

E-BOOK OF EXTENDED ABSTRACT

THE 14TH INTERNATIONAL INVENTION, INNOVATION & DESIGN COMPETITION 2025



14TH **INDES** 2025

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DESIGN COMPETITION 2025

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MEALNOURISH - RULE-BASED HEALTHY MEAL PLANNER SYSTEM FOR MALNOURISHED CHILDREN

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ABSTRACT

Malnutrition among children is a critical public health issue. It remains so, particularly in developing nations where access to balanced diets and nutritional knowledge is often inadequate. Addressing this challenge requires not only clinical and policy-based interventions but also creative and innovative technological solutions. Therefore, this research developed a web-based expert system designed to assist caregivers in planning nutritionally balanced meals for malnourished children. The system makes recommendations based on age, gender, weight, height, and dietary preferences. Developed as a web-based application, the system integrates MySQL for data management and Flask for backend functionality. The development process follows the Waterfall Model, which includes requirements analysis, system design, implementation, testing, and evaluation. Meal plans are generated using recipes from the *Nutritionists' Choice Cookbook* Volumes I and II. Evaluation results show that the system provides user-friendly, customized meal plans that comply with Malaysia's Dietary Guidelines for Children and Adolescents. In the future, the system will be enhanced by expanding the recipe database, integrating real-time dietary tracking features, and developing a mobile app version to increase accessibility and convenience.

Keyword: rule-based, expert system, child malnutrition, consumer health

1. INTRODUCTION

Malnutrition occurs when the body does not receive adequate nutrients to maintain healthy tissues and organ function. It encompasses both undernutrition and overnutrition (myhealthopedia.com, 2025). It remains a critical health challenge, especially in developing countries where access to nutritious food and reliable dietary information is limited. Children are especially vulnerable, and inadequate nutrition during early development can lead to long-term physical and cognitive impairment. Despite ongoing public health efforts, many caregivers still lack the necessary tools and guidance to provide balanced meals tailored to children's individual needs (Poh et al., 2023).

With the advancement of technology, expert systems have emerged as promising tools to support health-related decision-making (Bondevik et. al., 2024). This study introduces a web-based rule-based expert system aimed at assisting caregivers in planning nutritious meals for malnourished children. By considering age, gender, weight, height, and dietary preferences, the system generates personalized meal plans. The plans are based on professional resources, including the *Nutritionists' Choice Cookbook Vol I and II*, and align with national dietary standards to ensure reliability and relevance in caregiving contexts.

2. METHODOLOGY

2.1 Waterfall Methodology

This system was developed using the waterfall methodology. The waterfall process (Figure 1) involves five stages such as analysis, design, implementation, testing, and maintenance (Senarath, 2021).

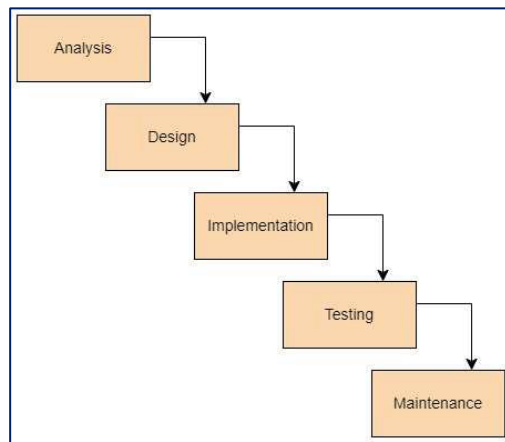


Figure 1 Waterfall Methodology

The analysis phase involves gathering detailed information about what the system needs to accomplish and understanding the requirements from all stakeholders involved. The primary goal of the design phase is to develop detailed technical specifications that guide the development process. The third phase of the waterfall methodology is implementation phase. This phase involves converting system design into a functional system. The fourth phase of the waterfall methodology is testing. Now that the product is out with the users, the application must be put through a series of tests to ensure it has all the functionalities as required. The final phase which is maintenance is to enhance the functionalities of the system based on the customer’s request.

2.2 System Architecture

Figure 2 presents the system architecture for this project. It consists of three main components; the user interface, inference engine, and the knowledge base. The user interface allows caregivers to enter child-related information such as age, gender, weight, height, and dietary preferences and displays a structured meal plan customized to the child's daily calorie requirements. The inference engine uses forward chaining to process the child's information. It applies rules to provide a personalized recipe. The knowledge base contains data and guidelines based on article research and the Malaysian Dietary Guidelines.

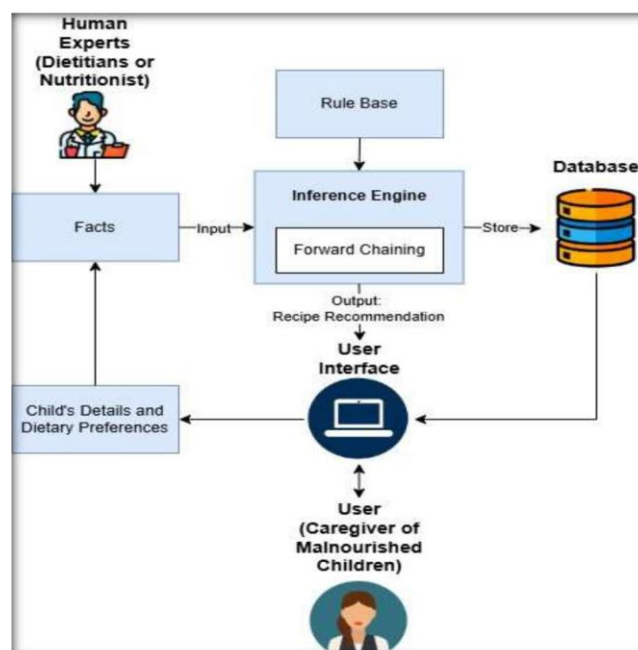


Figure 2 System Architecture

2.3 User Interface

Figure 3 shows the user interface of the system.



Figure 3 User Interface

3. CONCLUSION

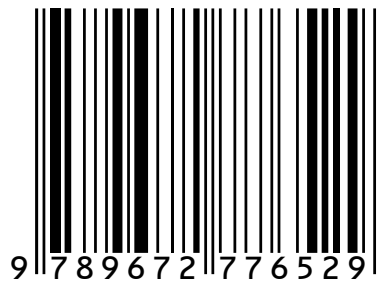
In conclusion, the approach to tackling the multifaceted problem of malnutrition with the help of expert system is explored. The goal is to deliver personalized and nutritionally suitable meal recommendations. The system combines a user-friendly interface with a powerful rule-based engine to provide precise recipe recommendations customized to children's nutritional requirements.

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