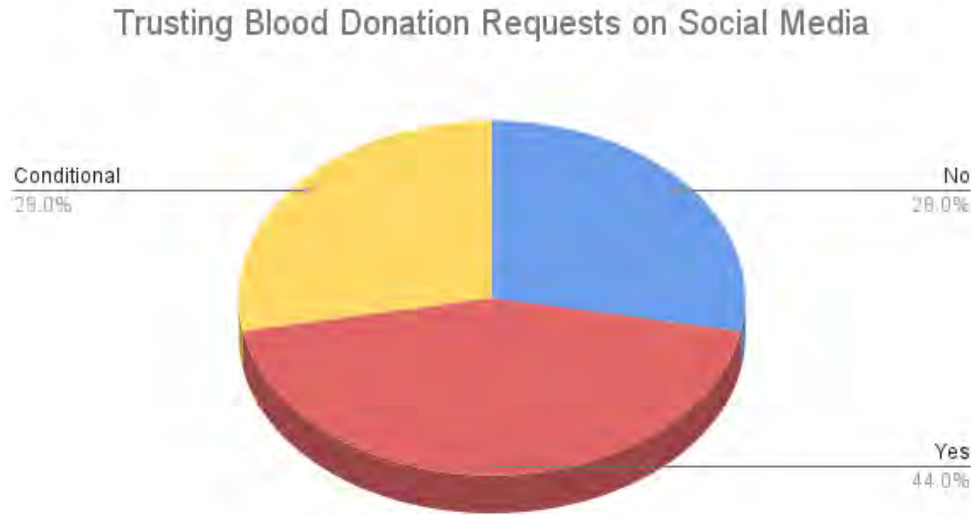


Figure 4.5: Trust in Social Media

On one side of the spectrum, participants expressed a strong sense of **Civic Responsibility**. Participant P46 argued for a collective approach to security, asserting:

“Everyone should come forward for themselves.”

Conversely, the sub-theme of **Personal Choice** highlights the perspective that health decisions must remain under the individual’s control. Participant P37 summarized this stance by emphasizing bodily autonomy:

“Since it involves own body, it should be personal choice.”

The sense of duty appears stronger among participants, with **Civic Responsibility** emerging as the dominant sub-theme (24 references) compared to **Personal Choice** (12 references). This dominance is mirrored in the quantitative data (Figure 4.6), where 56% ($N = 28$) viewed donation primarily as a Civic Responsibility, while only 24% ($N = 12$) viewed it as strictly a Personal Choice.

4.3 Institutional Perspectives

To assess the operational feasibility of the proposed system, interviews were conducted with healthcare related professionals and voluntary organization leaders. The analysis of these professional insights resulted in three major themes: *Operational Modernization*, *Institutional Sustainability*, and *Ethical Jurisprudence*.

4.3.1 Operational Modernization

The first theme addresses the shift from traditional blood procurement to digital frameworks. Diagnostic center managers noted that existing methods are losing effectiveness in a digitalized landscape. For instance, I1 observed that: “In the era of globalization and smartphones, traditional methods like loudspeaker announcements

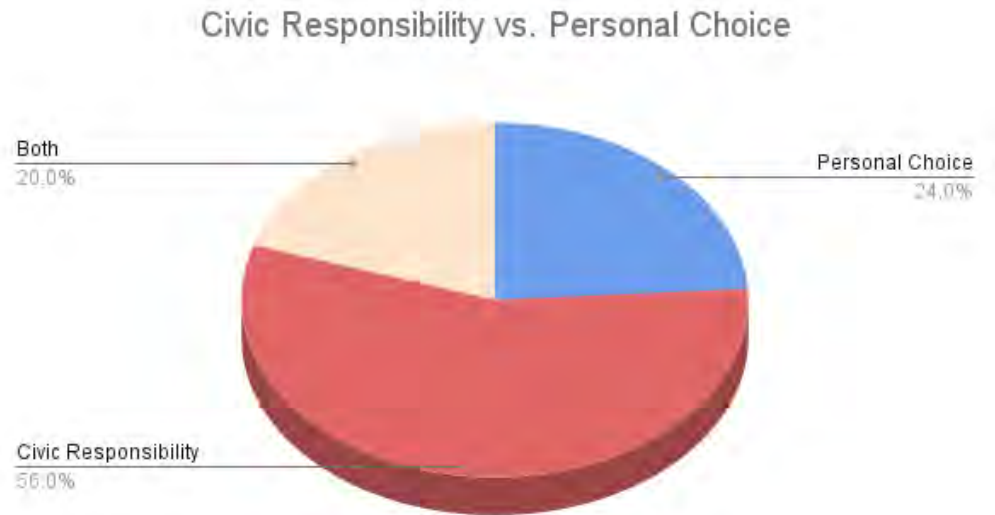


Figure 4.6: Social Perspective

are ineffective.” This theme highlights that a central digital portal is viewed as a practical solution to current distributed sourcing gaps, with I1 further noting that: “A central online portal would stop people from aimlessly searching streets for blood.”

4.3.2 Institutional Sustainability and Policy Guardrails

The second theme focuses on the conditions under which healthcare providers would accept a point-based system. While there is interest in offering discounts in exchange for donation points, institutions prioritize financial stability. I2 emphasized the necessity of balanced policies: “If point usage results in financial loss, it cannot be accepted. Both parties’ interests must be considered during policy making.” This indicates that for private healthcare providers, the system’s feasibility is contingent upon guidelines that prevent institutional loss while offering patient benefits.

4.3.3 Ethical Jurisprudence and Legal Risks

The final theme, *Ethical Jurisprudence*, emerged specifically from the perspective of non-profit voluntary organizations. This theme identifies concerns regarding the potential for reward systems to be misinterpreted or misused within the existing legal framework of Bangladesh. I3, a representative from Sandhani, highlighted the legal risks associated with blood transactions: “Buying/selling blood is punishable by 2 years in prison in Bangladesh. This system could become a medium for trading blood for money, raising ethical issues.”

4.3.4 Feasibility and Potential to Increase Donation

Despite the ethical cautions raised by voluntary groups, the stakeholders generally agreed on the system’s potential to improve donor engagement. All interviewed

stakeholders (100%) expressed that an organized structure would likely improve public reliability. As I2 noted, a structured system has the potential to: “build trust and make life easier, increasing interest” in voluntary donation. This suggests that while ethical safeguards are required, the operational benefits are recognized across different institutional types.

Chapter 5

Phase 2: Design and Development of Proposed Platform

This chapter details the system architecture of “Shebok,” translating the sociotechnical requirements into a functional digital environment. The design strategy prioritizes the mitigation of high-friction user behaviors specifically “technical anxiety” and “trust deficits” by adhering to Human-Centered Design (HCD) principles [9]. The theoretical foundation of the interface is governed by Donald Norman’s **Seven Stages of Action** model [8]. Given the high-stakes nature of blood donation, the design explicitly targets the two primary cognitive gaps defined by Norman: the *Gulf of Execution* (the gap between intent and action) and the *Gulf of Evaluation* (the gap between action and verification).

The qualitative insights gathered from the user study were directly translated into engineering guidelines. This section bridges the gap between the identified user needs and the technical specifications of the proposed system.

5.1 Addressing the Trust Deficit

Finding: Users expressed significant anxiety regarding “Social Media Scams” (P03, P08) and questioned the legitimacy of blood requests.

Design Implication: The system cannot rely on open posting. It requires a **Trust Architecture** that verifies both ends of the transaction:

- **Institutional Verification:** Blood banks and hospitals must have proper institutional profile.
- **OTP Proof of Donation:** To prevent false claims, points are not awarded automatically. The validation process requires physical proximity:
 1. The authorized personnel requests for a unique One-Time Password (OTP) upon donors arrival. Donor will provide the OTP from his phone.
 2. The authorized personnel at the transfusion center must input this OTP into the organization’s side to confirm the donation.

