Development of Health Story Web Application Using Artificial Intelligence for Food Label Analysis and Eating Behavior Prediction to Recommend Personalized Exercise

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ABSTRACT: *This paper presents the development of the Health Story web application, an innovative platform designed to promote personalized health management through the integration of artificial intelligence (AI) and behavioral psychology. Addressing the challenges in tracking dietary intake and personalizing exercise recommendations, the application features an OCR-powered food nutrition label scanning system for real-time food analysis and an AI-driven module for predicting eating behaviors and recommending personalized exercise patterns. It further incorporates an interactive, blog-based system to foster self-tracking and leverage narrative psychology for enhanced user engagement and motivation in achieving individual health goals. Developed with Next.js, Tailwind CSS, and a Directus/PostgreSQL backend, the system integrates advanced AI for weight loss outcome prediction. Comprehensive evaluation with 30 users across five key areas—user capability, system capability, system quality and efficiency, design, and security—demonstrated strong performance, achieving an average satisfaction score of 4.79±0.41. These results confirm that the Health Story application effectively meets its objectives, offering a sustainable and innovative solution for personalized digital health.*

Keywords: Web Application, Artificial Intelligence (AI), Food Label Analysis, Eating Behavior, Exercise Recommendation

1. Introduction

The contemporary health landscape in Thailand is significantly impacted by the increasing prevalence of unhealthy eating habits, which contribute to considerable fat accumulation and the escalating burden of non-communicable chronic diseases (NCDs) such as diabetes, hypertension, and heart disease (ThaiHealth, 2023). This concerning epidemiological trend highlights an urgent societal need for effective interventions that promote healthier lifestyles and sustainable behavioral change. While the promotion of regular physical activity and proper dietary habits remains a crucial public health strategy (ThaiHealth, 2018), information technology has concurrently emerged as a powerful and indispensable tool for personal health management. The global adoption of health applications and wearable digital devices continues to expand rapidly, with over 300 million health applications utilized annually and wearable device users projected to reach nearly 460 million by 2025 (Ghazwani et al., 2024). This trajectory underscores the profound potential of digital solutions to empower individuals in comprehensively tracking, monitoring, and ultimately improving their health behaviors.

In response to these identified public health challenges and by leveraging the growing global trend of digital health solutions, this research details the development of the "Health Story" web application. This interactive, blog-based storytelling platform is specifically designed to foster healthier behaviors through a novel integration of artificial intelligence (AI) and established principles from behavioral psychology. The application incorporates several key features to support this objective: it facilitates user engagement by enabling the sharing and reading of personal health journeys and provides exercise recommendations via integrated video clips; it calculates daily calorie needs based on individual user profiles to guide appropriate food intake; and crucially, it employs advanced AI technology for comprehensive food label analysis and precise eating behavior prediction, leading to personalized exercise recommendations and predictions of potential weight loss outcomes. By strategically integrating concepts from self-tracking and narrative psychology (Ryan & Deci, 2000), the application aims to cultivate and enhance long-term user motivation for sustained healthy living. The technical architecture of the system was built using modern web development frameworks, specifically Next.js and Tailwind CSS for the front-end (prototyped initially in Figma), and a robust Directus low-code platform coupled with a PostgreSQL database for secure backend data management. Continuous user feedback and analysis of blog content were integral to refining the system's ability to effectively meet diverse user needs. Ultimately, this project represents a deliberate and strategic integration of information technology and behavioral psychology, aspiring to create a sustainable and contextually relevant health innovation tailored specifically for Thai society.

2. Purposes of Research

The primary objectives that guided the development and evaluation of the Health Story web application, as outlined in this research, are as follows:

1. To develop the Health Story web application, an interactive platform that integrates artificial intelligence for food label analysis, eating behavior prediction, and personalized exercise recommendations, while simultaneously fostering healthy behaviors through the strategic application of self-tracking and narrative psychology.
2. To conduct a comprehensive evaluation of the effectiveness and user engagement of the Health Story web application in promoting active personal health management among its users.
3. To demonstrate and explore the synergistic integration of information technology with behavioral psychology, with the aim of creating innovative and sustainable digital healthcare solutions that can positively impact public health.

