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Whistleblowing System for Website-Based Sexual Violence Complaints: An Improved Approach Combining Design Thinking and Software Development Life Cycle

Luthfiah Gustiana[1], Tenia Wahyuningrum[2*], Teotino Gomes Soares[3]
[1, 2] Study Program of Informatics, Telkom University
[3] Department of Computer Science, Dili Institute of Technology
[1, 2] Jalan DI Panjaitan 128, Banyumas, 53147, Indonesia
[3]Ai-meti-laran, Díli, Timor-Leste
*teniaw@telkomuniversity.ac.id

Abstract — Cases of sexual violence in higher education often go unreported due to concerns about reporter identity safety and the absence of adequate reporting mechanisms. This study developed a website-based sexual violence reporting system equipped with whistleblowing features, using a combined approach of Design Thinking and the Software Development Life Cycle (SDLC). The Design Thinking stages were applied to understand user needs and design empathy-based solutions, while SDLC provided the technical framework for system implementation. Development followed an iterative process, starting with planning, UI/UX design, and interface development using React.js, and then proceeding to system testing through black-box testing, usability testing, and the System Usability Scale (SUS). The testing results show that the system functions as intended and achieved a SUS score of 82.43 (Excellent category) from the user side and 79.5 (Good category) from the admin side, indicating that the system is easy to use and fosters a sense of safety and comfort for reporters. Overall, the system shows potential to enhance comfort, security, and the effectiveness of digital reporting for sexual violence cases.

Keywords – design thinking, sexual violence, software development life cycle, website, whistleblowing

I. INTRODUCTION

Sexual violence remains a critical and pervasive problem in various contexts, including higher education[1]. According to the Regulation of the Minister of Education, Culture, Research, and Technology of the Republic of Indonesia No. 30 of 2021, sexual violence encompasses actions that insult, harass, or attack a person's body and reproductive functions due to power or gender imbalances, causing psychological, physical suffering, or reproductive health issues[2]. The 2023 report by the National Commission on Violence Against Women (CATAHU) recorded 892 reported cases of sexual violence in higher education, 791 of which involved perpetrators from the same educational background. In total, 2,139 cases involved students and academic staff, highlighting the fact that perpetrators can come from environments that are expected to uphold ethical values, such as educators and academic figures [3], [4]. The Sexual Violence Prevention and Handling Task Force or in Indonesian called as Satgas PPKS has reported that while complaints received are followed up, significant challenges remain regarding accessibility, public awareness, and trust [5], [6], [7]. Some complainants withdrew or became unreachable due to fear, anxiety, or uncertainty about case follow-up. These conditions highlight the need for a digital reporting system that is secure, accessible, anonymous, and capable of providing transparent progress tracking.

To address this need, this research proposes the development of a website-based sexual violence complaint system with an integrated whistleblowing feature. Whistleblowing systems have been shown to improve trust and reporting rates by ensuring confidentiality, protecting the reporter's identity, and enabling a secure information flow [8]. However, building such a system requires not only robust technical implementation but also a deep understanding of user needs and psychological considerations, especially given the sensitive nature of sexual violence cases.

In this research, the development process adopts a hybrid methodology combining Design Thinking (DT) and the Software Development Life Cycle (SDLC). DT provides a human-centered approach that emphasizes empathy, ideation, and iterative prototyping to ensure solutions are directly aligned with user needs [9], [10], [11], [12]. This method is particularly relevant for sensitive social issues where user trust and emotional safety are critical. However, DT alone does not provide a comprehensive framework for structured software engineering processes, particularly in areas such as detailed system design, testing, and maintenance.

On the other hand, SDLC offers a structured, phase-based technical framework that ensures the system is developed with clear requirements, robust architecture, systematic testing, and long-term maintainability [13]. While SDLC excels in technical rigor, it is often criticized for being less flexible in addressing rapidly evolving user needs during the development process [14].