This “digital handshake” ensures that points are only generated when a verified donor interacts with a verified medical entity, effectively neutralizing the risk of exploitation.

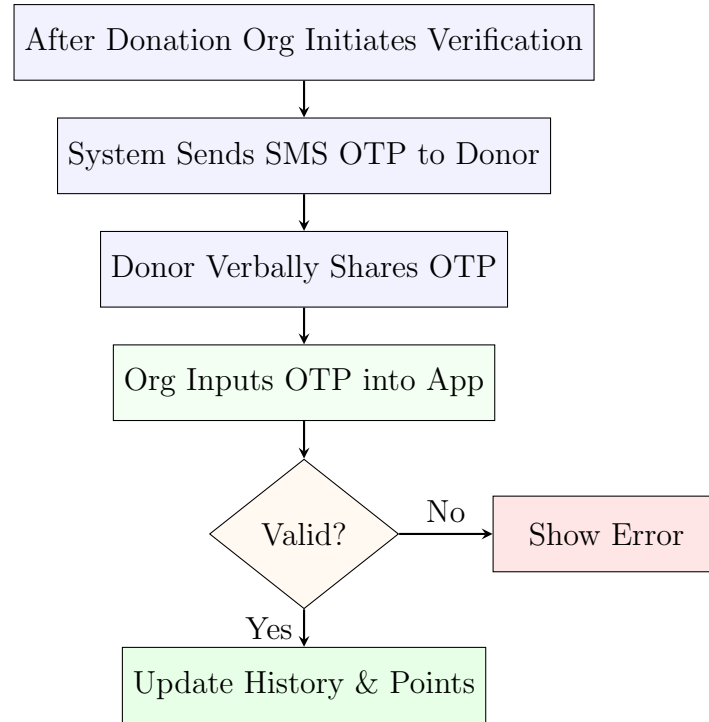


Figure 5.1: The OTP "Digital Handshake" Workflow. This process ensures points are only awarded when a donor is physically present at a verified organization.

5.2 Mitigating Technical Anxiety: Privacy by Default

Finding: The high frequency of the *Technical Anxiety* code (29 references) and participants' widespread concern regarding "data misuse" indicate that privacy is a major barrier to entry.

Design Implication: The application must adopt rigorous security protocols. Beyond basic encryption, strict server-side logic must be implemented to establish inviolable logical boundaries.

- **Data Privacy and Integrity:** Personal contact details must be masked by default; donors' phone numbers should never be publicly visible on the feed. The backend architecture assumes full responsibility for data encryption and service uptime, ensuring user trust is not compromised by technical failures.
- **Automated Eligibility Enforcement:** To prevent health risks and exploitation, a read-only donation history is presented on the donor interface, clearly displaying the last donation date and the countdown to the next eligible date. The system rigorously enforces a lockout period (e.g., 90 days). The organization also conducts a verification before transfusion by previewing donor history. Since donation records are immutable and verified solely by organizations, this logic effectively eliminates the risk of frequent, unsafe donations or falsified history.

5.3 Translating User Needs into Interface Design

The specific requirements of the system were derived directly from the sociotechnical friction points identified. To bridge the gap between user needs and system architecture, the design process categorized these needs into Functional Requirements (core system capabilities) and Non-Functional Requirements (attributes such as usability and trust).

To ensure every design choice serves a specific research goal, the development process utilized a “Problem-Solution Translation Matrix,” mapping the qualitative feedback directly to the implemented solutions (Table 5.1).

Identified Problem	HCI Requirement	Implemented Solution
“Scammers from social media, selling people’s blood”	Process Integrity: System must ensure the transfusion mechanism is secure despite open requests.	Verified Transfusion Handling: While requests are open to ensure accessibility, the final verification is restricted to registered, verified organizations to maintain trust.
“Previous donation information should be a must have for me”	Visibility of System Status: Users need a persistent record of their actions.	Digital Donor History: A permanent, unalterable log of all past donations is available in the user profile.
“I feel that valuable recognition and rewards are key”	Extrinsic Motivation: Actions must be met with tangible value.	Redeemable Reward System: A points-based economy where engagement translates to redeemable incentives.

Table 5.1: The Requirements Translation Matrix. This table maps the specific friction points identified in the qualitative study to the interface solutions implemented in the developed system.

5.3.1 Functional Requirements

The functional requirements define the specific actions the system performs to automate tracking and distribution tasks.

- **Automated Eligibility Tracking:** To facilitate easy tracking of donor availability, the system calculates eligibility automatically based on the user’s last donation date. The Home Dashboard features a dedicated widget that explicitly displays the “Next Eligible Donation” date. This removes the need for manual calculation, ensuring users know exactly when they can donate again [5].

- **Immutable History Management:** The system implements a “Donation History” module that serves as a digital ledger. This function allows users to view a chronological list of their altruistic activities. This history is updated automatically upon successful verification by an organization and provides the specific proof of donation requested by users.
- **Incentive and Reward Distribution:** To operationalize extrinsic motivation, the system includes a functional Points Engine. Upon the completion of a verified donation loop as illustrated in Figure 5.2, the system automatically credits the donor’s account with points. These points are displayed prominently on the user’s profile to address the lack of appreciation cited in the interviews [7].
- **Organization-Side Verification:** The system includes a “Donor Verify” function restricted to the Organization Dashboard. This allows hospital admins to input a donor’s One-Time Password (OTP) to validate the physical presence of the donor before any rewards are dispensed.

5.3.2 Non-Functional Requirements

The non-functional requirements focus on the quality attributes of the system, ensuring it is easy to access, secure enough to build trust, and provides clear visibility of information.

- **Ease of Use and Accessibility:** The interface is designed for immediate scannability. To ensure the system is easy to access during emergencies, the design utilizes high-contrast visuals. Blood requests are displayed on distinct cards with critical information (Blood Group, Hospital Name) visually isolated. This ensures that users can identify urgent requests in seconds without navigating complex menus [2].
- **Security and Trust Architecture:** To ensure the system is secure enough to increase user trust, the architecture implements a gated handling model. While the system allows anyone to request blood (ensuring accessibility), it enforces a strict “Verified Organization” protocol for the transfusion mechanism. Only entities with physical existence and valid licensing can verify a donor and mark a request as fulfilled. This prevents scammers from manipulating the donation records or selling blood, as the final validation step is controlled exclusively by trusted institutions [6].
- **Visibility of System Status:** The system provides immediate feedback to ensure better visibility of actions. When a donor completes a verification step, the app instantly updates the interface with success messages and point increments. This responsiveness ensures the user always understands their current status within the application workflow [8].

5.3.3 Bridging the Gulf of Execution: Algorithmic Equity and Open Coordination

The “Gulf of Execution” refers to the difficulty users face in translating their goal (helping a patient) into the correct system inputs. To minimize this cognitive load,

the system implements two architectural strategies supported by HCI literature on information foraging [3].

1. **Algorithmic Equity (The Plan):** To prevent decision paralysis caused by unstructured data, the interface utilizes a standard and a First-In-First-Out (FIFO) prioritization logic. The standard logic is prioritizing requests that require immediate attention (e.g., Accident, Pregnancy). Another one is by presenting the oldest, unfilled requests at the top of the feed, the system ensures that patients who have been waiting the longest receive immediate visibility, addressing the issue of request starvation.
2. **Open Coordination Model (The Action):** Safety-critical systems require redundancy rather than rigid constraints [1]. This system utilizes an **Open Coordination Model**. The interface bridges the execution gap by facilitating direct communication between multiple donors and the recipient. This design choice acknowledges the unpredictability of physical travel in Bangladesh; by allowing concurrent communication, the system creates a necessary operational redundancy. If one donor faces logistic delays, others are still able to coordinate, prioritizing patient survival over database exclusivity.

5.3.4 Bridging the Gulf of Evaluation: The Trust-Verification Bridge

The “Gulf of Evaluation” represents the user’s difficulty in determining whether the system state has changed satisfyingly after an action [8]. In the existing ecosystem, donors often report a lack of closure or fear of scams.

