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Article

Interface Design of Integrated Infectious Disease Screening Information System in the Teaching Factory for Health Innovation (V-Kes)

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Abstract: Communicable diseases such as Tuberculosis (TB), Dengue Hemorrhagic Fever (DHF), and HIV/AIDS remain major public health challenges in Indonesia, including Jember Regency. Data from the Central Bureau of Statistics and the Ministry of Health indicates an increasing trend in these diseases, emphasizing the importance of early detection through screening as a strategy to reduce transmission and mortality rates. This study creates an interface design that aims to create an infectious disease screening information system based on Artificial Intelligence (AI) that is not yet available in the Teaching Factory for Health Innovation (V-Kes) using the Rapid Application Development (RAD) approach. RAD was chosen because it allows rapid system development through continuous iterations and active user involvement. The research involves a multidisciplinary team from the fields of health, information technology, and management, while V-Kes functions as both an innovation laboratory and a real-world practice setting that integrates digital technology into community-based health services. The expected outputs of this research include scientific publications at national and international conferences, scientific posters, copyright registration of the information system, and a comprehensive final report. This interface design will later enable the developed system to accelerate the detection of infectious diseases, increase service efficiency, and enrich students' learning experiences through the Teaching Factory 4.0 concept. Moreover, this study contributes to strengthening local digital health systems and provides a replicable model for health technology development in other educational institutions.

Keywords: *Infectious disease screening; health information system; artificial intelligence; Teaching Factory; RAD*

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1. Introduction

Infectious diseases such as tuberculosis (TB), dengue hemorrhagic fever (DHF), and HIV remain major public health challenges in Indonesia, with Jember Regency notably ranking second in East Java for TB cases, reporting around 4,419 cases in 2024. TB control efforts in Indonesia have been supported by global health partnerships involving WHO, the Global Fund, and USAID, which aid in detection, case management, and adapting to pandemics like COVID-19; however, challenges persist in coordination and policy alignment [1]. High prevalence of multiple infectious diseases among Indonesian children is linked to factors such as poor hygiene practices, inadequate nutrition, and urban living conditions [2]. Infectious diseases like acute respiratory infections, pneumonia, diarrhea, and TB are widespread across Indonesian provinces, with diarrheal diseases being particularly prevalent and requiring prioritized intervention [3], [4]. Community-based health education programs that are culturally adapted and participatory have shown promise in improving awareness and preventive behaviors against infectious diseases in rural Indonesian districts [5]. Additionally, coinfections involving malaria, dengue fever,

and typhoid complicate diagnosis and treatment in endemic areas, underscoring the need for systematic diagnosis and intensive monitoring [6]. HIV cases in Jember are also quite high; cumulative data from 2002 to 2024 shows that approximately 8,000 HIV cases have been identified [7]. Meanwhile, regarding dengue fever, Jember is among the 10 regencies/cities in East Java with the highest number of dengue fever sufferers [8].

Integrated screening information systems significantly enhance early detection and management of infectious diseases by combining diverse health data sources and automating case identification. For example, China's integrated health big data platform (IHBDP) pooled medical records, immunization data, and administrative registries to detect dengue fever, tuberculosis (TB), and under-immunized migrant children more effectively than traditional methods [9]. Similarly, the IS-MiHealth digital tool in Spain increased screening rates and diagnostic yield for multiple infections including HIV, hepatitis, and TB among migrants by providing targeted recommendations based on patient characteristics [10]. In the UK, the Health Catch-UP! clinical decision support system improved multi-disease screening in primary care for migrants but highlighted the need for robust implementation strategies including staff training and financial incentives [11], [12]. Advances in point-of-care testing (POCT) integrated with Internet of Medical Things (IoMT) technologies enable rapid, on-site infectious disease diagnosis with real-time data transmission, facilitating timely treatment and outbreak containment [13]. Artificial intelligence (AI) and big data analytics further strengthen early warning systems by improving outbreak prediction and decision-making but require addressing challenges like data quality, transparency, and ethical concerns [14], [15]. Overall, digital transformation of integrated screening systems improves speed, accuracy, reporting, and evidence-based responses to infectious diseases.However, the effectiveness of an information system depends heavily on the user interface (UI) and user experience (UX). A well-designed interface can improve the system's usability, reduce input errors, and speed up workflow. A well-designed interface also generates more accurate data, supports clinical decision-making, and creates a positive user experience [16].