The combination of DT and SDLC in this study aims to leverage the strengths of both methodologies. DT ensures that the system is empathetic, intuitive, and responsive to user needs, while SDLC guarantees that the technical implementation follows systematic engineering standards. This hybrid approach has been recognized in prior research as effective for complex and high-sensitivity projects, as it bridges the gap between creative, user-focused ideation and structured technical execution [15]. Therefore, the objective of this research is not only to produce a functional and secure sexual violence reporting system but also to demonstrate that the DT– SDLC hybrid approach can serve as a replicable development model for other sensitive, high-impact digital platforms.

II. RESEARCH METHOD

This research employs a hybrid development approach that combines Design Thinking (DT) and the Software Development Life Cycle (SDLC). DT emphasizes a human-centered process aimed at understanding user needs and producing empathy-based solutions, while SDLC provides a structured, disciplined framework for software engineering, ensuring technical quality, scalability, and maintainability. By integrating these approaches, the system is designed with a deep focus on user experience without compromising on the rigor of technical implementation.

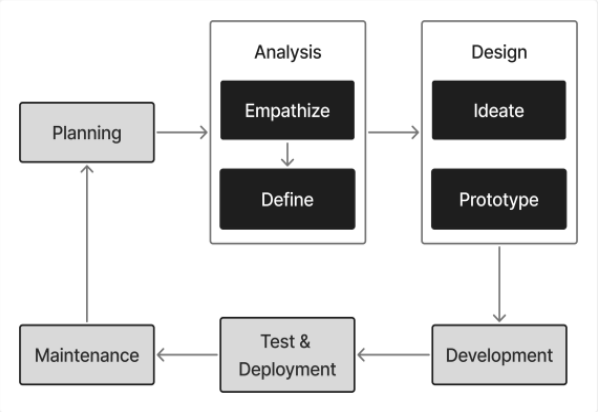

Fig. 1. Stages of the hybrid development method applied in this research

Fig. 1 illustrates the hybrid methodology, where the iterative and empathetic nature of DT is systematically aligned with the sequential, phase- driven structure of SDLC, resulting in a development process that is both adaptable to user feedback and technically robust. The combined stages implemented in this research are as follows:

A. Planning

In this stage, the project scope, required resources, risk anticipation measures, and development timeline were established. Stakeholders were identified, objectives were defined, and project constraints were set to ensure the process was well-structured and aligned with research goals. The planning also included initial discussions with Satgas PPKS to validate the feasibility of the system concept.

B. Analysis (Empathize & Define)

This stage combines DT's Empathize and Define phases with SDLC's analysis process. Qualitative user research was conducted through structured interviews with students, lecturers, and Satgas PPKS to understand existing pain points in sexual violence reporting. Insights from this process revealed 1). The necessity for reporter anonymity to reduce fear of retaliation; 2). The necessity for reporter anonymity to reduce fear of retaliation; 3). The demand for real-time case progress tracking.

Based on these findings, a problem statement and requirement specification document were created, detailing 1). Functional requirements (e.g., secure report submission, evidence upload, status tracking); 2). Non-functional requirements (e.g., data security, accessibility, reliability).

C. Design (Ideate & Prototype)

This phase integrated DT's Ideate and Prototype stages with SDLC's design phase. Potential solutions were brainstormed and prioritized, followed by the creation of UI/UX wireframes and interactive prototypes using Figma. The process also covered system architecture planning and database schema design to ensure alignment between the interface and backend requirements.

D. Development

The development stage translated the approved design into an operational system. The frontend was developed using React.js to provide responsiveness and interactivity, while the backend and database were implemented using Firebase to enable real-time data processing and secure authentication.

E. Test and Deployment

Testing included Blackbox testing to validate functional correctness, usability testing to assess ease of use, and the System Usability Scale (SUS) for quantitative usability scoring. Detected issues were resolved prior to deployment to ensure system stability, security, and performance. The SUS score can be calculated by equation (1).

$$A = 2{,}5[\sum_{n=1}^{5}(U_{2n-1} - 1) + (5 - U_{2n})] \qquad (1)$$

Where A is SUS score; n is number of questions.

F. Maintenance

After deployment, a maintenance plan was prepared to address bug fixes, system updates, and feature

improvements based on user feedback and emerging needs [9]. This ensures the system remains relevant, secure, and effective over time.

