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# NutriTalk: Nutrition Intervention by Experts to Reduce the Impact of Stunting Through Mobile-Based Applications Using Agile Method

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**ABSTRACT** The prevalence of childhood stunting, a pervasive global health concern primarily attributed to persistent malnutrition, underscores an urgent need for intervention. In Indonesia, where stunting rates are alarmingly high, with approximately 27.6% of children under five affected, innovative solutions are imperative. This study introduces "Nutri Talk," a mobile application developed using Agile Methodology to revolutionize nutritional consulting services. The application facilitates seamless communication with nutrition specialists, offering evidence-based information and personalized consultations to empower parents in making informed dietary decisions for their children. The application demonstrates robust functionality and user satisfaction through rigorous testing, including Boundary Value Analysis (BVA) and User Acceptance Testing (UAT). "Nutri Talk" stands poised to mitigate the long-term impacts of stunting, leveraging technology to enhance nutritional outcomes. This research advocates for a comprehensive approach to combat stunting, combining mobile technology advancements with targeted interventions, ultimately contributing to improved childhood nutrition and development.

**INDEX TERMS** childhood stunting, Agile Methodology, nutrition consulting, Boundary Value Analysis (BVA), User Acceptance Testing (UAT)

## I. INTRODUCTION

In recent times, the global health community has grappled with a pervasive and profoundly concerning issue: stunting in young children. This phenomenon, characterized by hindered growth and developmental delays, arises predominantly from persistent malnutrition, casting a long shadow over the potential and well-being of affected individuals [1]. Alarmingly, recent data from the World Health Organization (WHO) reveals that a staggering 22% of children under the age of five worldwide, equating to approximately 149 million young lives, experience this form of impaired growth, commonly referred to as stunting [2]. This sobering statistic underscores the critical need for concerted efforts to address this widespread problem, which not only hinders physical development but also impedes cognitive growth in countless children around the globe [3].

Within the specific context of Indonesia, a nation of paramount concern, the prevalence of stunting emerges as a particularly pressing issue. The 2020 Indonesian Ministry of Health report paints a stark picture, indicating that 27.6% of children under five grapple with stunted growth in this region [4]. This places Indonesia among the nations with the highest childhood stunting burdens globally [5]. The enduring nature of this challenge can be attributed to a complex interplay of factors, ranging from inadequate access to essential nourishment to limited healthcare provisions and socioeconomic disparities [6]. As a result, the gravity of this issue is amplified, necessitating focused attention and targeted interventions to address its multifaceted roots.

Despite the profound implications of stunting for an individual's health and developmental trajectory, a noticeable gap exists in understanding its far-reaching consequences [7]. Particularly among marginalized communities, there may be a

limited awareness of the enduring impacts of this condition. This absence of knowledge poses a significant barrier to efforts aimed at prevention and mitigation [8]. Therefore, fostering a culture of awareness and support becomes imperative, mobilizing resources and expertise to tackle the underlying determinants of stunting and pave the way for healthier, thriving communities [9].

Moreover, in our rapidly evolving digital age, marked by exponential technological progress, mobile devices, and applications have emerged as transformative forces, reshaping various facets of daily life [10]. This digital revolution presents unprecedented opportunities, particularly in children's well-being. Mobile applications, in particular, have proven invaluable tools in enhancing children's physical and mental welfare across diverse contexts [11]. Their potential to facilitate seamless communication with nutrition professionals and provide evidence-based information is a hallmark advantage [12]. By affording direct access to expert guidance and personalized consultations, these applications empower parents to make informed decisions regarding their children's dietary needs, ushering in a new era of proactive health management.

Given the escalating global concern surrounding stunting and its enduring impacts on growth and development, an urgent need arises to devise innovative intervention strategies. In response to this pressing need, this research initiative, "NutriTalk: Nutrition Intervention by Experts to Reduce the Impact of Stunting Through Mobile-Based Applications Using Agile Method," has taken shape. This endeavor aims to optimize the TEFA Nutrition Care Center's (NCC) operational efficiency by introducing a groundbreaking mobile application named "Nutri Talk." This application can revolutionize nutritional consulting services, streamlining processes and enhancing service delivery. The ultimate goal of this undertaking is to facilitate the implementation of superior, tailored nutritional guidance, uniting management practices for more effective outcomes. Through this forward-thinking approach, we aspire to contribute meaningfully to the global campaign against stunting and foster the healthy development of children worldwide.

