

Anaceting Mobile Health Application: An Innovative Digital Solution for Early Stunting Detection in Indonesian Children

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Abstract: Stunting is a complicated public health problem in Indonesia, with a countrywide rate of 21.5% in 2023. Puskesmas Rejosari in Pekanbaru City had the most stunting instances, with 50 out of 239. This shows that new ways are needed to find stunting cases early and teach people in the community about it. The goal of this study is to create the ANACETING (Stunting Prevention Information Application) Android app as a digital tool for finding stunting in toddlers early. The study is at the fourth stage of the Research and Development (R&D) approach and includes 30 mothers of toddlers as test subjects. A panel of media and material experts conducted validation using a structured questionnaire with 22 items on a Likert scale instrument. The app contains tools for measuring growth, interactive educational content, guidelines for supplementary feeding, immunization schedules, and a space for individuals in the community to chat about topics. The media expert gave it a score of 4.00 (in the "Feasible" category), while the content expert gave it a score of 4.00 with a content validity grade of 0.80. The user trials showed a satisfaction score of 4.20 and a System Usability Scale score of 82.5 (category "Very Feasible"). The job completion rate was 96%, and the user retention rate was 87%. The ANACETING software has shown to be a good digital learning tool since it is easy to use, works on a lot of Android devices, and can be used offline. Women may learn more about stunting and support community-level initiatives to stop it by using the app. This research helps Indonesia's digital health technology expand by employing a strategy that may work in any part of the nation.

Keywords: Android application; Digital health; Early Detection; Stunting; Toddler.

Introduction

Stunting is one of Indonesia's most difficult and serious public health issues, particularly for kids under five (Jayanti et al., 2021; Suratri et al., 2023; Yusriadi et al., 2024). The age group under three years old is very essential since it is the "golden period" for growth and development (Onis & Branca, 2016). The World Health Organization (WHO) says that this condition signifies that a child's height is more than two standard deviations below the average height for their age. This

signifies that they aren't growing properly since they've been living in horrible conditions and not getting enough food for a long time.

The number of individuals in Indonesia who are stunted is going down, which is a positive indicator, but it has to go down quicker to reach the national objective. The most current information from the Indonesian Nutrition Status Survey (SSGI) reveals that the rate of stunting in the country went from 24.4% in 2021 to 21.6% in 2022. Further data shows that the stunting prevalence dropped to 21.5% in 2023, but this figure still falls short

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of the ambitious target set in the National Medium-Term Development Plan (RPJMN) 2020–2024, which is a stunting prevalence of 14% (Laksono et al., 2024). Although this decrease provides hope and demonstrates the effectiveness of the implemented intervention programs, a more massive acceleration is needed to achieve the set targets.

In the global context, Indonesia still faces significant challenges in addressing stunting. Research by Siramaneerat et al. (2024) shows that the prevalence of stunting in Indonesia varies significantly between urban and rural areas, with disparities reflecting the complexity of social, economic, and geographical factors affecting children's nutritional status. A comprehensive study identified that factors such as the child's age, birth weight, maternal nutritional status, and place of residence are the main determinants of stunting occurrence in children aged 24–59 months (Siramaneerat et al., 2024).

The analysis by Fentiana et al. (2022) on 165 districts and cities in Indonesia where stunting rates are 30% or higher identified important factors that can be targeted for improvement. The research shows that antenatal care (ANC) services at the district/city level can reduce stunting rates by 2.56%, contraceptive use by 2.25%, and handwashing with soap by 5.76%. Together, these three variables lower the rate of stunting by 18.18%, showing how important it is to take a multisectoral approach to the problem.

Torlesse et al. (2016) did further study that shows how important the water, sanitation, and hygiene (WASH) sector is for lowering stunting. The research indicated that children who lived in homes that drank unclean water and didn't have enough sanitary facilities were more than three times as likely to be stunted. These results show that stunting therapies need to use a whole-person strategy that includes not just nutrition but also basic infrastructure and good hygiene.