3. Literature Review

The development of the Health Story web application is deeply rooted in the synergistic intersection of advancements in digital health interventions, the burgeoning capabilities of artificial intelligence (AI) applications, and established principles from behavioral psychology. The increasing global adoption of digital devices and mobile health (mHealth) applications has fundamentally reshaped personal health management strategies. This trend is underscored by the widespread proliferation of health applications and wearable devices, with the latter projected to reach nearly 460 million users by 2025. These technologies have consistently demonstrated efficacy in supporting users with health behavior control, encompassing areas such as dietary management, physical exercise, and medication adherence, through features like reminders and progress tracking (Dalkou et al., 2015), (Duplaga & Tubek, 2018). This foundation is further enriched by the strategic integration of AI and relevant behavioral psychology theories, which collectively enhance the effectiveness and personalization of contemporary health interventions.

3.1. Digital Health Interventions

Digital health broadly encompasses a diverse range of technologies, including telemedicine, mobile health, and wearable devices, all aimed at enhancing healthcare delivery and improving patient outcomes (Kim et al., 2023). The application of digital health technologies has been extensively documented for its capacity to facilitate disease monitoring, prevention, and management, exerting significant positive impacts on patient engagement and empowerment (Adibi, 2024). For instance, mobile health apps are recognized for effectively helping users control various health behaviors, such as diet, exercise, and medication, through tools that provide reminders, track progress, and enable communication with healthcare providers (Ghazwani et al., 2024) The integration of AI within these digital health applications further promises substantial advancements in domains such as early diagnosis, sophisticated symptom monitoring, and the provision of highly personalized care, thereby augmenting the overall effectiveness of health interventions (Widmer, 2024).

3.2. Artificial Intelligence in Health

Artificial intelligence (AI) is actively revolutionizing personalized healthcare, particularly within the critical domains of nutrition and exercise guidance. AI's intrinsic ability to analyze complex datasets and generate specifically tailored recommendations is fundamentally transforming individual approaches to health and wellness. By leveraging advanced machine learning and deep learning techniques, AI systems can offer remarkably precise nutritional advice and predict various health outcomes, thus significantly enhancing personalized healthcare pathways. This transformative impact is evident across a spectrum of applications, from sophisticated dietary assessments to nuanced exercise recommendations, and is substantiated by a growing body of academic studies and successful commercial platforms.

In personalized nutrition, AI technologies are instrumental. They enable the analysis of genetic, phenotypic, and behavioral data to optimize dietary recommendations for improved health outcomes (Kahalkar & Vyas, 2024). Machine learning models, including deep neural networks, have demonstrated superior accuracy in generating dietary recommendations, achieving up to 95% accuracy in comparison to traditional methodologies (Vegesna, 2024). Furthermore, AI significantly enhances dietary assessment through the utilization of image recognition and deep learning, enabling the analysis of nutrient content with high precision and effectively reducing common errors associated with conventional assessment methods (Kassem et al., 2025). AI-driven platforms possess the capability to integrate data from diverse sources, including genetic and microbiome information, to generate highly personalized dietary advice that meticulously addresses individual needs and preferences (Kahalkar & Vyas, 2024). This approach is consistent with existing research that found AI can effectively analyze and provide nutritional recommendations aligning with user eating behavior (Chew et al., 2024).

Beyond nutrition, AI's predictive capabilities extend prominently into exercise and health outcome forecasting. AI applications, such as MyBehavior, utilize machine learning to deliver customized exercise and diet advice, which has led to documented improvements in user health behaviors (Rabbi et al., 2023). AI's predictive power is also employed in analyzing data from wearable devices and electronic health records (EHRs) to facilitate early disease identification and inform personalized treatment plans (Kahalkar & Vyas, 2024). The accuracy of food assessment methods using photographs and AI has been reviewed, indicating AI's potential for accurate nutrient content assessment, though further development is necessary for full implementation (Sun et al., 2024). Commercial platforms, including Instacart's Smart Shop (Miller, 2024) and Weightwatchers (Keller, 2024), are actively integrating AI to enhance user experience by customizing grocery shopping and food tracking to individual nutritional needs (Tsolakidis et al., 2024). This trend underscores the growing interest in using technology for both preventive and daily health management, laying a strong foundation for future digital health system development.