This DT–SDLC hybrid methodology effectively bridges the gap between creative, user-centered design and structured technical execution, producing a sexual violence reporting system that is secure, efficient, and empathetic to user needs.

III. RESULT

The results of each stage from the combined Design Thinking (DT) and Software Development Life Cycle (SDLC) process are presented as follows. Each stage's outcome reflects the integration between user-centered insights from DT and the structured technical implementation from SDLC.

A. Planning

The planning phase identified project objectives, scope, and resources. Technologies and tools were selected to support development efficiency and system security. Table 1 lists the technologies and tools applied in this research.

In this phase, the objectives, scope, and expected outcomes of the project were clearly defined. Stakeholders were identified, and development constraints were established to maintain project feasibility. The selection of technologies prioritized security, scalability, and development efficiency, considering the sensitivity of sexual violence case reports.

Table 1. Technologies and Tools Applied.

Component	Technology/ Tools	Description
Frontend	React.js	UI development
Backend and Database	Firebase	Authentication and data storage
Media Storage	Cloudinary	Evidence storage (document or image)
Prototyping	Figma	UI/UX design
Testing	Blackbox and SUS	Functional and usability testing

Table 1 presents the technologies and tools applied in this research, along with their roles.

B. Analysis (Empathize and Define)

This stage merged DT's Empathize and Define with SDLC's analysis phase. User research through interviews with students and Satgas PPKS revealed three critical needs:

- The system must guarantee anonymity to protect reporters' identities.
- Reporting procedures must be clear and guided to reduce confusion.
- Users need real-time case progress updates for reassurance and transparency.

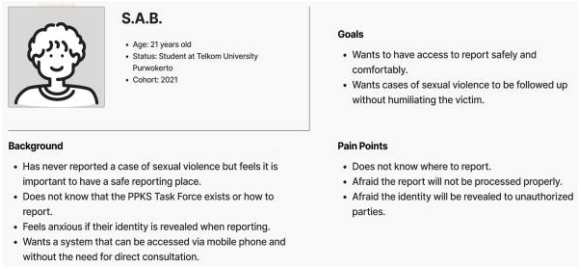

Fig. 2. User Persona

Fig. 2 shows the developed User Persona, representing a typical potential reporter of sexual violence.

Table 2. User Journey

Stages	User Experience s	Emotion	Difficulties
Realize need some helps	Experienced or knew sexual violence	Confuse and fear	Have no idea how to report
Search for information	Try to search information via website or some friend	Confuse	Missing information or hard to find
Report to Satgas	Sending message or directly meet Satgas	Fear	Afraid the identity known and he process feel too hard
Discontinue reporting	Canceling the report	Fear and disappoint	Feel unsafe causes the system

Table 2 presents the User Journey, mapping the emotional states, experiences, and obstacles faced from recognizing the need for help to discontinuing the report process.

C. Design (Ideate & Prototype)

Feature brainstorming produced core functionalities like anonymous reporting, evidence upload, and report tracking. UI/UX prototypes were created in Figma to ensure intuitive navigation and empathetic design language.

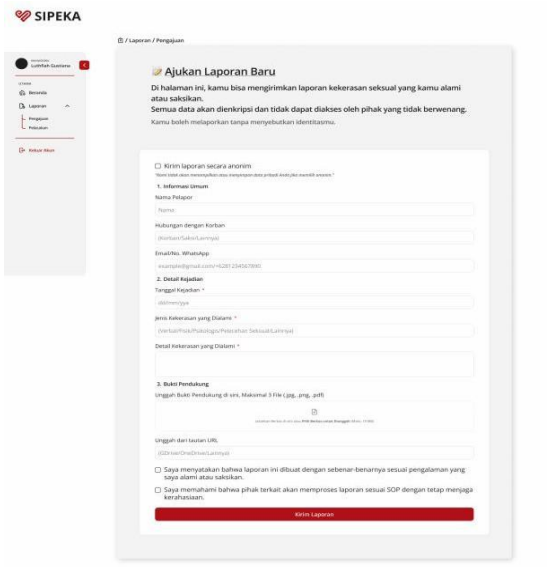

Fig. 3. User Interface Prototype in Indonesian Language

Fig. 3 shows the User Interface Prototype, highlighting the report submission page.