To address the complexity of the stunting issue, the Indonesian government has launched various strategic and comprehensive policies (Sunarya, 2023). The National Strategy for the Acceleration of Stunting Prevention 2018–2024 is the main plan that guides how to carry out stunting prevention programs by working together across different sectors. This strategy implements five main pillars: political commitment and leadership, national campaigns and behavior change communication, convergence of central-regional-community programs, food and nutrition security, and monitoring and evaluation. The implementation of the program includes specific nutritional interventions targeting pregnant women and toddlers aged 6–23 months, such as anemia screening, distribution of nutritious supplementary food, provision of iron tablets,

and regular and continuous monitoring of child growth and development.

At the regional level, the city of Pekanbaru has shown very encouraging progress and has become a best practice model in addressing stunting. Data shows a very significant decrease in stunting prevalence from 16.8% in 2023 to 8.7% in 2024, far exceeding the national target and even achieving an ambitious target. This extraordinary success is supported by a strong commitment from the local government with a substantial budget allocation of Rp 42.03 billion, detailed in 16 strategic programs and 17 specific activities, including the provision of additional nutritional intake, comprehensive health services for pregnant women and children, as well as innovative programs such as the Stunting Foster Parent Program (BAAS).

However, behind the aggregate success of Pekanbaru City, there remains a significant geographical disparity in the distribution of stunting cases. Based on the comprehensive report from the Pekanbaru Health Office in 2024, the Rejosari Health Center in the Tenayan District recorded the highest number of stunting cases, with 50 children out of a total of 239 cases across all health centers in the city, or approximately 20.9% of the total cases. The high concentration of cases in this area makes it a priority locus in the accelerated stunting reduction program, requiring a special approach and more intensive interventions.

In-depth investigations through structured interviews with healthcare workers and focus group discussions with mothers of toddlers in the Rejosari Health Center area revealed complex and multidimensional root problems. The main findings indicate a significant knowledge gap among mothers regarding the concept of stunting, risk factors, and the importance of optimal feeding practices during the first 1000 days of life (1000 HPK). The low health and nutrition literacy is in line with research findings that emphasize that maternal knowledge and attitudes are key determinants in the prevention of stunting. In response to these challenges, healthcare workers at Puskesmas Rejosari have developed various innovative intervention programs, with a primary focus on strengthening the role of posyandu cadres as the front line in community education.

The optimization program for posyandu cadres aims to raise community awareness about the importance of adequate and quality nutrition intake, as well as to facilitate an effective early detection system for signs of stunting in toddlers. Implementation is carried out through a comprehensive and participatory approach, including intensive counseling with methods tailored to the characteristics of the local community,

structured home visits, and socialization involving various elements of the community.

Although these efforts demonstrate a high level of commitment, program evaluations indicate that there are still significant obstacles that must be addressed to achieve optimal effectiveness. The main challenges identified include limitations in delivering effective and engaging education, the still limited reach of information, especially for communities in peripheral areas, and the lack of practical tools that mothers can use for self-monitoring their children's growth. This condition demands innovation in the methods of delivering information and education that are more accessible, engaging, and user-friendly, especially in the context of the rapidly evolving digital era. Early detection of stunting in infants and toddlers is a fundamental component of an effective prevention strategy, yet its implementation still faces various systemic obstacles. In the context of the ongoing digital transformation, the use of Android-based mobile technology has proven to be an effective and scalable solution for improving public health and nutrition literacy.

Bagus & Romli (2024) looked at the "Mobile Health Monitoring Application" and showed how useful mobile technology can be for finding stunting early. Using the waterfall approach to make the app led to seven primary sections that let you fully track a child's progress. Based on input from 50 early adopters, the software had a 95% success rate for functionality and an 85% satisfaction score for users. Also, the review of the mobile health app reveals that child growth monitoring is happening more often, by as much as 40%, and that growth concerns are being found earlier, by as much as 30%. If extensively employed, implementation models suggest that stunting prevalence might drop by 5% over the course of three years. These results show that mobile health technology might make a big difference in programs that stop stunting, especially in Indonesia, where smartphones are quite common and the internet infrastructure is becoming stronger.