Based on the aforementioned issues, this study aims to design an interface for an infectious disease screening information system (DHF, HIV, and TB) in Jember Regency that meets user needs. This website-based screening system is part of the Health Department's teaching factory website, vkes.co.id. The hope is that the public will have unlimited access to the vkes.co.id website. The resulting system is also expected to accelerate the screening process, minimize cases of infectious diseases, and thus support infectious disease control efforts in Jember Regency.

Previous studies in Indonesia indicate that the development of health information systems for infectious disease screening is still largely **disease-specific**. The SIKRIBO mobile application has been shown to improve early TB screening performance and achieve good usability through a user-centered design approach; however, it is limited to TB cases only [17]. In the context of HIV, several mHealth applications have been developed to support education, prevention, and linkage to healthcare services, and these applications have proven effective in increasing user knowledge. Nevertheless, concerns related to privacy and data security remain significant obstacles to broader adoption. mHealth applications have shown effectiveness in supporting HIV education, prevention, and linkage to healthcare by improving adherence to pre-exposure prophylaxis (PrEP) and increasing HIV testing rates among key populations [18]. These tools are highly acceptable and widely used among men who have sex with men (MSM) in various countries, including Malaysia and Nepal, where smartphone ownership and internet access are high, facilitating engagement with HIV prevention content and services [19]. However, privacy and data security concerns remain significant barriers to broader adoption, especially in stigmatized populations; studies highlight the importance of ensuring confidentiality and addressing perceived risks to increase willingness to use mHealth apps [20]. mHealth interventions tailored for specific groups, such as adolescent girls and young women or female sex workers, show promise in improving PrEP

adherence and retention in care but require further optimization and evaluation for sustained impact [21], [22]. Peer-led cognitive behavioral therapy delivered via mHealth also demonstrates potential for improving antiretroviral therapy adherence among HIV-positive youth. Overall, while mHealth platforms enhance knowledge and preventive behaviors effectively, addressing privacy concerns and customizing interventions to user needs are critical for maximizing their reach and impact [20], [23].

Similarly, digital-based dengue fever surveillance systems implemented in several regions in Indonesia utilize web-based platforms and integration with DHIS2 to accelerate case reporting and identify high-risk areas. Although these systems contribute to improved disease monitoring, challenges such as delays in data entry and limited user-friendly features for field officers persist. Overall, existing research tends to address each infectious disease separately, highlighting the need for an **integrated screening information system** that combines DHF, HIV, and TB in a single, user-friendly platform to support effective disease control efforts in Jember Regency.

2. Materials and Methods

This study uses the Rapid Application Development (RAD) method as an overall system development approach. The RAD method was chosen because it accelerates the software development process through an iterative cycle that actively involves users in interface design. In RAD, user needs are accommodated through intensive user involvement from the beginning to the end of development. Users are directly involved in workshops, prototyping, and iterative evaluations. In contrast, SDLC (specifically the waterfall model) accommodates user needs through a formal and documented requirements analysis phase at the beginning of the project.

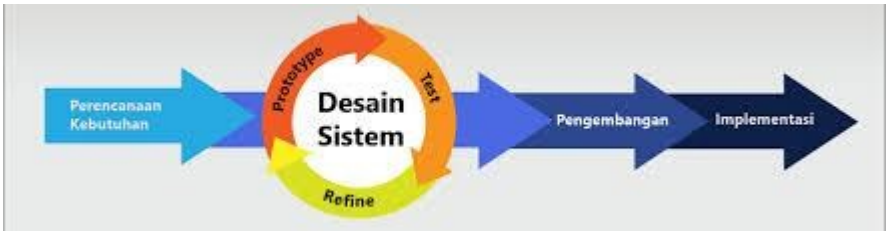


Figure 1. RAD Method

The RAD stages in this research include:

1.1 Requirements Planning
- Identifying the need for an infectious disease screening information system (DHF, HIV, and TB) in Jember Regency.
- Identifying variables for infectious disease screening information systems (DHF, HIV, and TB) in Jember Regency.

1.2 Prototype Design (User Design)
- Creating a design for an infectious disease screening interface (DHF, HIV, and TB) in Jember Regency using principles according to user needs.
- Initial prototypes are iteratively tested with potential users to obtain feedback.

1.3 Construction
- Develop web/mobile based information systems according to the agreed interface design.
- Integrates screening data input features as well as case visualization dashboards.
- Perform functional testing (black-box testing)

3.4 Implementation (Cutover)
- The system was tested on a limited basis at the Health Innovation Teaching Factory (Vkes)
- Provide guidance to users.

In creating the interface design for this research, the stages carried out were in the prototype design.