AI applications in health communication have also been explored to enhance health behavior interventions, addressing critical public health issues such as smoking cessation and chronic disease management through AI-driven tools like chatbots and specialized applications (Weingott & Parkinson, 2024). The AI Impact Communications Model (AI-ICM) has been proposed as a framework to align technical advancements with theoretical communication frameworks, offering a systematic roadmap for future research and practice in this domain (Weingott & Parkinson, 2024). Beyond these applications, AI's role in digital health is continually expanding, encompassing automated image interpretation and complex decision-making algorithms, which collectively contribute to the reconfiguration of health knowledge and medical control paradigms (Marent & Henwood, 2023).

3.3. Behavioral Psychology and Digital Health

Behavioral psychology provides the foundational theories necessary for designing effective mHealth interventions that drive sustained health behavior change. Research consistently demonstrates that mHealth interventions explicitly informed by behavior change theories result in statistically significant improvements in health outcomes (Ofori & El-Gayar, 2020). Mobile applications specifically designed for behavioral change frequently incorporate a range of behavior change techniques (BCTs), with over half of relevant studies reporting positive outcomes in health behavior modification (Ofori & El-Gayar, 2020). The effectiveness of mHealth interventions is substantially supported by the near-universal access to mobile devices, which provides an ideal platform for the ubiquitous delivery of health and wellness applications (Duplaga & Tubek, 2018).

1. Self-Determination Theory (SDT) and Intrinsic Motivation

Self-Determination Theory (SDT), developed by Deci and Ryan, stands as a prominent framework in behavioral psychology emphasizing the critical role of intrinsic motivation in fostering long-term health behavior change (Ryan & Deci, 2000). This theory posits that intrinsic motivation is significantly enhanced when three fundamental psychological needs—autonomy, competence, and relatedness—are satisfied (Flannery, 2017). Specific techniques designed to support these needs within interventions include facilitating discussions about personal views (supporting autonomy), providing clear and constructive feedback (fostering competence), and acknowledging individual perspectives (cultivating relatedness) (Teixeira & Hagger, 2016). Intrinsic motivation is strongly associated with improved psychological well-being and more sustainable long-term behavior change, as it involves engaging in activities for their inherent satisfaction rather than solely for external rewards (Deci, 2004).

2. Digital Health Interventions and Self-Tracking

Digital health interventions are uniquely positioned to leverage self-tracking mechanisms to increase personal awareness and facilitate behavioral shifts by enabling users to systematically monitor their own data (Alberts et al., 2024). Self-tracking directly aligns with SDT by promoting autonomy through personalized data collection and enhancing competence by providing immediate feedback on progress ("Facilitating Health Behavior Change", 2023). The integration of SDT principles within digital interventions has been shown to enhance user motivation and engagement, underscoring that the primary focus should remain on facilitating genuine behavior change rather than merely superficial engagement with the technology itself (Alberts et al., 2024).

3. Narrative Psychology and User Engagement

Narrative psychology emphasizes the profound power of personal stories and reflective practices, which can significantly enhance intrinsic motivation by providing individuals a structured opportunity to articulate their health journeys, define personal goals, and critically reflect on past behaviors (Flannery, 2017). This approach inherently supports the psychological need for relatedness by fostering a sense of connection to one's own experiences and potentially to others who share similar journeys (Martela, 2020). Engaging in reflective practices within a digital health context can help users internalize the underlying motivation behind their health goals, thereby rendering behavior changes more sustainable (Alberts et al., 2024).

4. User-Centered Design Principles

User-centered design principles, encompassing attributes such as ease of use, rapid system response, and consistency with user expectations, are unequivocally crucial for the success and broad adoption of health applications (Alberts et al., 2024). These principles are fundamental in ensuring that health applications are not only technologically advanced in their functionality but also inherently appealing, accessible, and intuitive to navigate, which collectively supports sustained user engagement ("Facilitating Health Behavior Change", 2023). By aligning closely with SDT, user-centered design can directly enhance the satisfaction of core psychological needs, thereby further promoting intrinsic motivation for healthy behaviors (Gillison et al., 2019).