Based on the thorough examination of the problems mentioned, it is very important to come up with new ways to help the stunting eradication program in Indonesia that are both preventative and promotional. To solve this problem, the researchers started working on "ANACETING (Stunting Prevention Information Application)," a new digital technology based on Android that was intended to be a complete early detection and teaching tool for stunting. This software is important and useful for Puskesmas Rejosari since stunting is quite common in the region and they need a solution that can reach a lot of people quickly and easily.

The ANACETING platform is developed with a user-centered design approach that integrates easy access to information, interactive education, and practical tools for monitoring child growth. This application is expected to enhance mothers' awareness and ability to independently recognize the early signs of stunting, thereby enabling the implementation of earlier and more targeted intervention actions. Furthermore, this application is designed to synergistically support the programs implemented by Puskesmas Rejosari and the Pekanbaru City Government in achieving the established stunting elimination targets, in line with the vision of Indonesia Gold 2045, which prioritizes the development of quality human resources as the main focus of national development.

Method

Research Design

This research uses a research and development (R&D) approach with a development model adapted from Kainulainen (2023) at the fourth stage, which includes initial product development, expert validation, product revision, and limited testing. The R&D approach was chosen because it is suitable for the development of innovative technology products in the health field that require systematic validation and evaluation (Hamzah, 2019; Kainulainen, 2023). This model has proven effective in the development of mobile health applications for early detection of health issues, as demonstrated in similar research by Bagus & Romli (2024), who developed a health monitoring application with a functionality success rate of 95%.

The researchers used a validated questionnaire to evaluate how well the product works, how easy it is to use, and the quality of its content, while they analyzed the data using simple descriptions and statistical methods. The researchers developed a new product in the form of a mobile application, carried out prototype creation, and tested its effectiveness through collaboration with an experienced information technology (IT) team in the development of digital health applications. The result of this research is the Stunting Prevention Information Application named ANACETING, which is designed by integrating the principles of user experience (UX) design and evidence-based health education (Nielsen & Budiu, 2013).

The research's location and time

We chose the Rejosari Health Center in Pekanbaru City for this study because early surveys and secondary data showed that this area has the highest rate of stunting. According to the Pekanbaru City Health Office report from 2024, there were 50 cases of stunting out of

a total of 239 cases across all city health centers (Pekanbaru Health Office, 2024). The choice of this site is also backed up by the fact that it is easy to go to for researchers and that local healthcare staff are prepared to work together to put new digital health technologies into use. The study will last six months, from March to August 2024. It will be split into four phases: requirements analysis (1 month), application creation (3 months), validation and testing (1 month), and assessment and finalization (1 month).

Population and Sample

Target Population

This study's participants are moms of toddlers (12 to 36 months old) who live in the region served by the Rejosari Health Center in Pekanbaru City. The toddler age group was chosen because it is a key time in a child's growth and development when nutrition and stimulation may have the most effect on stopping stunting (Stewart et al., 2013).

Research Sample

The sample in this study consists of mothers with toddlers (aged 12 to 36 months), with a total of 239 respondents determined using the Slovin formula with a confidence level of 95% and a margin of error of 5% (Hamzah, 2019). This sample size also refers to similar research by Siramaneerat et al. (2024) which used a representative sample for the evaluation of digital health applications.

Sampling Technique

The sampling method employed is purposive sampling, which means that samples are chosen based on certain factors or characteristics that are important to the study goals (Fetters et al., 2013; Wisdom & Creswell, 2013). To be included, moms must: have children between the ages of 12 and 36 months; be patients at Puskesmas Rejosari; possess an Android smartphone; be able to read and write; and be willing to take part in the study. Some reasons for not being able to participate are: women with children who have congenital illnesses; not being cooperative throughout the study procedure; and moving during the research time.