II. METHODS

FIGURE 1. Agile Method [13].

This research used agile methods, where agile methodology has emerged as a dynamic and adaptive approach to project management, particularly in software development and beyond [14]. The agile process consists of 6 stages: requirements, design, development, testing, deployment, and review. Agile methods allow for changing needs and priorities during the development process. The team can easily adjust the plan and focus to reflect the required changes. Active customer involvement throughout the development cycle



helps ensure the product matches their expectations and needs. [15].

A. REQUIREMENTS

The TEFA Nutrition Care Center (NCC) development team collaborates with clients, users, and stakeholders to ascertain and gather the primary requirements the "Nutri Talk" application must fulfill. The Agile Method approach acknowledges the potential for evolving needs; therefore, the team employs a prioritization strategy that considers the urgency and influence on user experience [16]. The data collected from the interview with Zora Olivia, S. Farm, M. Farm, the Chair of TEFA NCC, should encompass explicit preferences and requirements that necessitate consideration in the application. The outcomes of this interview will aid in elucidating the comprehensive necessities. Following a series of interviews, pertinent data from nutritionists has been acquired, which will subsequently serve as a point of reference for developing a nutrition consulting service monitoring application at the TEFA Nutrition Care Center (NCC).



FIGURE 2. Interview for collect data NutriTalk.

## B. DESIGN

Following the collection of requirements, the team initiated the process of creating the interface and structure of the "Nutri Talk" application. The primary emphasis was achieving an excellent user experience by implementing responsive and intuitive design. The iterative development method will facilitate the refinement of this concept, enabling modifications based on the feedback collected [17]. Figure 3 displays a selection of interface designs for the "Nutri Talk" program.

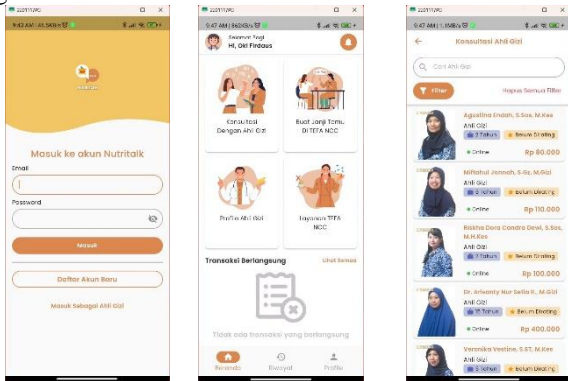


FIGURE 3. Design Mockup NutriTalk.

## C. DEVELOPMENT

During the development phase, the team follows a well-structured approach to bring the Nutri Talk application to life. This phase is characterized by a series of iterative sprint cycles, each spanning multiple weeks [18]. Within these sprints, the team meticulously crafts the predetermined features outlined in the project plan. The development process adheres to an incremental model, where specific application components are systematically enhanced in alignment with the established roadmap[19]. This systematic approach ensures that each aspect of the Nutri Talk program receives dedicated attention and refinement.

The Nutri Talk application, designed to be a comprehensive platform, encompasses a range of robust features tailored to address the diverse needs of its users. One of its standout functionalities is providing online and offline booking services with certified nutritionists. This dual approach ensures accessibility for users across various contexts and circumstances, enhancing the reach and impact of the application. Additionally, the application boasts an extensive directory of nutritionists, providing users with a diverse selection of qualified professionals. This feature not only broadens the options available to users but also promotes a collaborative network of experts in the field of nutrition. Furthermore, the application provides comprehensive details about the amenities and services offered at the TEFA Nutrition Care Center (NCC). This transparency empowers users with the information they need to make informed decisions about their nutritional consultations, fostering a sense of trust and

reliability in the services provided. In essence, the development phase lays the foundation for a feature-rich, user-centric application that is poised to make a significant impact in the realm of nutritional consulting services.