To bridge this gulf, the design incorporates a Physical Verification Protocol designed to validate the social contract between the donor and the system:

- **The Human-in-the-Loop Validation:** Digital signals (like GPS) are insufficient to restore trust in a landscape plagued by fraud. Therefore, the system enforces a physical checkpoint. The verification of a donation is decoupled from the user’s smartphone and placed in the hands of a verified Organization Admin. This ensures that the digital record is only created once the physical act is witnessed by a trusted third party.
- **Closing the Feedback Loop:** This interaction serves as the definitive “system image” update (Norman’s final stage). The successful validation triggers immediate system feedback, dispensing points and updating the donor’s history. This tangible response confirms to the donor that their altruistic effort was successfully recorded, directly countering the “fear of unrecorded effort” identified in user interviews.

As illustrated in Figure 5.2, the system logic forms a closed loop designed to foster habit formation. The top half of the diagram addresses the *Gulf of Execution* by simplifying the discovery and contact process. The bottom half addresses the *Gulf of Evaluation* through the Physical Verification step. Crucially, the final arrow connecting “Trust & Reward” back to “Discovery” represents the **Retention Loop**. By providing immediate positive reinforcement only after physical verification, the system aims to increase the donor’s intrinsic motivation to re-enter the cycle, thereby converting sporadic volunteers into regular donors.

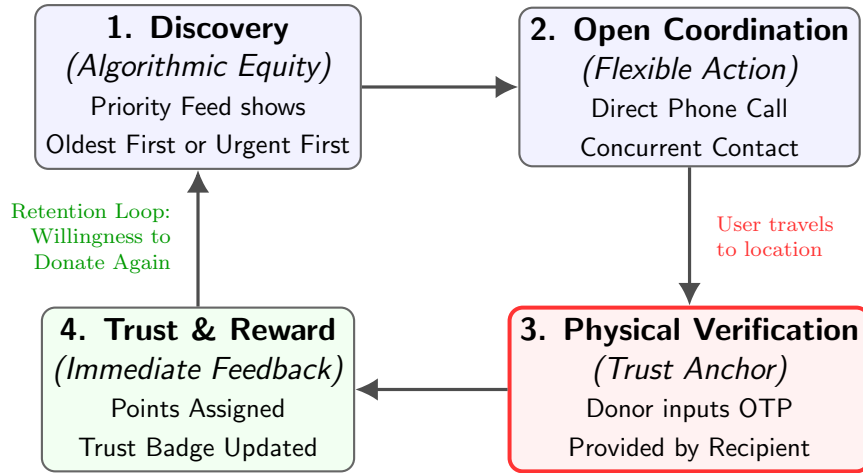


Figure 5.2: The Trust-Integrated User Cycle adapted to Norman’s Seven Stages of Action [8]. The workflow utilizes an ‘Open Coordination’ model to ensure redundancy during execution, while relying on ‘Physical Verification’ to provide definitive evaluation feedback.

5.4 Operational Workflow Logic

The designed workflow, illustrated in Figure 5.3, guides the donor through a behavioral cycle specifically engineered to validate physical effort and enforce social trust. The process moves beyond simple data entry, focusing instead on the interactions required to sustain a voluntary community.

5.4.1 Discovery

- **Automated Gatekeeping**

The donor opens the application to the Home Dashboard, where the system immediately checks the “Next Eligible Donation” date. If the user is ineligible, the flow stops here. This gatekeeping mechanism filters out unqualified donors at the source, preventing the frustration of rejection at the hospital which often leads to donor attrition.

- **Urgency and Equity Sorting**

If eligible, the user views the Blood Requests feed. To address the issue of “patient starvation,” where older requests are buried by newer ones, the system defaults to an “Oldest First” sorting logic. This ensures that attention is equitably distributed to those who have been waiting the longest. However, the system maintains flexibility, allowing donors to other sorting option (e.g., by Urgency) to suit their immediate context.

5.4.2 Action

- **Direct Coordination**

The donor selects a request card and contacts the recipient. By removing third-party intermediaries or approval queues, the system minimizes coordination latency, which is critical in emergency scenarios.

- **Physical Commitment**

Following the call, the donor travels to the location. This transition represents the material investment (time and effort) that the user makes. The system is designed specifically to capture and validate this offline effort in the subsequent phase, ensuring it does not go unrecognized.

5.4.3 Verification

- **The Trust Anchor**

Upon arrival, the donor meets the responsible Organization Admin at the point of care. The donor provides a unique, system-generated One-Time Password (OTP) to the admin.

- **Validating the Social Contract**

The admin enters this OTP into the “Donor Verify” module. While technical in execution, this step serves a sociotechnical purpose: it enforces a “Human-in-the-Loop” verification. By requiring a trusted institutional entity to witness the donor’s presence, the system effectively neutralizes the fear of scams and fraudulent claims that plagues current social media solutions.

5.4.4 Reward (The Retention Loop)

- **Closing the Evaluation Gap**

As soon as the OTP is validated, the system credits the donor’s account with points and marks the request as fulfilled. This simultaneous action bridges the gap between physical altruism and digital recognition, providing the immediate gratification necessary for behavioral reinforcement.

- **Immutable Proof of Impact**

Finally, the system updates the donor’s “Donation History” with an immutable log of the event. This permanent record addresses the user’s need for recognition and serves as a badge of honor, encouraging long-term retention and transforming one-time volunteers into habitual donors.

5.5 Technology Stack

The technical infrastructure of the *Shebok* platform was selected to address two critical operational requirements: the need for broad accessibility across the diverse mobile landscape of Bangladesh, and the absolute necessity of real-time data consistency for emergency medical coordination.

5.5.1 Frontend Development: Flutter Framework

The client-side application was developed using the **Flutter** framework. This choice was driven primarily by accessibility and performance constraints:

- **Device Accessibility:** Given the significant socioeconomic disparity among the target demographic, the application needed to perform efficiently on low-end smartphones with limited processing power. Unlike hybrid web frameworks, Flutter compiles directly to native ARM machine code, ensuring smooth performance and responsiveness even on older hardware.
- **Cross-Platform Reach:** To ensure inclusivity, the system required simultaneous deployment on both Android and iOS ecosystems from a single codebase. This eliminated technical barriers to entry, ensuring that no potential donor was excluded based on their device preference.

5.5.2 Backend Infrastructure: Supabase

For server-side operations, the system utilizes **Supabase** to manage the critical requirements of medical data handling:

- **Real-Time Consistency:** In emergency blood procurement, latency can be fatal. Supabase’s real-time subscription model was utilized to push instant updates to donor feeds the moment a request is verified. This ensures that the information displayed is always consistent with the actual status of the patient, removing the need for manual refreshing.
- **Data Integrity (ACID Compliance):** Built upon a PostgreSQL database, the backend ensures strong consistency and ACID (Atomicity, Consistency, Isolation, Durability) compliance. This is vital for the “Incentive Engine,” ensuring that reward transactions and donation records are processed reliably without data corruption or duplication.

5.5.3 Interface Design: Figma

Prior to implementation, **Figma** was employed not merely for visual design, but as a tool for accessibility validation. High-fidelity prototypes were tested against contrast and sizing standards to ensure the interface remained legible and usable for all demographics, including those with visual impairments or lower digital literacy.

5.6 User Centric Design and Feature Implementation

The visual architecture of the “Shebok” platform was developed with a focus on accessibility and cognitive ergonomics. To address the requirements identified in the primary research phase, the interface utilizes a high-contrast color palette specifically utilizing standard medical red (#FF0000) against a clean white background. This design choice ensures readability for users in high-stress emergency situations while maintaining a professional medical aesthetic.

The following subsections detail the implemented solution, categorized by user interaction points.