Research Instruments and Tools

Technology Devices

The tools and materials used in this research include hardware and software necessary for the design of the Stunting Prevention Information Application (ANACETING). The specifications of the development tools adhere to industry standards for mobile health applications, including Android Studio as the Integrated Development Environment (IDE), SQLite database for

local data storage, and React Native framework for cross-platform performance optimization (Bagus & Romli, 2024).

Data and Educational Materials

The data included includes the rate of stunting at Puskesmas Rejosari and information from an initial survey regarding how much moms already knew about stunting. The application included educational materials that were made according to the World Health Organization (WHO) and the Indonesian Ministry of Health's guidelines. These materials cover a wide range of topics, such as stunting, its causes, its short- and long-term effects, ways to find it early, and ways to prevent it based on evidence (WHO, 2019).

Anthropometric Measurement Tool

The anthropometric testing tools used have been calibrated and meet WHO standards, including: [1] A structured questionnaire to record respondents' identities and measure mothers' knowledge and understanding before and after using the application, [2] A digital scale with a capacity of 150 kg and an accuracy of 0.1 kg to measure the weight of toddlers, [3] An infantometer with an accuracy of 0.1 cm to measure the length of babies aged 0–24 months in a supine position, and [4] A portable stadiometer with an accuracy of 0.1 cm to measure the height of children over 24 months in a standing position.

Data collection technique

This study uses a data triangulation method that combines quantitative and qualitative approaches to obtain comprehensive data (Creswell & Creswell, 2017). Data collection was carried out through three main techniques: structured interviews with key informants (Rejosari Health Center health workers, integrated health post cadres, and mothers of toddlers) to understand the specific needs and expectations of mobile health applications; systematic participant observation to identify usability issues, usage patterns, and technical barriers during application implementation; and a validated questionnaire developed based on the adaptation of Bengkalis State Polytechnic research (2024) and has gone through a content validity ratio (CVR) validation process by a panel of 7 experts in the field of public health and nutrition information technology.

Data Analysis

This study uses a mixed methods approach with quantitative analysis through conversion of product feasibility scores using a 5-point Likert scale (1 = Strongly Disagree to 5 = Strongly Agree), where descriptive statistics (mean, median, standard deviation)

and parametric paired t-test are used to compare the pre-test and post-test scores of respondents' understanding, with the application feasibility criteria set at a minimum of 80% of all questionnaire criteria according to digital health application evaluation standards, and if not met, systematic revisions will be carried out based on the priority of validator and user feedback. Meanwhile, qualitative analysis uses content analysis techniques with an inductive approach to analyze interview and observation data to identify key themes related to user experience, implementation barriers, and recommendations for improvement (Braun & Clarke, 2023).

Result and Discussion

ANACETING Application Development Results

This research produces an innovative product in the form of the Stunting Prevention Information Application (ANACETING), an Android-based digital platform specifically designed for early detection of stunting in toddlers with a user-centered design approach and evidence-based content. This application has gone through a systematic development process using the Research and Development (R&D) methodology and has proven to be suitable for use as an educational medium and practical tool for early detection of stunting at the community level (Bagus & Romli, 2024). ANACETING is packaged with an intuitive interface design and attractive interactive features, specifically designed to increase the involvement of mothers of toddlers in using the application and ensure that the educational material presented is easy to understand by target users. The visual design of the application adopts the principles of mobile usability proposed by Nielsen & Budiu (2013), taking into account local user characteristics and local cultural contexts.