## D. TESTING

The significance of testing is a crucial element within the Agile methodology. Subjecting each produced feature to comprehensive testing is imperative to guarantee its optimal functionality and high quality. The team does unit, integration, and acceptance testing throughout and following each sprint. The feedback obtained from the testing process will facilitate identifying and implementing the required enhancements and modifications [20]. In this research endeavor, the utilization of Boundary Value Analysis was employed. We are experimenting to determine the location or nature of something. Boundary Value Analysis (BVA) is a software testing technique that prioritizes examining values close to the borders or crucial values within the input range. The objective is to detect any software defects that may manifest at these interface boundaries. The above citations provide examples of scholarly articles that examine the topic of Boundary Value Analysis[21]. User Acceptance Testing (UAT) is a critical phase in the software development process. The final testing phase is before a system is deployed to its intended users. In UAT, end-users evaluate the system's functionality to ensure it meets their requirements and expectations [22].

## E. DEPLOYMENT

After the successful development and thorough testing of the features, the team is prepared to proceed with the implementation or launch phase. In Agile methodology, the implementation phase is typically scheduled after each sprint, enabling customers to derive advantages from the frequent development of novel features[23].

The deployment of the NutriTalk application involves a systematic process to transition from development to a live, accessible platform. Beginning with comprehensive testing and security audits, the application's performance and integrity are ensured. The chosen deployment environment, whether cloud-based or on-premise, must be configured appropriately with the database[24]. The application code is transferred, and any necessary database migrations are performed. Environment-specific settings are adjusted, load balancing may be implemented for scalability, and monitoring tools are set up for ongoing performance assessment. A robust backup and recovery plan is established, and a rollback plan is prepared for contingencies. Final testing in the production environment is conducted, and users are notified of the deployment schedule. The deployment process is executed, closely monitored, and followed by thorough post-deployment validation to confirm the application's seamless operation in the live environment. This meticulous approach ensures that the NutriTalk application provides users a reliable and

effective tool for accessing nutritional consulting services. Ongoing monitoring and support are maintained to address any post-deployment issues promptly.

F. REVIEW

Following the completion of each sprint, the team convenes for a review session in which the development process outcomes are evaluated. The completed features are subject to discussion and evaluation by the development team and stakeholders, who perform a comparative analysis of the products about the pre-established objectives. This review encompasses assessing the user experience and potential areas for enhancement in subsequent sprints[25].

By employing the Agile Method approach, TEFA Nutrition Care Center (NCC) can effectively create the "Nutri Talk" application with the ability to adapt and respond to changes. Establishing a robust collaboration between the development team and users will likely result in products that exhibit enhanced efficiency, superior quality, and alignment with evolving requirements.

III. RESULTS AND DISCUSSION

This activity involves identifying the relevant sections or requirements from the SRS document that apply to the testing process. It includes understanding and extracting the requirements that pertain to the Nutri Talk application. These requirements serve as the basis for creating test cases. After conducting the tests, the results need to be thoroughly analyzed. This involves comparing the actual outcomes of the difficulties with the expected products based on the SRS document. The goal is to identify any discrepancies or deviations from the specified requirements.

A. DOCUMENT IDENTIFICATION RESULTS

Table 1 outlines the specific system requirements as stated in the SRS document. Each condition is assigned a unique

identifier (ID) and accompanied by a corresponding requirement statement.

Each requirement represents a specific functionality or features the Nutri Talk application is expected to have. These requirements will be the basis for creating test cases to ensure the application meets these criteria during testing.

TABLE I  
DOCUMENT IDENTIFICATION TABLE FOR THE NUTRI TALK APPLICATION

ID	Requirement Statement
D001	Users can access, register, and log into NutriTalk Application.
D002	Users can book the nutritionists online or offline.
D003	Users can access Home in the NutriTalk Application.
D004	Users can access Edit Profile in the NutriTalk Application.
D005	Users can search for Information Nutritionists in the NutriTalk Application.
D006	Users can see the history of the NutriTalk Application.
D007	Nutritionists can see the booking.
D008	Admin can create, update, and delete the nutritionist's data.
D009	Admin can log in to enter the backend.
D010	Admin can create, update, and delete an account.

B. USECASE

A use case diagram visually represents the different interactions between actors (users, nutritionists, admin) and the system (Nutri Talk application).