3.4. Challenges and Future Directions in Digital Health Integration

Despite the immense potential offered by the integration of digital health technologies and AI in promoting health behaviors, several significant challenges persist. Issues such as data privacy, ensuring robust security protocols, mitigating algorithmic biases, addressing disparities in digital literacy, and ensuring equitable access to technology across diverse populations must be systematically addressed to facilitate the responsible development and effective implementation of these interventions (Adibi, 2024) (Kim et al., 2023) (Kahalkar & Vyas, 2024) (Bond et al., 2023). Furthermore, the critical alignment of advanced technological capabilities with established behavioral psychology theories remains paramount to maximize the overall effectiveness of health interventions (Weingott & Parkinson, 2024). Ethical and regulatory considerations, including the need for high-quality data, are also vital to ensure that AI-driven solutions are safe, effective, and equitable (Bond et al., 2023) (Sosa-Holwerda et al., 2024). While some researchers propose that extrinsic motivation, when judiciously integrated with intrinsic motivation, can also contribute to sustained behavior change (Luria, 2022), the effectiveness of digital health interventions may vary based on individual differences and specific contextual factors. Consequently, a comprehensive approach that considers both intrinsic and extrinsic motivational factors, alongside individual and contextual variables, may be necessary for optimizing health behavior change interventions. As digital health continues its rapid evolution, it is imperative to proactively consider these multifaceted challenges and opportunities to fully realize the transformative potential of technology in revolutionizing healthcare delivery and improving patient outcomes for all stakeholders (Kassem et al., 2025).

In summary, the confluence of robust digital technology platforms, advanced AI capabilities, and well-established psychological theories provides a comprehensive and potent framework for developing innovative and effective health solutions. The Health Story application precisely builds upon this intricate foundation by integrating sophisticated AI-driven analysis with a psychologically informed design, specifically aiming to address the pressing health needs identified within the Thai population.

4. Conceptual Framework

In an era where information technology and Artificial Intelligence (AI) play a crucial role in enhancing quality of life, proactive healthcare through digital systems has emerged as a compelling and innovative approach.

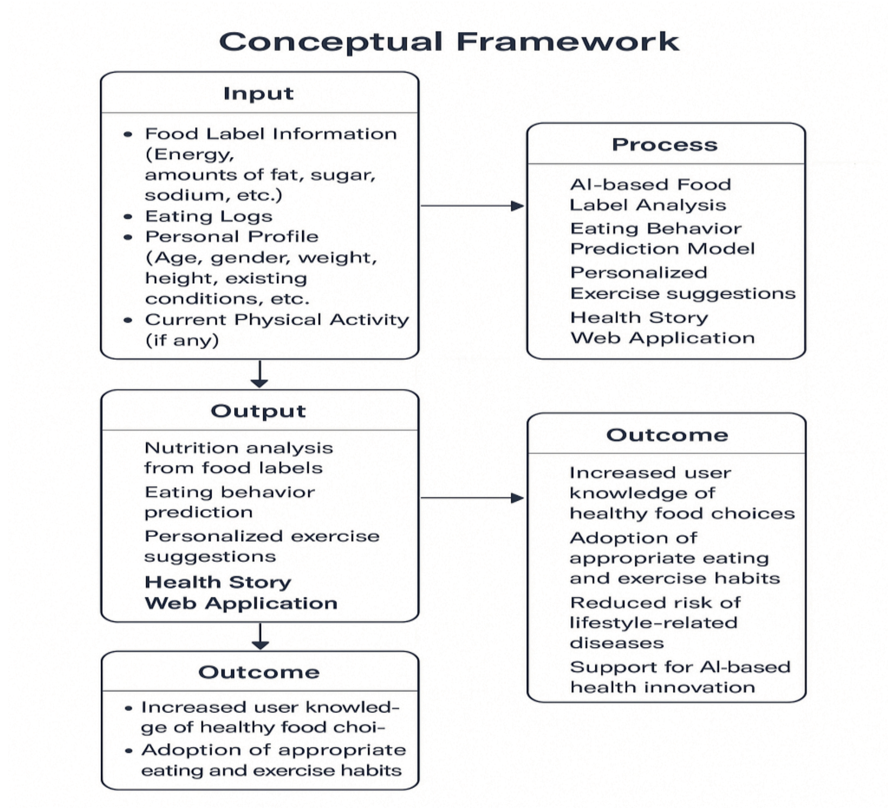

Figure 1. Conceptual Framework

This research focuses on the development of an interactive web application that integrates personal health data with nutrition analysis and food consumption behavior, utilizing AI-driven processes to generate personalized exercise recommendations and promote sustainable healthy behaviors.