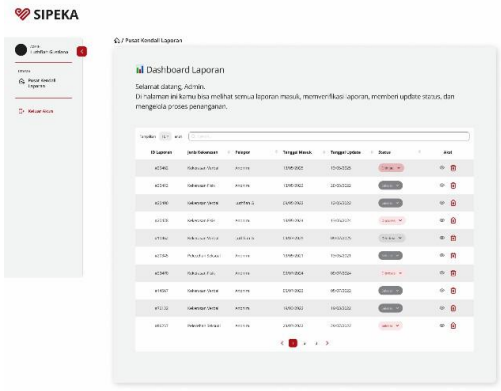

Fig. 4. User Interface Admin

Fig. 4 shows the Admin Interface Prototype, highlighting the reports dashboard.

D. Development

The approved designs were implemented into a functional system are 1). Frontend: React.js for responsive and dynamic interfaces; 2). Backend: Firebase for secure authentication and real-time database handling, 3). Media Storage: Cloudinary for secure, encrypted evidence storage.

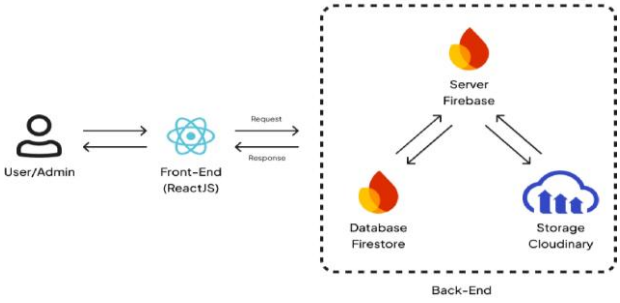

Fig. 5. System Architecture Diagram

Fig. 5 presents the System Architecture Diagram, showing the separation between user-side and admin-side processes to maintain confidentiality.

E. Test and Deployment

System testing produced the following outcomes:

- Blackbox Testing: 9 out of 10 functional scenarios passed, resulting in a 90% success rate, indicating the system met most functional specifications.
- Usability Testing: In Non-technical participants successfully submitted reports and tracked case status without significant difficulties.
- SUS Results: The Total number of respondents to these questionnaires is 41 participants. Using equation (1), the SUS score is calculated, and the values are,
  a. User Interface (36 participants): Average score of 82.43 (Excellent category).
  b. Admin Interface (5 participants): Average score of 79.5 (Good category).

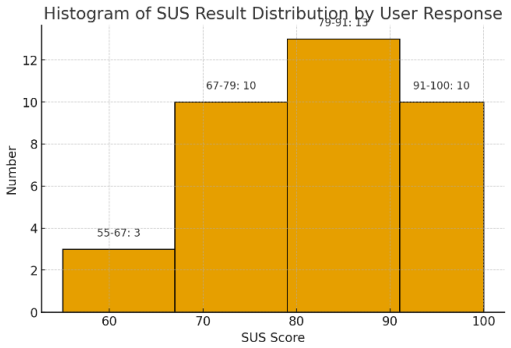

Fig. 6. A Histogram of SUS Result Distribution by User Response

Fig. 6 presents a histogram indicating that most of the data is clustered in the middle (around 79–91), with a little data on the lower side (55–67), and a moderate amount on the upper side (91–100).

Table 3. Descriptive Statistics of SUS Score

Descriptive Statistics	
Mean	82.43
Standard Error	1.96
Median	81.25
Mode	85.00
Standard Deviation	11.73
Sample Variance	137.67
Kurtosis	-0.52
Skewness	-0.20
Range	45.00
Minimum	55.00
Maximum	100.00
Sum	2967.50
Count	36.00
Confidence Level (95 %)	3.97

Table 3 shows that the SUS Scores observed in 36

cases ranged from 55 to 100. The total range between the highest and lowest scores was 45. The average SUS Score from a user perspective was 82.43, with the median of the sorted data being 81.25 and the most frequently occurring value being 85, indicating that the data were concentrated in the lower 80s.