Technical Characteristics of the Application

ANACETING has significant technical advantages in terms of accessibility and performance. This application is user-friendly because it can be downloaded and operated on various types and series of Android devices with minimum specifications of Android 7.0 (API level 24), providing broad compatibility for users with various economic levels. The optimal application size (<50 MB) makes ANACETING not take up much space on the user's gadget's internal memory, overcoming the constraints of limited storage that are often an obstacle to the adoption of mobile health applications in developing countries (Bagus & Romli, 2024).

In addition, the ANACETING application has been optimized for efficient battery power usage through the

implementation of lazy loading for multimedia content and an efficient caching mechanism for frequently accessed data. The offline mode feature allows users to access basic educational content without an internet connection, overcoming the challenges of digital infrastructure in areas with limited connectivity. With these various technical advantages, it can be concluded that the ANACETING application meets the usability and accessibility criteria required for large-scale implementation in a community environment.

Analysis of Local Needs and Context

Demographic and Epidemiological Profile of the Target Area

Based on field observation data and situational analysis that have been carried out, the material and functionality of the ANACETING application are specifically aimed at mothers who have toddlers based on the inclusion criteria that have been set and adjusted to the level of needs and cognitive abilities of mothers of toddlers in the Rejosari Health Center area of Pekanbaru City. The selection of this target area was based on epidemiological data showing that the highest stunting rate in Pekanbaru City was in the Rejosari Health Center area, with 50 cases out of a total of 239 cases in all health centers in the city.

Knowledge Gap and Implementation Challenges

The results of the baseline assessment revealed that the majority of mothers with toddlers in the target area still had limited understanding of the concept of stunting, risk factors, and early detection methodology. This finding is in line with research by Siramaneerat et al. (2024) which identified disparities in health knowledge between urban and rural areas in Indonesia. The demographic profile shows that most mothers of toddlers in this area are still relatively young (20-30 years), indicating the need for an educational approach that is tailored to the characteristics of the digital native generation.

Analysis of the local health system shows that stunting education media from the Rejosari Health Center is still dominated by conventional counseling with a one-way communication approach. This limitation results in low levels of information retention and lack of active involvement from the target audience. In addition, geographical accessibility constraints and inflexible schedules cause low awareness of mothers to come to health facilities such as integrated health posts regularly.

Justification for Developing Digital Solutions

Based on a comprehensive analysis of the problems identified in the field, researchers developed an innovative concept in the form of an information application and early detection of stunting as a

preventive and promotive effort in the movement to prevent and reduce stunting rates in the Rejosari Health Center area of Pekanbaru City. The digital health approach was chosen based on evidence from the research of Bagus & Romli (2024) which showed the effectiveness of mobile health applications in increasing knowledge retention and behavioral changes related to children's health.

System Architecture and Design

User Interface Design and Navigation Flow

The ANACETING application design was developed with a focus on optimizing the user experience through intuitive menu relationship design and logical navigation flow. The display design is based on the principles of human-computer interaction to facilitate the navigation structure and minimize the user's cognitive load (Nielsen & Budiu, 2013). The application information architecture is designed with a hierarchical structure approach that allows users to access information with a maximum of 3 touches for the main content.

The ANACETING application flowchart is designed with a decision tree algorithm that considers various usage scenarios and possible user journeys. The application workflow integrates input of child anthropometric data, processing using WHO growth standards, and output in the form of interpretation of nutritional status and personalized follow-up recommendations.

Application Components and Features

The ANACETING application consists of several main modules designed in a modular manner to allow for scalability and ease of maintenance. Each feature is developed based on user needs identified through a participatory design process involving end users in the conceptualization stage.

The authentication system uses secure security protocols with data encryption implementation to protect the privacy of user information (Hazra et al., 2024; Soni & Singh, 2021). The registration process is designed to be user-friendly with minimal required fields to reduce the cancellation rate during the onboarding process. The main dashboard provides an overview of child growth status with visual indicators that are easy for non-technical users to understand. The monitoring module integrates growth chart plotting based on WHO Child Growth Standards with an automated alert system for indications of stunting risk.