5.6.1 Streamlining Access and Request Management

To bridge the gap between "intent" and "action," the primary interface cluster focuses on immediate usability. As identified in Chapter 3, complex navigation often deters users during emergencies. Therefore, the design consolidates the User Dashboard, Request Feed, and Creation tools into a unified workflow.

As illustrated in Figure 5.4, this cluster addresses three specific requirements:

- **Immediate Status Visibility (Left):** The dashboard provides the user with their current eligibility status instantly upon login, removing the need for manual date calculations.
- **Centralized Discovery (Middle):** To mitigate the issue of "information silos" found in social media groups, the Request Feed aggregates all active needs into a single, scrollable list. Each card highlights the critical data (Blood Group and Location) to facilitate rapid decision-making.
- **Frictionless Request Creation (Right):** The request form is simplified to require only essential medical data. This design choice directly addresses the user need for a hassle-free method to broadcast emergencies without navigating complex administrative menus.

5.6.2 Building Trust through Identity and History

A critical finding in our research was the user anxiety regarding the lack of record-keeping in traditional manual systems. Donors expressed a strong desire for transparency and a verifiable history of their contributions. To address this, the second interface cluster focuses on Identity and Evidence.

Figure 5.5 demonstrates how the system operationalizes the requirement for trust:

- **Verified Profile (Left):** The profile acts as a digital identity, displaying the user's blood group and contact rating. This visibility helps build trust between the donor and the recipient organization.
- **The Digital Ledger (Right):** The "Donation History" screen serves as an immutable log of all verified contributions. Unlike paper-based cards which are easily lost, this cloud-synced record provides the tangible proof of altruism that users specifically requested during the survey phase, fostering a sense of long-term achievement.

5.6.3 Institutional Oversight and Identity Verification

To ensure the ecosystem remains secure and manageable for healthcare providers, the Organization Dashboard was designed to minimize administrative friction while enforcing strict identity protocols. This directly addresses the requirement for a "Digital Compliance Layer" that prevents fraudulent actors from entering the donation pool.

As depicted in Figure 5.6, the interface fulfills two critical safety functions:

- **Streamlined Administration ((Left) Figure 5.6):** The dashboard allows organizations to view all the actions at a glance. This minimalist design ensures that hospital staff can navigate simply.

- **Identity Proofing ((Middle and Right) Figure 5.6):** To validate the “Trust Profile” of a donor, the system mandates an email-based verification step. Despite users ability to self screen, this additional step acts as an added layer of security to ensure that standard donation rules are followed. Administrators can trigger an OTP to the donor’s registered email and review their donation history before clearing them for a new donation. This pre-screening mechanism filters out unqualified donors before the physical process begins.

5.6.4 Closing the Loop: The Verification and Incentive Cycle

The final implementation cluster demonstrates the core operational logic of the Shebok platform: the transition from a digital request to a physical reward. This flow executes the “Closed Loop” requirement defined in Chapter 4, ensuring that points are only generated after tangible proof of work.

Figure 5.7 illustrates the sequential steps that enforce process integrity:

1. **Request Fulfillment (Left):** The administrator selects a specific blood request to proceed.
2. **The Physical Handshake (Middle):** The system pauses for the mandatory One-Time Password (OTP) entry. This step forces the “Human-in-the-Loop” validation, as the administrator must physically receive the code from the donor at the point of care.
3. **Immediate Gratification (Right):** Upon successful OTP entry, the system instantly calculates and credits the reward points to the donor’s wallet. This immediate visual feedback satisfies the psychological requirement for positive reinforcement, completing the user journey.

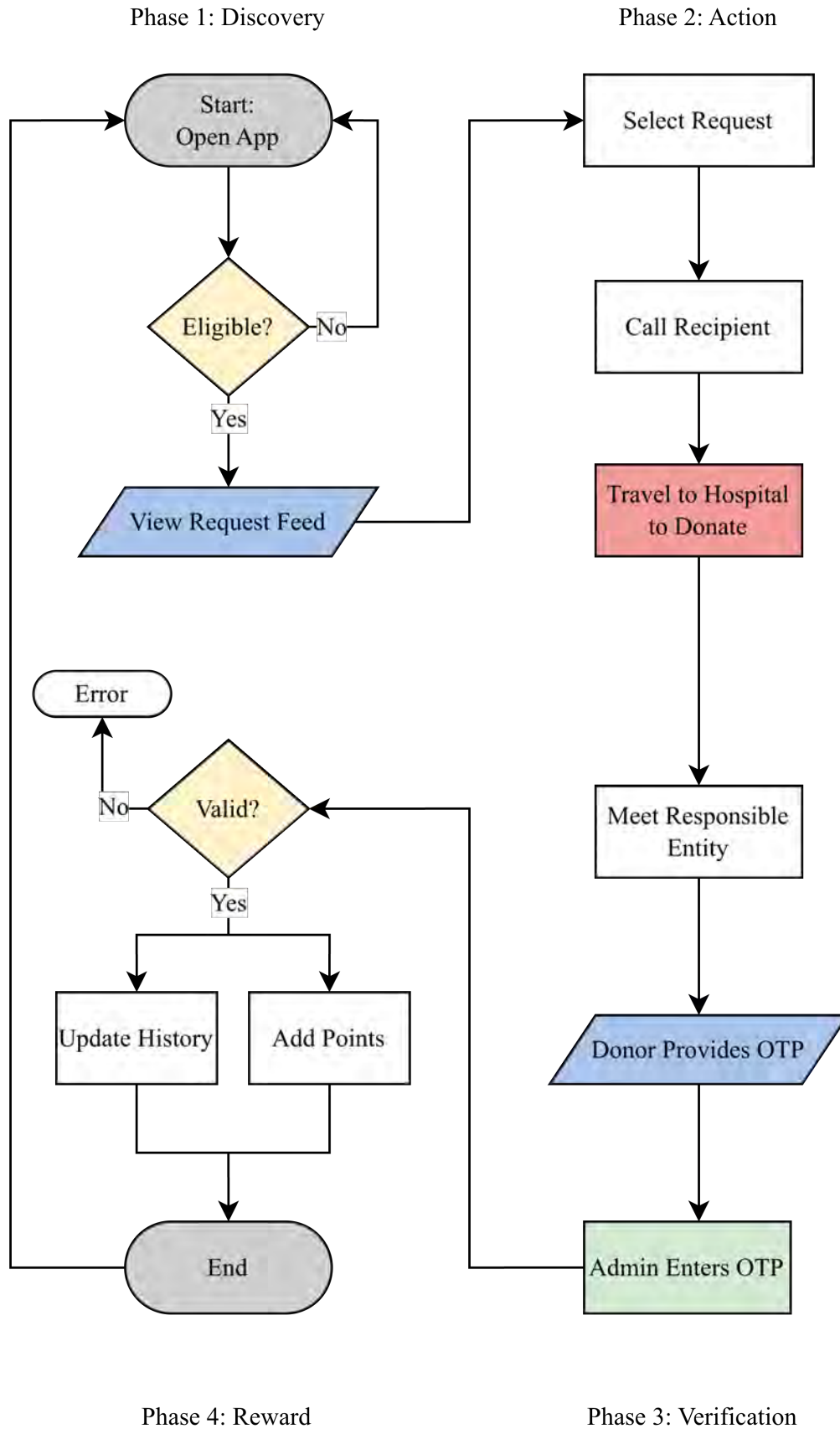


Figure 5.3: Four-phase looping operational flow of the Shebok system, illustrating the cyclical progression from discovery to reward and continuous donor engagement.