Table 3 also shows that the standard deviation of 11.73 and the sample variance of 137.67 represent a moderate distribution of the data around the mean. The calculated standard error is 1.96, with a 95% confidence interval for the mean of approximately ±3.97, implying that the population mean likely lies between 78.46 and 86.40. The distribution shows a slight negative skew (-0.20), meaning the data are slightly skewed to the left, and a kurtosis of -0.52, indicating a somewhat flatter distribution (platykurtic) than a normal distribution. Overall, the data show that most observations are concentrated around the mean with moderate variability, a fairly symmetrical shape, and no extreme outliers.

To clarify the quantitative evaluation process, the mathematical procedures for each testing method are briefly described. The System Usability Scale (SUS) was calculated using the standard formula, where each item score was converted to a 0–4 scale. The scores from ten items were summed and multiplied by 2.5 to yield a value in the range of 0–100. This procedure resulted in an average score of 82.43 for the user interface and 79.5 for the admin interface.

For Blackbox Testing, the success rate was computed as the ratio of passed scenarios to the total number of test cases. Out of 10 scenarios, 9 were successfully executed, leading to a success rate of 90%. The one failed scenario was related to error handling on network.

These mathematical formulations ensure that the reported results are not only descriptive but also methodologically transparent and reproducible.

F. Maintenance

The maintenance plan includes routine updates, bug fixes, and feature enhancements based on user feedback. Security audits are also scheduled periodically.

IV. DISCUSSION

The results presented in Section III indicate that the developed system successfully meets both functional and usability requirements for a secure sexual violence complaint platform.

A. Usability and User Experience

The SUS scores achieved 82.43 for the user interface and 79.5 for the admin interface demonstrate that the system falls into the Excellent and Good usability categories, respectively. According to[16], a SUS score above 80 indicates excellent usability and a high likelihood of user adoption. This suggests that the interface design, navigation flow, and overall interaction experience are well-received by both reporters and administrators.

B. Accessibility and Process Transparency

The inclusion of real time case status updates increases transparency, a factor often cited in whistleblowing literature as crucial for maintaining user trust. The web-based nature of the system ensures broad accessibility without the need for specialized applications, which is particularly beneficial for institutions with limited technical resources.

C. Advantages Over Conventional Reporting

Compared to traditional in-person or email-based complaint handling, the developed system offers:

1. Faster report submission through structured digital forms.
2. Enhanced anonymity with optional identity disclosure.
3. Centralized case management for administrators.
4. Automated updates to keep users informed without requiring direct contact.

V. CONCLUSSION

This research successfully developed a website-based sexual violence complaint system integrated with a whistleblowing feature, using a combined Design Thinking and Software Development Life Cycle methodology. The approach allowed the system to be designed based on user needs while maintaining technical robustness and security.

Key findings from the research include:

a. The system meets the identified functional requirements, including anonymous reporting, evidence upload, case tracking, and secure case management for administrators.
b. Usability testing produced a System Usability Scale (SUS) score of 82.43 for the user interface (Excellent) and 79.5 for the admin interface (Good), indicating that the system is easy to use and well-received by its target users.

Limitations of this research include:

a. Usability testing was limited to participants from a single institution, which may affect generalizability. Therefore, the results presented should be considered as initial usability testing.
b. The system is currently available only in a web-based format and does not yet include a native mobile application, which may limit accessibility for some users.
c. Security testing was limited to functional and usability testing; advanced penetration testing was not conducted.

Future work is recommended to:

a. Expand testing across multiple institutions to validate broader applicability.
b. Develop a native mobile application to improve accessibility.
c. Conduct regular penetration testing and security audits to further strengthen data protection.

The results indicate that the developed system can serve as a secure, user-friendly, and effective platform for handling sexual violence complaints in higher education, and with further improvements, it can be adapted for wider institutional use.

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