The developed system is architected around a four-stage conceptual framework, illustrated in Figure 1, which outlines the flow from data acquisition to long-term health outcomes:

1. Input: This stage encompasses all user-generated and contextual data fed into the system. Key inputs include nutritional information derived from food labels (e.g., energy, fat, sugar, sodium content), users' eating logs, comprehensive personal profile data (age, gender, weight, height, existing health conditions), and records of current physical activity.
2. Process: This core stage involves the AI-powered analytical and predictive functionalities. It includes AI-based food label analysis, the eating behavior prediction model, and the generation of personalized exercise suggestions. These processes are executed within the Health Story web application environment.
3. Output: The output stage delivers the system-generated results directly to the user. This includes detailed nutritional analysis from food labels, forecasts of eating behaviors, and individualized exercise plans. These outputs are presented through the interactive interface of the Health Story web application.
4. Outcome: This final stage represents the long-term benefits and goals achieved through the system's use. Expected outcomes include increased user knowledge of healthy food choices, the adoption of appropriate eating and exercise habits, a reduced risk of non-communicable diseases (NCDs), and the establishment of a prototype for future AI-based health innovations.

5. Research Methodology

To systematically develop the Health Story web application with high quality and ensure it effectively meets user needs, this research adopted the Software Development Life Cycle (SDLC) framework, specifically utilizing the Waterfall Model. This model was selected for its clear, sequential structure, which was well-suited for a project with defined requirements and distinct development phases. The system development adhered to the following seven phases:

Phase 1: Requirement Collection
User requirements were comprehensively gathered through a mixed-methods approach, including semi-structured interviews with potential users, distribution of questionnaires to the target demographic, and analysis of existing health behavior data. This phase aims to identify essential features for promoting health behavior changes, such as a calorie recording system, diverse exercise activity selection, and an interactive blog writing system for personal health reflection.

Phase 2: Feasibility Study
A thorough feasibility analysis was conducted to assess technical viability, evaluate the appropriateness of proposed technologies, and identify potential resource limitations. This ensured the system's successful development and deployment within the intended operational environment.

Phase 3: System Design
This phase involved the detailed design of the system architecture, including the NoSQL database schema, and the user interface (UI). A prototype was initially created using Figma to ensure a visually appealing, user-friendly, and intuitive interface aligned with modern UX/UI principles. The design incorporated real-time interactive displays for user health metrics (e.g., calorie values, Basal Metabolic Rate (BMR), Total Daily Energy Expenditure (TDEE)) and integrated a notification module (pop-ups) for personalized encouragement and advice, drawing on principles of positive psychology to foster continuous user engagement.

Phase 4: Program Development (Coding)
The front-end of the web application was developed using Next.js, JavaScript, and Tailwind CSS, ensuring a responsive and modern user experience. The back-end system leveraged Directus, a low-code platform, for efficient data management, connected to a highly secure PostgreSQL database for robust personal data storage. A key component developed in this phase was the AI module, designed to predict users' potential weight loss trends based on their recorded calorie intake and daily physical activities.

Phase 5: System Testing
In this phase, the system was evaluated by a purposive sample 5 experts, consisting of 3 IT specialists and 2 certified nutritionists. This expert group was specifically selected to verify the dual pillars of the application: technical stability and the clinical accuracy of the nutritional analysis and exercise recommendation logic. By employing this multidisciplinary panel, the research ensured that the AI-driven models for food label analysis and behavior prediction were not only technically sound but also health-compliant and beneficial to the target users.

Phase 6: System Installation
The Health Story web application was successfully deployed on a production server. Robust security measures, including authentication and authorization systems, were implemented to manage user access and protect sensitive data.

Phase 7: System Maintenance
Post-deployment, a continuous maintenance phase was initiated. This involved documenting and addressing issues identified during actual usage, implementing bug fixes, performing code improvements, and deploying system updates based on ongoing user feedback to ensure the application remained efficient, secure, and up-to-date.

The effectiveness of the Health Story web application was assessed through a user evaluation involving 30 voluntary participants. These participants were selected through a combination of purposeful sampling (one IT expert for technical feedback) and simple random sampling (29 university students interested in improving their health behaviors, including calorie tracking, exercise logging, and health storytelling). Participants tested the system and provided feedback on its performance and ability to motivate and promote healthy living. The evaluation focused on five key perspectives: user capabilities, system functionality, system quality and performance, design features, and security.