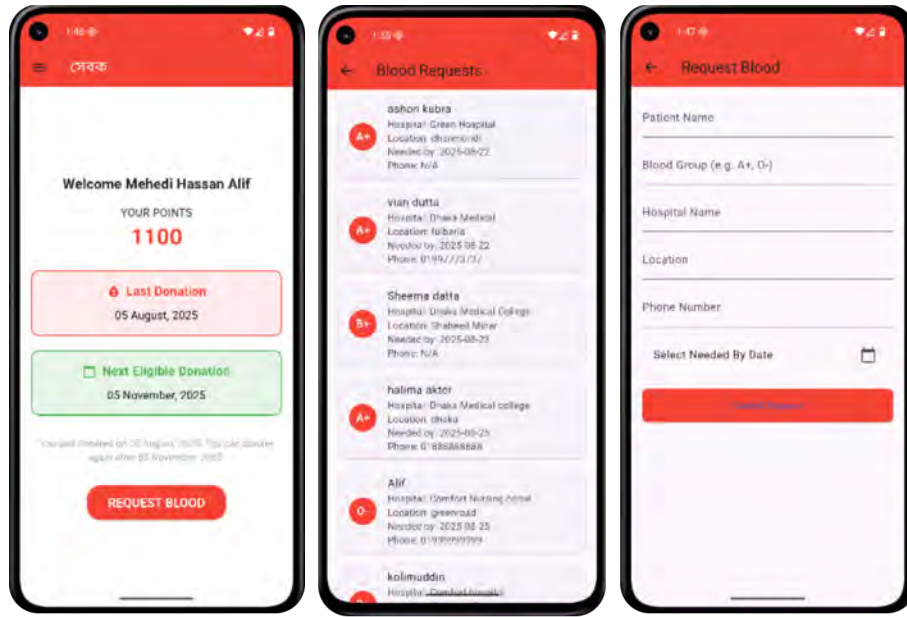


Figure 5.4: (Left) The User Dashboard providing at-a-glance status. (Middle) The Consolidated Blood Request Feed addressing information fragmentation. (Right) The Request Creation interface designed for rapid data entry.

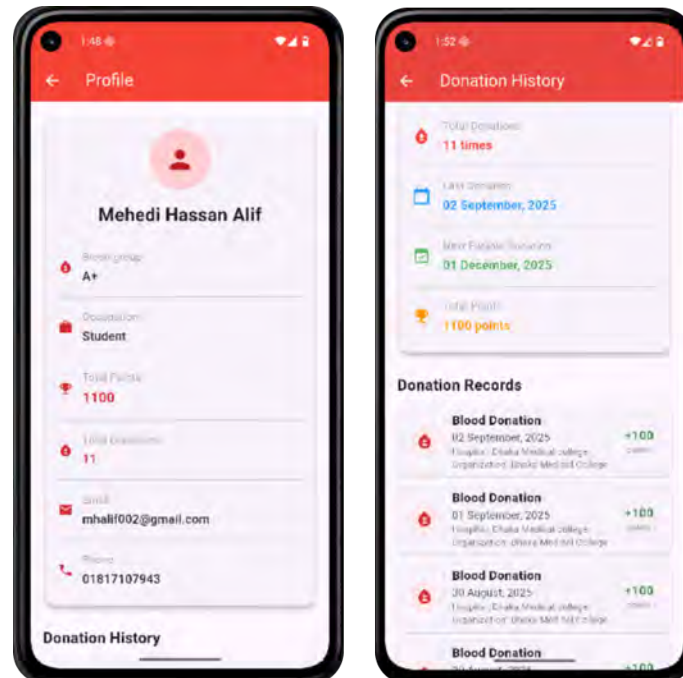


Figure 5.5: The Identity and Transparency Cluster. (Left) The User Profile displaying verified medical details. (Right) The Donation History ledger serving as proof of past altruism.

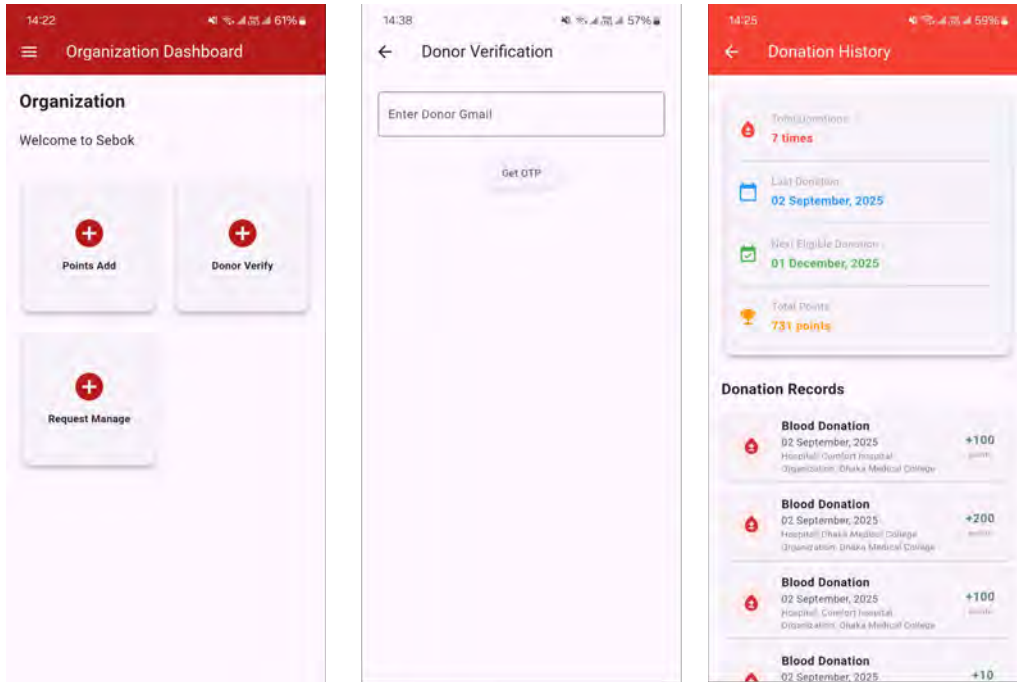


Figure 5.6: (Left)The organization dashboard. (Middle) The organization requests for an OTP to the donor email. (Right)After OTP is verified, donation history is visible .

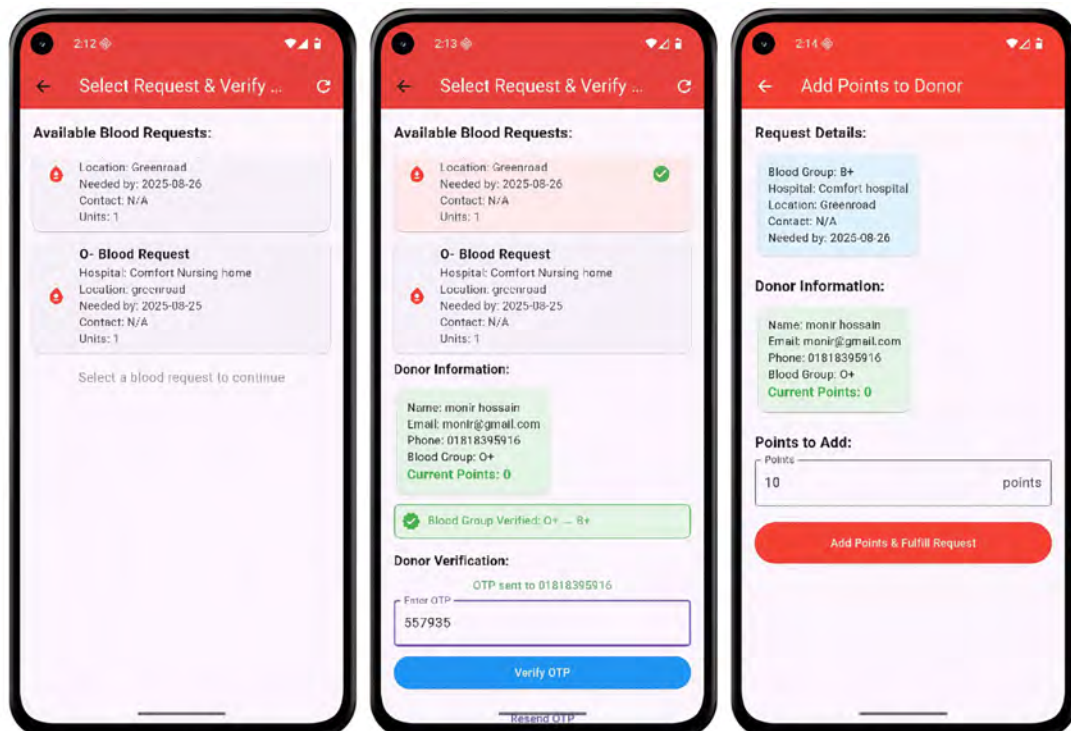


Figure 5.7: The Verification and Incentive Loop. (Left) The Request Selection screen where the admin initiates request after fulfillment. (Middle) The Verification screen requiring the donor's OTP. (Right) The Incentive screen showing the addition of points.