Educational content modules include evidence-based articles, interactive learning videos, and infographics curated by nutritionists and pediatricians. Content is presented in a multimedia format with a

progressive disclosure approach to accommodate various levels of user literacy.

Nutrition Guide and Complementary Food Guide feature for breast milk Module (MPASI Menu)

The Complementary Food Guide feature for breast milk provides recommendations for complementary food menus that are tailored to the child's age, availability of local ingredients, and considerations of local eating culture. The recipe database was developed in consultation with nutritionists to ensure nutritional adequacy and acceptability.

Community Engagement Platform (Discussion Room)

The discussion platform facilitates peer-to-peer learning and support systems among mothers of toddlers. This feature is moderated by health workers to ensure quality control of information and prevent the spread of health misinformation.

Application Validation and Evaluation

Instrument validity testing was conducted through expert judgment involving a multidisciplinary panel of experts to assess the extent to which the instrument and application were in accordance with the research objectives and digital health application quality assurance standards. The panel of experts consisted of senior lecturers from the Computer Engineering Department of Riau Islamic University with expertise in mobile application development and human-computer interaction, as well as pediatricians with experience in digital health implementation.

Validation of the media aspect was conducted by experts with a focus on evaluating the feasibility of the application media from the perspective of technical performance, user interface design, and system usability. Evaluation data were obtained through a structured questionnaire developed based on an adaptation of the Mobile Application Rating Scale (MARS) and has been adjusted to the context of children's health applications (Stoyanov et al., 2015).

The evaluation questionnaire consisted of 22 instrument items using a 5-point Likert scale (1 = Strongly Disagree to 5 = Strongly Agree), with a distribution of 15 items for the visual appearance aspect (visual design, layout consistency, color scheme, typography) and 7 items for the programming quality aspect (functionality, performance, security, compatibility). After conducting descriptive statistical analysis, the average score of media expert assessment on the ANACETING application was 4.00 (SD=0.45). Based on the established interpretation criteria, the ANACETING application is categorized as "Feasible" with a value interval of 61-80% (80% of the maximum score).

Although the application has reached the "Feasible" category, several recommendations from media experts indicate the need for minor improvements, especially in terms of optimizing loading speed for multimedia content and improving accessibility features for users with disabilities. Revisions and improvements were made based on feedback that was prioritized before the user trial stage.

Validation of Educational Material and Content

The validation test by material experts aims to assess the feasibility of the application in terms of content accuracy, pedagogical approach, and the appropriateness of the language used. The validation process was carried out by a pediatrician at DR. RUBINI Mempawah Hospital with credentials in pediatric nutrition and growth monitoring, to ensure the scientific validity of the educational content in the application.

The material evaluation instrument uses the content validity index (CVI) approach with a focus on relevance, clarity, simplicity, and ambiguity of the content. After conducting content analysis, the average score of the material expert assessment was 4.00 (CVI=0.80), indicating that 80% of the content was considered very relevant and scientifically accurate. The percentage of eligibility according to the material expert shows that the ANACETING application is in the "Feasible" category with a value interval of 61-80%.

Recommendations from material experts mainly focus on improving visual aids for technical explanations, simplifying medical terminology to improve understanding, and adding examples of local foods in the MPASI guide module. Content revisions were made by maintaining scientific accuracy while increasing accessibility for the target demographic.

Table 1. Revision Based on Media Expert Feedback

Aspects	Identified Issues	Implementation Solutions	Status
Performance	Video content loading time >5 seconds	Implementation of progressive loading and video compression	Completed
Navigation	Inconsistent back button behavior	Standardization of navigation patterns across modules	Completed
Accessibility	Lack of screen reader support	Addition of alt-text and ARIA labels	Completed
Visual Design	Color contrast ratios below WCAG standards	Adjustment of color palette for compliance	Completed