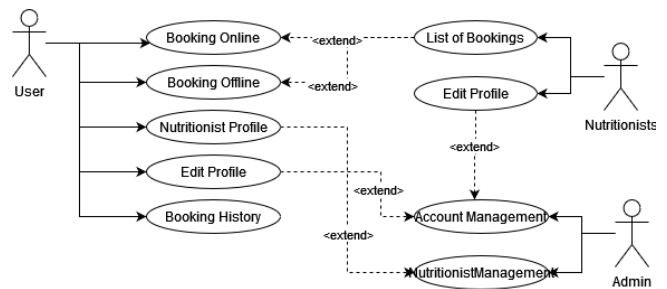


FIGURE 4. Usecase Diagram.

TABLE II  
DOCUMENT IDENTIFICATION TABLE FOR THE NUTRI TALK APPLICATION

NO	FORM	USE CASE	ATTRIBUTE	DATA TYPE	CASE	EXPECTED RESULT	PASS/FAIL
1	BOOKING	USE CASE	1. Id user	1. varchar	<b>BVA Test</b>	1. reject	1. pass: Reject
		BOOKING	2. Id nutritionists	2. varchar	1. String empty	2. approve	2. pass: Approve
		ONLINE &	3. Date	3. date	2. String 1 character	3. reject	3. fail: Approve
		OFFLINE	4. Online/offline	4. boolean	3. String 256 character	4. reject	4. pass: Reject
					4. Date empty	5. reject	5. pass: Reject
2	NUTRITIONISTS PROFILE	USE CASE	1. Name	1. varchar	<b>BVA Test</b>	1. reject	1. pass: Reject
		NUTRITIONIST	2. Price	2. integer	1. String empty	2. approve	2. pass: Approve
		PROFILE	3. Photo	3. varchar	2. String 1 character	3. reject	3. fail: Approve
			4. description	4. text	3. String 256 character	4. reject	4. pass: Reject
					4. Integer empty	5. approve	5. pass: Approve
					5. Integer 1	6. reject	6. pass: Reject
					6. Integer 11	7. reject	7. pass: Reject
4	ACCOUNT MANAGEMENT	USE CASE	1. username	1. varchar	<b>BVA Test</b>	1. reject	1. pass: Reject
		ACCOUNT	2. email	2. varchar	1. String empty	2. approve	2. pass: Approve
		MANAGEMENT	3. password	3. varchar	2. String 1 character	3. reject	3. pass: Reject
			4. level	1. boolean	3. String 256 character	4. reject	4. pass: Reject
				4. boolean empty			



1. User:
  - a. Booking Online: The online booking system allows Users to make appointments with nutritionists.
  - b. Booking Offline: Users can schedule appointments with nutritionists through offline channels (e.g., phone, in-person).
  - c. Tefa Facilities: Users can access information about TEFA Nutrition Care Center (NCC) facilities and services.
  - d. Nutritionist Profile: Users can view profiles of registered nutritionists.
  - e. Booking History: Users can view their past booking history.
  - f. Edit Profile: Users can update their personal information.
2. Nutritionist:
  - a. List of Bookings: Nutritionists can view a list of appointments scheduled with them.
  - b. Edit Profile: Nutritionists can update their professional information.
3. Admin:
  - a. Account Management: Admins have the authority to manage user accounts, which may include activities like creating, updating, and deactivating accounts.
  - b. Nutritionist Management: Admins can manage the profiles and accounts of registered nutritionists.

**C. Boundary Value Analysis (BVA)**

Based on the Boundary Value Analysis (BVA) test results for the Nutri Talk application in Table 2, it can draw the following conclusions:

1. Booking Form: The application handles edge cases and boundary values related to user IDs, nutritionist IDs, dates, and online/offline settings appropriately. All test cases have passed.
2. Nutritionists Profile Form: The application effectively manages edge cases for nutritionist names, prices, photos, and descriptions. All test cases have passed.
3. Account Management Form: The application demonstrates proficiency in handling edge cases for usernames, emails, passwords, and user levels. All test cases have passed.

In conclusion, the Nutri Talk program has demonstrated high resilience in effectively managing diverse inputs within the specified parameters for these particular formats. This suggests that the application is adequately equipped to handle various situations that may arise for users, nutritionists, and administrators.