Chapter 6

Phase 3: Evaluation of Proposed Platform

This chapter presents the empirical evaluation of the *Shebok* application. The primary objective of this phase was to assess the system’s usability and operational effectiveness in a controlled environment. Having translated the initial user requirements into a functional prototype, it was critical to validate these design decisions against the actual behavioral constraints of potential donors. The evaluation focuses on determining whether the interface is intuitive for the target demographic and if the proposed workflow successfully bridges the gap between intent and action.

6.1 Methodology

To ensure the validity of our findings and measure the effectiveness of the solution against the originally identified barriers, this study re-engaged the **same cohort of 15 participants (P1–P15)** who participated in the initial User Study. By returning to these specific individuals, we could directly observe if the developed system addressed their previously stated concerns regarding trust, complexity, and transparency.

6.1.1 Study Setup and Constraints

During the initial interviews, “Technical Anxiety” was identified as key barriers. To respect these constraints and focus the evaluation purely on the application’s interface rather than installation friction, the study did not require users to install the app on their own devices. Instead, the application was pre-installed on a test device provided by the researcher. This setup functioned as a controlled experiment.

6.1.2 Evaluation Procedure

Participants were asked to perform a complete system simulation, role-playing as a donor while the researcher acted as the Organization Admin. The procedure followed a strict sequence to test all core functionalities:

1. **Onboarding:** The participant was given the test device logged in with generic donor credentials.

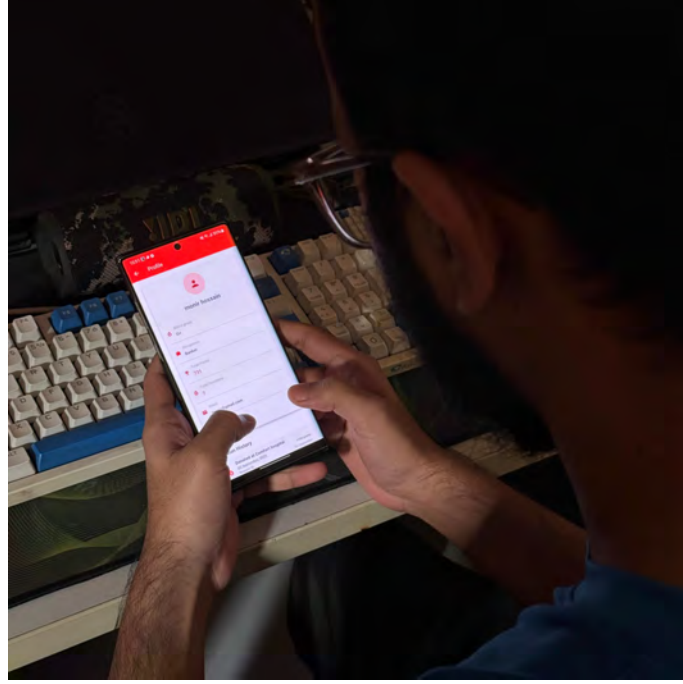


Figure 6.1: Participant interacting with the app prototype during usability testing.

2. **Exploration:** The participant was asked to navigate the interface freely to understand the layout and then explicitly verify their personal information in the 'Profile' section.
3. **Request Generation:** The participant created a blood donation request, testing the ease of form entry.
4. **Fulfillment Simulation:** Once the request was created, the researcher (acting as Organization) located the request on a separate device and initiated the fulfillment process.
5. **The Verification Cycle:** The researcher simulated the physical meeting. The participant received an OTP on the test device and was asked to provide it to the researcher.
6. **Reward Confirmation:** Upon verification, the participant observed the immediate addition of points to their profile.
7. **Data Collection:** Finally, the participant completed the standard System Usability Scale (SUS) questionnaire and participated in a 5-minute qualitative debriefing.

Figure 6.1 shows one of the participants interacting with the app during the System Usability Scale test.

6.2 Quantitative Analysis: System Usability Scale (SUS)

The System Usability Scale (SUS) was utilized to produce a composite measure of the system’s overall usability. Scores range from 0 to 100 [4].

6.2.1 Overall Scores

The individual scores for the 15 returning participants are detailed in Table 6.1.

Participant ID	SUS Score	Rating Interpretation
P1	37.5	Poor
P2	82.5	Excellent
P3	85.0	Excellent
P4	70.0	Good
P5	75.0	Good
P6	90.0	Best Imaginable
P7	25.0	Poor
P8	75.0	Good
P9	85.0	Excellent
P10	62.5	Marginal
P11	85.0	Excellent
P12	25.0	Poor
P13	25.0	Poor
P14	75.0	Good
P15	75.0	Good
Average Score	64.83	Marginal/Good
Median Score	75.0	Good

Table 6.1: System Usability Scale (SUS) Scores (Returning Participants)

6.2.2 Result Interpretation

The results show a Median SUS score of **75.0**, which places the *Shebok* application in the “Good” category of usability [13]. However, the distribution is notably split:

- **High Acceptance (66%):** 10 out of 15 participants rated the system above 70. These users, who generally exhibited higher digital literacy in the initial interviews, found the system intuitive.
- **Low Acceptance (27%):** 4 participants (P7, P12, P13, P1) rated the system significantly poorly (25–37.5). It is notable that these specific participants were the same individuals who expressed the highest levels of “Technical Anxiety” in Chapter 3. Their low scores were driven primarily by Question 4 (Need for technical support) and Question 10 (Need to learn a lot before using).

6.3 Qualitative Findings: Thematic Analysis of User Feedback

Following the quantitative assessment via the System Usability Scale (SUS), a structured qualitative debriefing was conducted to contextualize the participant scores. This phase lasted an average of 5 minutes per participant and focused on deconstructing the psychological drivers behind their ratings.

6.3.1 Data Cleaning and Participant Exclusion

To ensure the reliability of the qualitative insights, a data validation protocol was applied. Of the initial cohort, data from four participants (P5, P9, P11, P13) was excluded from the final analysis due to excessive *incomplete responses* or *insufficient engagement* with the interview protocol. Consequently, the following analysis is derived from the transcripts of the remaining valid participants.

6.3.2 Verification as a Psychological Anchor

A dominant theme across the dataset was the relationship between system features and psychological safety. Participants indicated that the “Digital Handshake” (OTP mechanism) served as more than a functional tool, it was a prerequisite for engagement.

- **The Necessity of Proof:** Participants P1 and P10 explicitly stated that “verified donor/recipient authentication” was the single biggest determinant of their willingness to use the system. This indicates that in the context of Bangladesh, a passive directory is insufficient; users require an active security broker.
- **Closing the Information Loop:** Participant P14 highlighted that receiving confirmation, ideally originating from the patient’s side, provided a sense of security that “the donation reached the intended recipient.” This specifically mitigates the fear of “blood brokers” diverting donations for profit.

6.3.3 Perception of Non-Monetary Incentives

Participants offered nuanced feedback regarding the reward structure, distinguishing between “payment” and “acknowledgment.”