Table 2. Revision Based on Feedback from Subject Matter Experts

Aspects	Identified Issues	Implementation Solutions	Status
Content Accuracy	Some guideline references are outdated	Update with WHO Growth Standards 2023	Completed
Language Appropriateness	Medical terminology is too complex	Simplification with addition of glossary	Completed
Cultural Relevance	Examples of MPASI lack local context	Addition of traditional Indonesian baby food recipes	Completed
Educational Approach	Lack of interactive learning elements	Integration of quizzes and self-assessment tools	Completed

User Trial and Usability Testing Pilot Testing Implementation

User trials are the empirical implementation stage of the revised ANACETING Application based on input from a panel of experts. The main purpose of pilot testing is to assess the feasibility of the ANACETING application in real-world conditions by involving real end users in a natural usage environment (Bagus & Romli, 2024; Guinard, 2011).

Pilot testing was conducted on a purposive sample consisting of 30 mothers with toddlers in the Rejosari Health Center area, Pekanbaru City, selected based on demographic representativeness criteria and variations in digital literacy levels. Implementation used a mixed-methods approach by combining quantitative usability metrics and qualitative feedback through semi-

structured interviews (Dupin & Borglin, 2020; Khairat et al., 2019).

User Evaluation Results

Quantitative data analysis yielded an average user satisfaction assessment score of 4.20 (SD=0.38) on a 5-point Likert scale. This result indicates a high level of user satisfaction and is in line with the findings of a study by the Bengkalis State Polytechnic (2024) which reported a user satisfaction level of 85% for similar mobile health applications.

Based on the system usability scale (SUS) assessment, the ANACETING application scored 82.5, which is included in the "Very Eligible" category with a value interval of 81-100%. This score indicates that the application has excellent usability and can be adopted

with a minimal learning curve by the target demographic.

Key performance indicators evaluated included: Task completion rate: 96% (29 out of 30 users successfully completed the core task); Error rate: 4% (average of 0.8 errors per user session); Task completion time: average of 3.2 minutes to complete the core

workflow; and User retention: 87% of users engaged in repeat use within the 2-week testing period. While the app was rated as "Very Good," qualitative feedback identified several areas for improvement, including improving the search function, adding notification customization options, and integrating with social media platforms for community building.



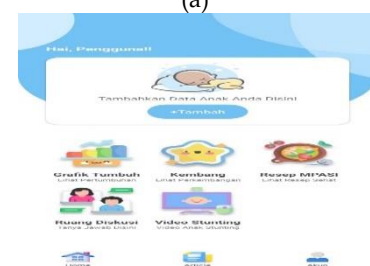
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(b)



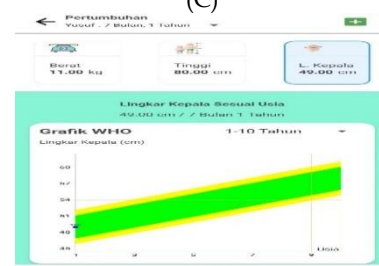
(c)



(d)



(e)



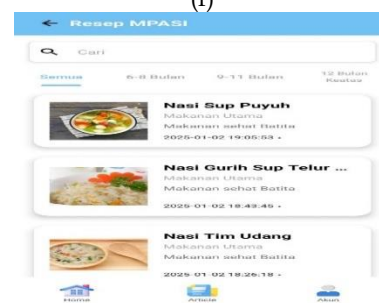
(f)



(g)



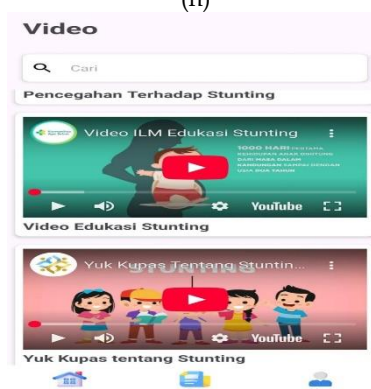
(h)



(i)



(j)



(k)