3. Results and Discussion

During the user interface design phase, development focused on user needs, who desired a system appearance aligned with the visual identity of the VKES logo. The VKES logo served as the primary reference for determining the color scheme, typography, and visual style to create consistency between the system's appearance and the brand image.

The primary color selection for the interface was adapted to the dominant color of the VKES logo to convey a professional, modern, and easily recognizable impression. Furthermore, the use of icons, buttons, and graphic elements was designed to follow the visual character of the logo, ensuring a harmonious interface that aligned with the organization's identity.



Figure 2. V-Kes logo

In terms of user experience, the layout of menus and interface components was simple and intuitive to facilitate user access to system features. A design consistent with the VKES logo is also expected to increase user trust and strengthen the overall system branding. Thus, the resulting interface design not only meets functional requirements but also represents the VKES visual identity in accordance with user preferences. The following are the results of the interface design for the infectious disease screening information system (DHF, HIV, and TB) in Jember Regency.

3.1 Landing Page



Figure 3. V-Kes landing page

This image displays the homepage interface design for V-Kes (Teaching Factory Inovasi Kesehatan), a digital platform for healthcare. This interface is designed to facilitate access to healthcare services, education, and medical data management through key features such as health information, consultations, training, and disease screening data processing. The interface design uses a modern, responsive, and user-friendly approach, with a fresh color combination that reflects professionalism in the healthcare sector.



Figure 4. V-Kes Health Check page

This image shows the interface design for the Health Check page on the V-Kes (Health Innovation Teaching Factory) digital platform. On this page, users are directed to select the type of health screening service they need. Three types of screening are available: Tuberculosis (TB) Screening, Dengue Fever (DHF) Screening, and HIV Screening.

Each screening service is presented in a card interface containing a title, a brief explanation of the purpose of the test, and a "Check Now" button for quick access. The visual design uses medical illustrations and disease-relevant icons, making it easy for users to identify the available screening options. The top of the page features a large headline, "Check Your Health," along with an illustration of a medical professional, reinforcing the digital healthcare service's professional and user-friendly image. Meanwhile, the bottom of the page features a footer with contact information, address, social media, and links to other services, promoting transparency and ease of communication with users. Overall, the design of this page shows how V-Kes presents digital solutions to support efforts to prevent and detect infectious diseases early through a simple, informative, and easily accessible interface for the public.