- **Acknowledgment vs. Transaction:** The majority of participants (P1, P2, P8) described the rewards as a “fair way to acknowledge contribution.” P2 specifically noted it generated a “sense of accomplishment.” This suggests that the system successfully gamified the experience without triggering the moral crowding-out effect often associated with cash rewards .
- **Moral Skepticism:** Conversely, Participant P12 (who provided a lower SUS score) expressed concern that “rewards might encourage selfish behavior.” This divergent view is critical, as it validates the decision to strictly avoid monetary value; any move toward cash incentives would likely alienate this highly altruistic segment.

6.3.4 Operational Efficiency as Value

An emergent theme was that the structural organization of the platform acted as an incentive in itself, independent of the point system.

- **Reduction of Logistical Friction:** Participants P1 and P3 noted that the reward system makes the process feel “worthwhile” by offsetting the “hassle” (transport, time, coordination).
- **Centralization:** Participants P6 and P15, who were neutral toward rewards, stated they would use the platform solely for its “organized request system.” This indicates that for a subset of users, the primary value proposition is simply the removal of chaos found in current social media-based methods.

6.4 Synthesis and Response to Research Questions

The themes identified above provide empirical evidence to address the core research questions posed at the outset of this study.

6.4.1 Addressing RQ3: Mitigating the “Trust Deficit”

Research Question 3 asked: Can a digital platform mitigate the social distrust associated with unregulated blood donation?

The findings confirm that trust in the Bangladeshi context is not given by default; it must be engineered. The positive reception of the verification protocols, as detailed in the theme **Verification Mechanisms Anchor User Trust**, validates that the “Trust Deficit” can be bridged through technological intervention. By mechanically enforcing a closed-loop verification (The Digital Handshake), the system successfully creates the safety required for users to move from intent to action.

6.4.2 Addressing RQ2: Efficacy of the Hybrid Model

Research Question 2 asked: Can non-monetary incentives improve retention without compromising the altruistic nature of the act?

The findings support the validity of the “Hybrid Incentive Model.” The user feedback from the theme **Incentives are Perceived as Acknowledgment, Not Transaction** demonstrates that non-monetary rewards function effectively because they act as a “Thank You” rather than a wage. The system successfully balances the equation: it provides enough extrinsic motivation to overcome the “Hassle Factor” (validated by the theme **Operational Efficiency Provides Intrinsic Value**) but keeps the value symbolic enough to preserve the intrinsic moral satisfaction of the donor.

6.4.3 Operational Utility as a Standalone Value

Beyond incentives, the study found that the structural organization of the platform itself acts as a motivator.

- **Centralization:** Participants P6 and P15, who were neutral toward rewards, stated they would use the platform for its “organized request system.” This indicates that for a subset of users, the primary value proposition is simply *efficiency* removing the chaos of the current fragmented system in Bangladesh.

Chapter 7

Discussion

This study set out to evaluate whether a Hybrid Incentive Model could effectively transition the Bangladeshi blood donation landscape to a sustainable voluntary one. The results from our user study and prototype evaluation suggest that while the operational backbone (verification) is necessary, careful curation of non-monetary incentives can potentially be the primary driver for donor retention. This chapter interprets these findings, analyzing how health-centric rewards successfully bridge the gap between intent and action without commodifying the act of donation.

7.1 The Efficacy of Non-Monetary Incentives

The core finding of this research is the strong validation of the “Hybrid Incentive Model”. Unlike monetary rewards, which previous literature suggests can crowd out intrinsic motivation [25], our findings indicate that non-monetary incentives, specifically those linked to healthcare outcomes, act as powerful reinforcers. Participants demonstrated a high degree of acceptance for rewards that offer utilitarian value, such as priority health checkups and transportation reimbursement. This aligns with the findings of Li et al. [35], who noted that reward-based applications effectively engage younger demographics. However, our study nuances this by highlighting that in the context of Bangladesh, the relevance of the reward is critical. Donors viewed health-related benefits not as payment but as a reciprocal care mechanism, reinforcing their identity as health-conscious citizens rather than selling a resource. While altruism remains the primary motivator, as supported by Monteiro et al. [40], it is often insufficient to overcome logistical friction. Our data suggests that incentives function effectively as friction reducers. They do not replace the desire to help but compensate for the tangible costs (time, travel, fatigue) associated with the act. However, from our studies, we have found a particular disparity between perceived motivation and actual participation that aligns with the findings by Khan et al. [39].

7.2 Balancing Altruism and Commodification

A critical tension observed in the study was the fear of commodification. As noted by one participant, there is a deep-seated cultural resistance to monetizing blood, with fears that businesses might exploit the system. The proposed model successfully

navigates this ethical dilemma by restricting the redemption of points to closed-loop health services. This design choice validates the arguments of Flanagan [28], who advocates that systems must uphold the Voluntary Non-Remunerated Blood Donation (VNRBD) standard. By ensuring that points cannot be converted into cash but only into services that promote well-being, the system maintains the moral high ground, ensuring that the incentive structure supports, rather than subverts, the humanitarian spirit of the community.

7.3 Security as a Trust Multiplier

While incentives drive motivation, trust drives participation. Our investigation into the Trust Deficit revealed that potential donors are often deterred by the fear of scams and unrecorded efforts, a barrier consistent with findings by Mohammed and Essel [26]. The implementation of the OTP-based Digital Handshake (Physical Verification Protocol) proved to be a decisive factor in mitigating this deficit. By introducing a mandatory security layer where hospital administrators verify the physical presence of the donor, the system provides institutional legitimacy. This security mechanism does not merely prevent fraud; it psychologically validates the donor’s effort. Knowing that a verified institution has digitally acknowledged their contribution significantly boosts donor confidence, allowing the incentive model to operate effectively in a secure environment.

7.4 Institutional Feasibility and Strategic Partnerships

The study’s inclusion of institutional perspectives reveals a critical divergence in how different entities perceive a digital incentive model. For private diagnostic centers, the transition to a point-based system is viewed as a logistical necessity. Stakeholders observed that as traditional methods of blood procurement become less effective in a digitalized society, a centralized online portal represents a natural operational evolution. However, this feasibility is strictly tied to financial guardrails. The findings indicate that while diagnostic centers are willing to offer healthcare discounts as incentives, they prioritize a “policy-driven” framework that protects the institution from financial loss. This suggests that the model’s success depends on balancing donor rewards with institutional sustainability.

In contrast, voluntary organizations prioritize ethical and legal integrity over operational ease. Concerns were raised regarding the potential for any reward system to be misinterpreted as a medium for the “trading” of blood, which is a punishable offense under existing national laws. This feedback highlights the necessity of the system’s “Digital Handshake” verification protocol. By integrating these institutional insights, the discussion suggests that the proposed system must function not just as a donor engagement tool, but as a regulatory bridge that standardizes how non-monetary incentives are distributed and verified across both private and voluntary sectors.

7.5 Summary

In conclusion, the system demonstrates that incentives, when ethically designed, are not enemies of altruism. By combining meaningful non-monetary rewards with a robust security layer that ensures transparency, the system addresses both the motivational and trust-based barriers plaguing the current donation ecosystem.

Chapter 8

Limitations and Future Work

This chapter discusses the constraints and hurdles faced during the study and the scope of future work

8.1 Study Limitations

While this research provides a functional framework for incentivized blood donation, the study encountered specific constraints that influenced the scope of data collection and the granularity of the analysis. These limitations are categorized into demographic, institutional, and methodological challenges.

8.1.1 Demographic Sampling Bias

A significant challenge in the data collection phase was achieving a strictly balanced demographic representation. Although the recruitment strategy aimed for diversity, the final dataset is skewed toward younger, male digital natives.

- **Gender Disparity:** Recruitment of female participants proved difficult due to prevailing social apprehensions. Many potential female respondents declined participation, citing security concerns regarding the sharing of personal experiences in a public setting.
- **Generational Gap:** Similarly, older demographics exhibited reluctance to engage with the digital aspects of the study. Consequently, the findings primarily reflect the sentiments of the tech-savvy youth population, potentially overlooking the distinct behavioral motivators of older, more traditional donors.