Figure 1. the final ANACETING application: (a) Opening Page; (b) Login Page; (c) Account Registration Page; (d) Home Page; (e) Child Data Page; (f) Child Growth Chart; (g) Child Growth and Development; (h) Stunting Articles; (i) Menu Food substitutes for breast milk; (j) Discussion Room; and (k) Discussion Room Educational Video Stunting

Iterative Development and Revision Process *Expert Feedback-Based Improvement Cycle*

The ANACETING app development process followed an iterative design methodology by implementing continuous improvements based on structured feedback from stakeholders. The app was revised in one major iteration after consolidating input from the expert validation and user testing phases.

Final Product Review

The final product review of the ANACETING application represents the result of a comprehensive development process that has undergone rigorous validation and iterative improvements. This final application is a synthesis of research findings, expert recommendations, and user feedback integrated through a systematic development approach involving a multidisciplinary team including researchers, IT specialists, and health professionals.

The final version of the ANACETING application is intended for several user segments, including mothers with toddlers as primary users, posyandu cadres as community health workers, and health workers as professional users with additional administrative functionality. Multi-level access control allows for personalization of the experience based on the user's role and responsibilities.

The final application interface features a clean design with improved visual hierarchy, enhanced navigation flow, and optimized content presentation based on user feedback. Integration with backend systems enables data synchronization and reporting capabilities for monitoring program effectiveness at the health center level.

Discussion and Implications

Contribution to the Digital Health Ecosystem

The development of the ANACETING application makes a significant contribution to the digital health ecosystem in Indonesia, particularly in the domain of maternal and child health (Mediani, 2020). This application represents a successful adaptation of global best practices in mobile health with consideration of local context and cultural specificities (Mulyaningsih et al., 2021; Siramaneerat et al., 2024).

From a technological perspective, ANACETING demonstrates the feasibility of developing a health application with resource constraints typical of developing countries, while maintaining quality standards comparable to international applications. Identified success factors include stakeholder engagement, an iterative development approach, and a focus on user-centered design principles.

Potential Impact and Scalability

Based on the results of pilot testing and expert evaluation, the ANACETING application has the potential to provide measurable positive impacts on increasing knowledge and changing behavior related to stunting prevention. Projections based on usage metrics and user feedback indicate a high potential adoption rate if implementation is carried out with proper change management strategies. Scalability analysis shows that the application can be adapted for implementation in other health centers with minimal customization needs. The modular architecture and flexible content management system allow for localization for different geographic areas with varying cultural contexts and local food availability.

Conclusion

This study successfully developed the ANACETING (Stunting Prevention Information Application) application based on Android which has proven to be feasible and effective as a digital solution for early detection of stunting in toddlers at the Rejosari Health Center in Pekanbaru City. The application developed through the fourth stage of Research and Development (R&D) methodology has superior technical characteristics with wide compatibility on Android devices, optimal file size (<50 MB), efficient battery usage, and offline capabilities that overcome the limitations of digital infrastructure. Validation by a panel of experts showed the feasibility of the application with a score of 4.00 on a scale of 5.0 for media and material aspects, while user trials resulted in a satisfaction level of 4.20 and a System Usability Scale of 82.5 which is categorized as "Very Feasible" with a task completion rate of 96% and user retention of 87%. The implementation of the ANACETING application has made a significant contribution to the digital health ecosystem in Indonesia by providing a comprehensive platform that integrates child growth monitoring, evidence-based educational content, contextual MPASI guidelines, immunization reminder systems, and community discussion platforms. This application has the potential to increase mothers' knowledge and awareness of stunting, support early detection through easy-to-use tools, and strengthen stunting prevention programs at the community level. With a modular architecture and flexible content management system, the ANACETING application can be adapted for implementation in other regions with minimal customization needs, providing opportunities for national scalability in supporting the target of reducing Indonesia's stunting prevalence to 14% according to the 2020-2024 RPJMN.

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