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Smart Healthy Diet Planning System

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Abstract

Non-communicable diseases (NCDs) such as diabetes, hypertension, and obesity continue to rise in Malaysia due to sub-optimal dietary habits and limited access to localized nutritional guidance. Many individuals struggle to construct balanced meal plans that accommodate specific health conditions. This paper introduces the Smart Healthy Diet Planning System, a web-based application designed to generate personalized meal recommendations based on individual health profiles, dietary restrictions, and local food preferences. Developed using HTML, CSS, JavaScript, PHP, MySQL, and Firebase, the platform integrates an AI recommendation engine powered by the OpenAI GPT-3.5 API with prompt-engineered clinical constraints. Following the Agile Software Development Life Cycle (SDLC), requirement gathering via a preliminary online questionnaire among 45 public respondents informed the initial system architecture. Functional testing verified that the AI recommendation logic successfully filters macronutrients and sugar content for simulated chronic condition profiles. The system serves as a supportive nutritional tool rather than a substitute for clinical medical advice.

Keywords: AI diet planning; chronic disease; Malaysia health; personalized nutrition; web-based system

Introduction

Unhealthy eating patterns remain a primary contributor to the high prevalence of non-communicable diseases (NCDs) in Malaysia. According to the National Health and Morbidity Survey (NHMS) conducted by the Institute for Public Health (2019), approximately 18.3% of Malaysian adults live with diabetes, 30.0% suffer from hypertension, and 50.1% are classified as overweight or obese (Institute for Public Health, 2019).

While several digital diet management applications exist, many provide generalized caloric tracking that fails to accommodate the specific nutritional constraints required for managing chronic conditions within a local culinary context (Kong et al., 2023). Recent reviews of AI-driven personalized nutrition and meal planning platforms also point to their growing role in tailoring dietary recommendations (Subashini & Suresh, 2024). To address this gap, the Smart Healthy Diet Planning System was designed to deliver personalized, locally accessible meal recommendations using artificial intelligence.

Medical Disclaimer: The Smart Healthy Diet Planning System is designed solely as an informational decision-support tool to assist users in selecting balanced daily meals. Generated dietary plans do not constitute formal medical diagnosis, clinical treatment, or personalized medical nutrition therapy. Individuals with severe chronic illnesses should consult a qualified healthcare professional or registered dietitian before making substantial dietary modifications.

Methodology

The project follows the Agile Software Development Life Cycle (SDLC) model, facilitating iterative refinement based on component testing and user feedback (refer Figure 1).

The core phases consist of:

1. **Requirement Gathering:** Evaluated existing systems and conducted a preliminary online questionnaire among 45 public respondents to identify dietary tracking challenges. Survey findings indicated that 78% of respondents struggled to determine portion sizes for local Malaysian foods, while 64% with self-reported health conditions found existing apps overly complex.

2. **System Architecture & Design:** Structured the relational database schema in MySQL to store user health parameters (e.g., blood pressure classification, glycemic targets, food allergies) and mapped user interface wireframes.

3. **System Development & AI Integration:** Developed the responsive frontend using HTML, CSS, and JavaScript, supported by PHP and Firebase services. The recommendation engine connects to the OpenAI GPT-3.5 API via HTTP REST requests. System prompts enforce clinical rule constraints (e.g., limiting daily sodium to less than 2,000 mg for hypertension profiles and constraining simple carbohydrates for diabetic profiles) combined with a database of local Malaysian food items.

4. **Functional Testing & Verification:** Conducted unit testing on API endpoints and verified generated meal outputs against predefined dietary guidelines.

5. **Planned Deployment & Usability Evaluation:** Full deployment and formal User Acceptance Testing (UAT) with end-users and nutritionists are planned for the next project iteration.

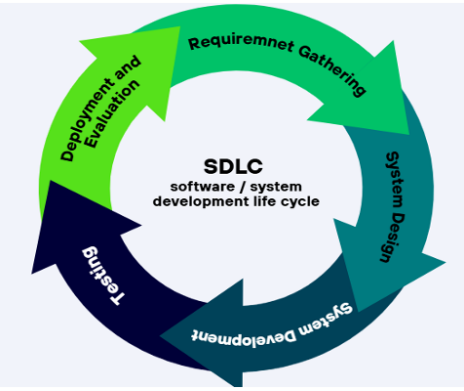


Figure 1: Agile SDLC Model

Results and Discussion

The core web architecture and AI recommendation interfaces have been successfully implemented. Users can register account profiles, specify existing chronic conditions (e.g., Type 2 Diabetes, Stage 1 Hypertension), and state local food preferences.

AI Recommendation Logic & Functional Testing

To evaluate the AI engine, test user personas were injected into the system. For a simulated diabetic profile (target glycemic control), the system passed user metrics and clinical prompts to the OpenAI API. The resulting meal recommendations successfully prioritized low-glycemic-index carbohydrates (e.g., brown rice, oats), high dietary fiber, and strict limits on added sugars.

Evaluation Criteria: Functional test cases were evaluated based on three verification criteria:

- **Constraint Adherence:** Exclusion of high-sodium ingredients for hypertensive profiles and refined sugars for diabetic profiles.

- **Local Culinary Relevance:** Inclusion of accessible Malaysian meals (e.g., *soup ayam*, steamed fish, brown rice *nasi campur*).

- **Nutritional Balance:** Verification that calculated daily caloric and macronutrient distribution aligned with standard dietary guidelines.

Comparative Analysis of Existing Platforms

A comparative review demonstrates the positioning of the proposed system relative to existing solutions. Table 1. Comparison of Existing Diet Planning Systems.

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Feature	Lifesum(Andersson, 2025)	Noom (May et al., 2023)Weight.	DietSensor (Makhsous et al., 2020)	Fooducate	MyDietCam(Kong et al., 2023)	Proposed System
Technology	Mobile App, AI	Mobile App	AI, Food Scanner	Mobile App	AI, Image Proc.	Web-based + AI
Main Objective	Personalized meals	Change eating habits	Control nutrients	Promote healthy choices	Food tracking	Diet control for NCDs
Method	AI & tracking	Daily coaching	Food scanning	Food scoring	Image recognition	AI meal planner
User Scope	Healthy eaters	Global adults	Chronic disease	General public	Healthy adults	Suitable for adults
Special Features	Large database	Real-time coach	Clinical support	Healthy alt.	Photo recog.	Free & Local Food DB

System Limitations

- **Development Phase:** The prototype is currently in its initial testing phase; comprehensive clinical validation and long-term user health outcome evaluations have not yet been completed.
- **Scope of Recommendations:** The system is tailored specifically for adult users managing mild-to-moderate chronic dietary constraints. It is not suitable for paediatric populations, pregnant women, or patients with end-stage renal disease requiring strict clinical supervision.
- **API Dependency:** Reliability and response latency depend on external OpenAI API availability and continuous internet connectivity.

Conclusion

The Smart Healthy Diet Planning System demonstrates the feasibility of combining web technologies with generative AI APIs to provide tailored, localized meal planning support for adults managing chronic health conditions. Initial functional testing confirms that the prompt-engineered AI engine generates relevant, low-sugar, and high-fiber meal plans suitable for local Malaysian culinary contexts. As the platform remains in its development phase, future work will focus on conducting formal User Acceptance Testing (UAT) with dietitians, expanding the native database of regional food items, and implementing offline rule-based fallback mechanisms.

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