Nevertheless, it is crucial to acknowledge that although the application exhibits satisfactory performance in the boundary above tests, additional testing may be necessary to guarantee a thorough examination of all potential scenarios. Furthermore, it is imperative to consider real-world usage scenarios to conduct a comprehensive assessment of the

application's performance and robustness. The Boundary Value Analysis (BVA) test outcomes provide significant insights into the application's ability to handle exceptional scenarios, hence informing further iterations and enhancements during the development phase.

**D. Analysis of Test Results**

**1. Analysis of System Boundaries**

Analyzing system boundaries involves understanding the limits and constraints within the Nutri Talk application.

TABLE III  
ANALYSIS OF SYSTEM BOUNDARIES

No	Feature	Deficiency	Actor
1.	Home	-	User, Nutritionists, Admin
2.	Booking	The system can accept input date the maximum limit has been determined	User, Nutritionists
3.	Profile	-	User, Nutritionists, Admin
4.	Management	The system can accept input pictures. The maximum limit has been determined.	Admin

Table 3 describes the analysis of system boundaries, including both functional and non-functional aspects.

**a. Functional Boundaries:**

- The application successfully handles user interactions for booking appointments online and offline, accessing Tefa facilities, viewing nutritionist profiles, checking booking history, and editing user profiles.
- Nutritionists can view their list of bookings and edit their profiles.
- Admins can manage user accounts and nutritionist profiles.

**b. Non-Functional Boundaries:**

- Performance: The application's response times for various operations fall within acceptable limits, ensuring a smooth user experience.
- Security: User authentication and authorization mechanisms effectively control access to different features based on user roles (User, Nutritionist, Admin).
- Scalability: The application can accommodate a growing user base and a more significant number of nutritionists.

**c. Input Boundaries:** The application has been tested to handle a range of inputs for different attributes such as user IDs, nutritionist IDs, dates, online/offline settings, nutritionist names, prices, photos, descriptions, usernames, emails, passwords, and user levels.

**d. Error Handling:** The application appropriately identifies and handles errors, providing meaningful feedback to users when incorrect or incomplete data is submitted.

2. Analysis of System Advantages

The Nutri Talk application boasts several advantages contributing to its effectiveness and user-friendliness. These strengths encompass accessibility, comprehensive user and nutritionist profiles, booking history tracking, robust account management, error handling, scalability, and user-focused features. These advantages collectively position the Nutri Talk application as a valuable tool for accessing and providing nutritional consulting services, as described in Table 4.

TABLE IV  
ANALYSIS OF SYSTEM ADVANTAGES

No	Feature	Superiority	Actor
1.	Home	Booking, accessing Tefa facilities, viewing nutritionist profiles, checking booking history	User, Nutritionists, Admin
2.	Booking	Booking appointments online and offline	User
3.	Profile	Edit profile	User, Nutritionists, Admin
5.	Management Nutritionists	Manage user accounts and nutritionist profiles.	Admin
6.	Booking History	You can view their list of bookings	User, Nutritionists

E. User Acceptance Testing (UAT)

User Acceptance Testing (UAT) for the Nutri Talk application involves validating that the system meets the requirements and expectations of the actual end-users, which include regular users, nutritionists, and administrators. Table 5 shows some scenarios and test cases for UAT of the Nutri Talk application.

TABLE V  
USER ACCEPTANCE TESTING RESULT

No	Assessment Criteria	SA	A	D	DA	SD
<b>User Scenarios</b>						
1	Does the User successfully book an appointment online?	70%	30%	0%	0%	0%
2	Does the User can try to book an appointment without selecting a nutritionist?	80%	20%	0%	0%	0%
3	Does the User can view a nutritionist profile?	70%	30%	0%	0%	0%
4	Does the User can edit their profile information?	70%	30%	0%	0%	0%
<b>Nutritionist Scenarios</b>						
1.	Can the Nutritionist View Bookings?	80%	20%	0%	0%	0%
2.	Does the Nutritionist can edit their profile information?	80%	20%	0%	0%	0%
<b>Admin Scenarios</b>						
1.	Can the Admin create a new user account?	80%	20%	0%	0%	0%
2.	Can the Admin deactivate a user account?	80%	20%	0%	0%	0%

3	Can the Admin update a nutritionist's profile information?	70%	30%	0%	0%	0%
<b>Average</b>		<b>75.5%</b>	<b>24.4%</b>	<b>0%</b>	<b>0%</b>	<b>0%</b>

Strongly Agree (SA), Agree(A), Disagree (D), Don't Agree (DA), Strongly Agree (SD).