8.1.2 Institutional Gatekeeping

The operational analysis was constrained by significant bureaucratic hurdles within the healthcare sector. Engaging with institutional stakeholders (hospital administrators and blood bank managers) was limited by rigorous gatekeeping and complex approval protocols. Securing official research permissions was unfeasible within the study's timeline, and potential participants were often restricted by internal workplace policies, preventing them from providing official statements.

8.1.3 Methodological and Technical Constraints

The study also faced challenges regarding data fidelity and analysis tools:

- **Data Integrity:** The storage demands of high-fidelity audio recording, combined with sporadic hardware malfunctions, resulted in the corruption of a subset of interview data.
- **Analytical Limitations:** The qualitative analysis utilized NVivo for thematic coding. However, feature disparities in the macOS version of the software created friction in the workflow. These software constraints limited the depth of the coding hierarchy achievable within the timeframe, potentially obscuring subtler behavioral nuances in the participant narratives.

8.2 Future Work

To further enhance user retention and foster a sense of community, future iterations of the platform aim to integrate advanced gamification mechanics, specifically a dynamic leaderboard and digital badge system. By visualizing donor contributions and awarding badges for milestones (e.g., "Life Saver," "Frequent Donor"), the system seeks to instill a sense of accomplishment and healthy competition. We do not aim to solve the national blood crisis at once with the Shebok system. Rather, we view this research as a stepping stone toward a better, more comprehensive national infrastructure. Future iterations must prioritize the inclusion of underrepresented demographics. To address the security concerns raised by female and older users, future systems should explore anonymous engagement models. Collaborating with large companies to accommodate point redemption focusing on the user needs, especially healthcare benefits and new features as well. Building an app is not main goal here. We are willing to build a system that will not only encourage people to save lives but also to fix the scattered system that leaves people stranded in times of need. To evolve beyond this prototype, the system should aim for interoperability with National ID (NID) databases and hospital information systems.

Chapter 9

Conclusion

9.1 Summary of Research

The persistence of blood shortages in Bangladesh, driven by a reliance on replacement donors and a critical trust deficit in the healthcare infrastructure, necessitated a re-evaluation of how voluntary donation is incentivized. This thesis set out to answer whether a Hybrid Incentive Model, combining non-monetary rewards with strict operational verification could bridge the gap between donor intent and action. In addressing our first research question regarding the primary barriers to donation, our formative study identified that the impediments were not merely logistical but deeply psychological. Specifically, the lack of institutional trust and the fear of fraudulent brokers were the most significant deterrents. To address the second research question on the influence of incentives, our findings revealed a high degree of acceptance for health-centric rewards. We determined that non-monetary incentives act as effective friction reducers that validate the donor's effort without commodifying it.

Furthermore, we resolved the third research question regarding operational security by designing the Physical Verification Protocol. The implementation of the OTP-based digital handshake ensures that the system is resistant to false claims, establishing a secure environment. Finally, regarding the fourth research question on the efficacy of the hybrid model, the System Usability Scale (SUS) scores and qualitative feedback confirmed that the model successfully reduces technical anxiety and fosters a sense of institutional legitimacy among users.

9.2 Key Contributions

This research makes a distinct contribution to the field of Human-Computer Interaction (HCI) and Public Health Informatics by defining and validating a Hybrid Incentive Model tailored for low-trust environments. This approach preserves the ethical standard of Voluntary Non-Remunerated Blood Donation (VNRBD) while providing a tangible acknowledgment of the donor's effort, effectively distinguishing between payment and care.

9.3 Closing Remarks

Transitioning Bangladesh from a replacement-based donation system to a 100% voluntary one is a complex socio-technical challenge that cannot be solved overnight. However, this thesis demonstrates that valid incentives and transparent verification can dismantle the barriers of fear and indifference. By acting as a foundational step, this work opens the door for future systems to cultivate a sustainable culture of donation, ensuring that technology serves as a bridge rather than a barrier to altruism.

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Appendix A

Survey Questionnaire: General Respondent

While the questions were asked, we asked them in Bengali, and they are here translated.

A.1 Demographic Information and Personal Experience

1. What is your age range?
2. What is your gender?
3. What is your highest level of education?
4. What is your current location?
5. What is your occupation?
6. What is your professional or study domain?
7. Have you ever donated blood?
8. If you have donated blood, what motivated you to donate?
9. If you have not donated blood, what prevented you from donating?
10. Have you or someone you know ever needed blood urgently?
11. If applicable, briefly describe the urgency.

A.2 Motivation, Social Norms, and Beliefs

1. Do you consider blood donation a civic responsibility or a personal choice?
2. Briefly explain your reason.
3. Do you trust blood donation requests on social media?

4. If your trust depends on certain factors, please explain.
5. Is public recognition for regular blood donors necessary?
6. What type of recognition is appropriate?

A.3 Barriers and Practical Challenges

1. In your opinion, why do people hesitate to donate blood?
2. How can donors be made to feel safer and more comfortable while donating?
3. Have you ever purchased blood from a blood bank?
4. If applicable, briefly describe your experience.
5. Have you ever seen or heard about any fraud related to blood donation?
6. If applicable, briefly describe the details.

A.4 Incentives and Reward System

1. Would non-monetary incentives encourage you to donate blood regularly?
2. Would earning points through blood donation increase your interest?
3. Which incentives are most meaningful to you?
4. Would incentives reduce the value of blood donation? Why or why not?
5. Would you support a reward system that provides incentives only after hospital or identity verification?

A.5 Technology and Digital Platforms

1. Would you use a mobile application to schedule blood donations, receive reminders, and manage rewards?
2. Would you share basic information (such as name, blood group, and phone number) in an application for emergency use? Why or why not?
3. What concerns do you have about using a blood donation mobile application?

Appendix B

Survey Questionnaire : Organization

While the questions were asked, we asked them in Bengali, and they are here translated.

1. Briefly introduce yourself and your occupation.
2. What services does your organization currently provide, and how are you involved in blood donation or related healthcare activities?
3. How feasible do you consider a point-based healthcare or reward system linked to blood donation?
4. What is your level of interest in accepting reward points, and do you currently offer any discounts or incentive programs?
5. What limitations or conditions would you propose for implementing a point-based reward system?
6. In your opinion, what are the main benefits and potential risks of a point-based blood donation system?
7. Would your organization be interested in partnering in such a system?
8. Do you believe such a system has the potential to increase blood donation rates? Please explain.
9. Would your organization be interested in future collaboration related to this initiative?

Appendix C

System Usability Scale(SUS)

While the questions were asked, we asked them in Bengali, and they are here translated.

1. I think that I would like to use this system frequently.
2. I found the system unnecessarily complex.
3. I thought the system was easy to use.
4. I think that I would need the support of a technical person to be able to use this system.
5. I found the various functions in this system were well integrated.
6. I thought there was too much inconsistency in this system.
7. I would imagine that most people would learn to use this system very quickly.
8. I found the system very cumbersome to use.
9. I felt very confident using the system.
10. I needed to learn a lot of things before I could get going with this system.

Appendix D

Post-SUS Interview : General Respondent

While the questions were asked, we asked them in Bengali, and they are here translated.

1. How did the reward system impact your willingness to use this platform compared to traditional donation methods?
2. Did the incentives feel like a fair acknowledgment of your effort, or did they change your view of donation from a charitable act to a transaction?
3. If the rewards were removed, would the organized request system alone be enough to keep you using the platform?
4. Did the visibility of the donation history and profile verification increase your confidence in the system?
5. What specific information or features made you feel that your donation was being handled securely and reaching the intended recipient?
6. Do you think a reward-based system effectively addresses the hesitation or 'hassle' often associated with blood donation?
7. What is the single biggest factor that would convince you to trust and regularly use a digital platform for blood donation over personal networks?
8. Would non-monetary incentives (e.g., priority service, community recognition) be sufficient to keep you engaged as a long-term donor?
9. How important is public recognition in your decision to donate repeatedly?