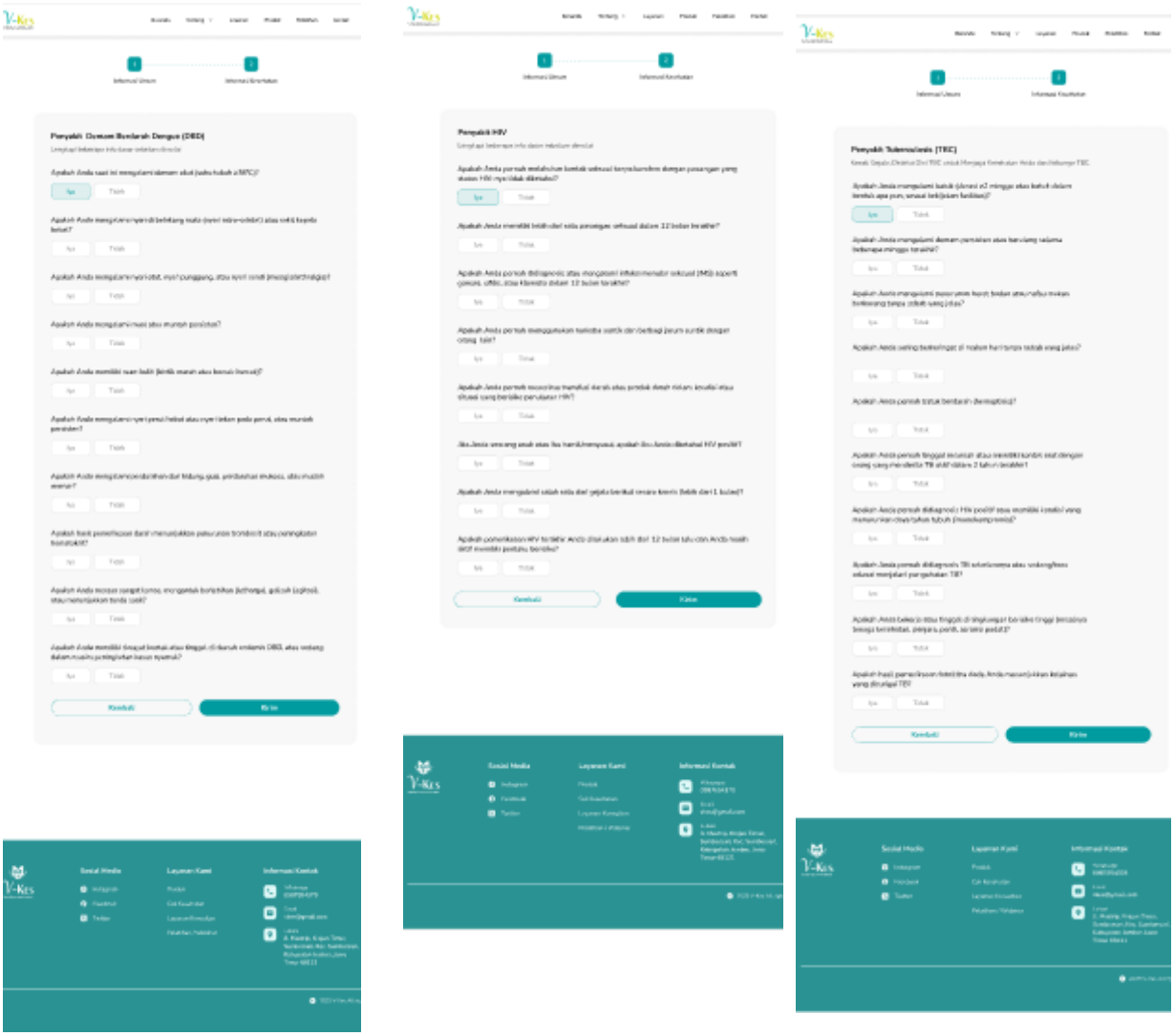


Figure 5. Desain infectious disease screening information system

The images above show the interface design for an infectious disease screening information system (DHF, HIV, and TB) in Jember Regency, developed through the V-Kes (Health Innovation Teaching Factory) platform. This system consists of three main services: Tuberculosis (TB) screening, Dengue Fever (DHF) screening, and HIV screening, designed for early disease detection based on digital technology. Each screening page is structured as an interactive questionnaire containing structured questions about symptoms and risk factors relevant to a specific disease. For example, in TB screening, questions cover symptoms such as coughing for more than two weeks, night fever, weight loss, and history of contact with someone with TB. In dengue fever screening, questions cover a history of high fever, muscle or joint pain, red spots on the skin, and complaints of headaches. Meanwhile, HIV screening focuses on risk factors for transmission, such as a history of unprotected sex, use of unsterile needles, and a history of blood transfusions.

Answers are provided in a simple "Yes" or "No" format, making it easy for users to complete. At the end of each page, there are "Back" and "Submit" buttons, allowing users to navigate and submit their screening results directly. These screening results are expected to serve as a basis for users to receive follow-up recommendations, such as medical consultations or further examinations. In terms of design, the entire interface uses a minimalist and responsive approach, with a white background for the questionnaire area to enhance readability, and the distinctive green and blue accents of the V-Kes

identity, emphasizing a professional, clean, and user-friendly feel. The footer of each page also provides contact information, services, and social media links for additional communication with the service provider.

Overall, this screening page design demonstrates how V-Kes integrates digital technology with questionnaire-based health instruments to improve public access to early detection of infectious diseases. Through this approach, V-Kes is expected to contribute to prevention efforts, education, and the improvement of public health services more effectively and efficiently.

4. Conclusion

This study contributes to the development of digital health screening by demonstrating how a user-centered and iterative approach can support the design of an integrated infectious disease screening information system. Through the application of the Rapid Application Development (RAD) method, this research emphasizes active user involvement as a key factor in ensuring that the system aligns with real operational needs within the V-Kes (Health Innovation Teaching Factory) environment. The main contribution of this research lies in providing a conceptual and practical foundation for integrating multiple infectious disease screenings—Tuberculosis, Dengue Hemorrhagic Fever, and HIV—into a single digital platform. Such integration has the potential to improve early detection processes, streamline data collection, and support more timely decision-making in public health services, particularly at the local level.

Furthermore, this study highlights the role of interface design as a strategic component of digital health systems, not merely as a visual element but as an enabler of usability, efficiency, and user acceptance. The findings suggest that a well-aligned interface can strengthen trust and encourage broader adoption of digital screening tools by both health workers and the community. Overall, the proposed interface design serves as a replicable model for the development of digital screening systems in educational and healthcare institutions. It supports the broader implementation of digital health transformation and contributes to strengthening community-based infectious disease control efforts in Indonesia.

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