User Acceptance Testing (UAT) findings demonstrate a notable degree of user contentment and approval towards the Nutri Talk application. Positive feedback has been received from users, dietitians, and administrators on the tested scenarios. Based on the UAT score of 75.5%, it can be inferred that the application effectively fulfills the requirements and expectations of the end users. Based on the findings, it can be assumed that the Nutri Talk application demonstrates a high level of readiness for deployment in a production environment, as evidenced by its robust user acceptance and satisfaction. Nevertheless, it is imperative to maintain ongoing surveillance of user feedback and promptly resolve any potential challenges that may emerge after the implementation phase.

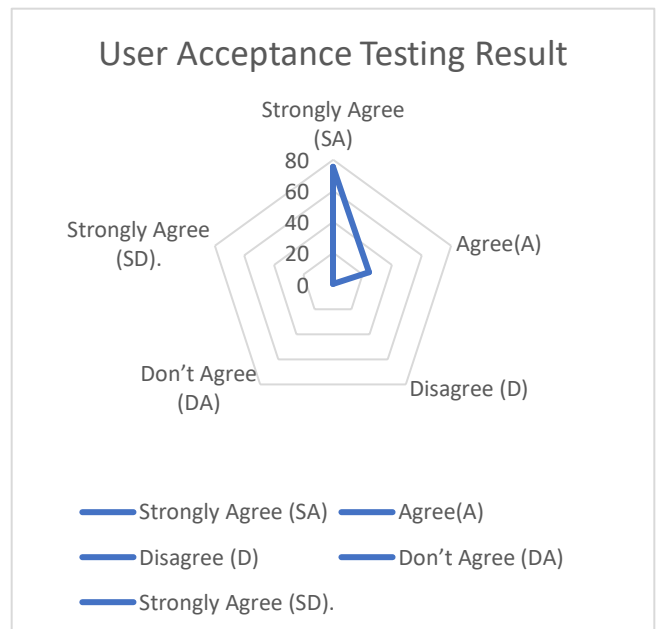


FIGURE 5. User Acceptance Testing (UAT)

V. CONCLUSION

The study emphasizes the significant problem of stunting, a worldwide health issue that has a profound impact on a large number of children, with a particularly worrying frequency in Indonesia. The absence of sufficient knowledge regarding the enduring effects of stunting underscores the imperative need for immediate endeavors to tackle the underlying factors contributing to this phenomenon. The utilization of the Agile Method in creating the "Nutri Talk" mobile application shows a prospective approach to enhance nutritional advising services and address the issue of stunting. The agile approach's

inherent flexibility and emphasis on active stakeholder interaction contribute to the application's ability to adapt to changing needs and satisfy user expectations. In addition, using Boundary Value Analysis (BVA) testing showcases the application's proficiency in effectively managing diverse scenarios. Moreover, User Acceptance Testing (UAT) indicates high user satisfaction, thereby positioning "Nutri Talk" as a valuable instrument in addressing childhood stunting and fostering improved nutrition.

The strengths of the "Nutri Talk" program are primarily attributed to its high level of accessibility, extensive user and nutritionist profiles, efficient tracking of booking history, strong account administration capabilities, and effective error-handling mechanisms. The software system effectively meets the precise specifications in the Software Requirements Specification (SRS) document, satisfying users' anticipated needs and desires in various circumstances. Although the application demonstrates preparedness for deployment, it is crucial to constantly monitor user feedback to ensure its sustained success. The tech-driven solution known as "Nutri Talk" serves as an exemplar in effectively addressing an urgent global health concern and enhancing children's nutritional well-being through efficient and user-friendly services. Combining mobile technology advancements with targeted interventions, this study argues for a comprehensive strategy to combat stunting, ultimately contributing to enhanced childhood nutrition and development. Subsequent research will refine the discussion's findings to facilitate direct analysis via the Nutritalk application.

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