6. Tools used in conducting research

The Health Story web application was developed using the following key tools: Next.js, JavaScript, Tailwind CSS (for front-end), Direct us (back-end), and PostgreSQL (database). The AI module for weight loss prediction was also a critical component.

The application's effectiveness was assessed using average scores and standard deviations from user feedback, according to the following interpretation scale for user satisfaction and system performance: 1) 4.50 – 5.00: Excellent performance, 2) 3.50 – 4.49: Good performance, 3) 2.50 – 3.49: Moderate performance, 4) 1.50 – 2.49: Adequate performance, and 5) 1.00 – 1.49: Performance needs improvement.

These results suggest a positive reception and functionality of the Development of Health Story Web Application Using Artificial Intelligence for Food Label Analysis and Eating Behavior Prediction to Recommend Personalized Exercise.

7. Research Results

This section presents the key outcomes and findings from the three phases of this research: system analysis and design, web application development, and system evaluation.

7.1. System Analysis and Design Outcomes

The initial phase culminated in a comprehensive system design for the Health Story web application, driven by a Design Thinking approach to optimize user experience. Key outputs included the detailed system architecture and Use Case Diagram, developed using Object-Oriented System Analysis. These designs, informed by relevant theoretical frameworks, guided the implementation of a robust NoSQL-based system and database structure. The overall system architecture is depicted in Figure 2, illustrating the interconnected components, while Figure 3 presents the Use Case Diagram, outlining user interactions and system functionalities.

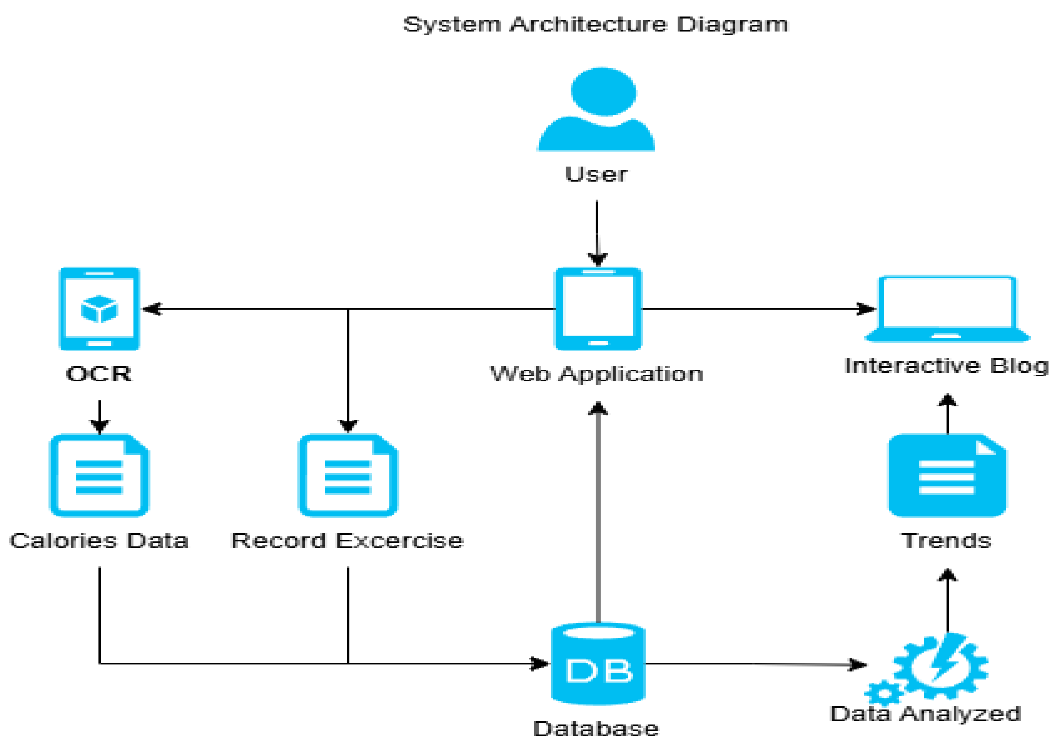

Figure 2. System Architecture Diagram of the Health Story Web Application.

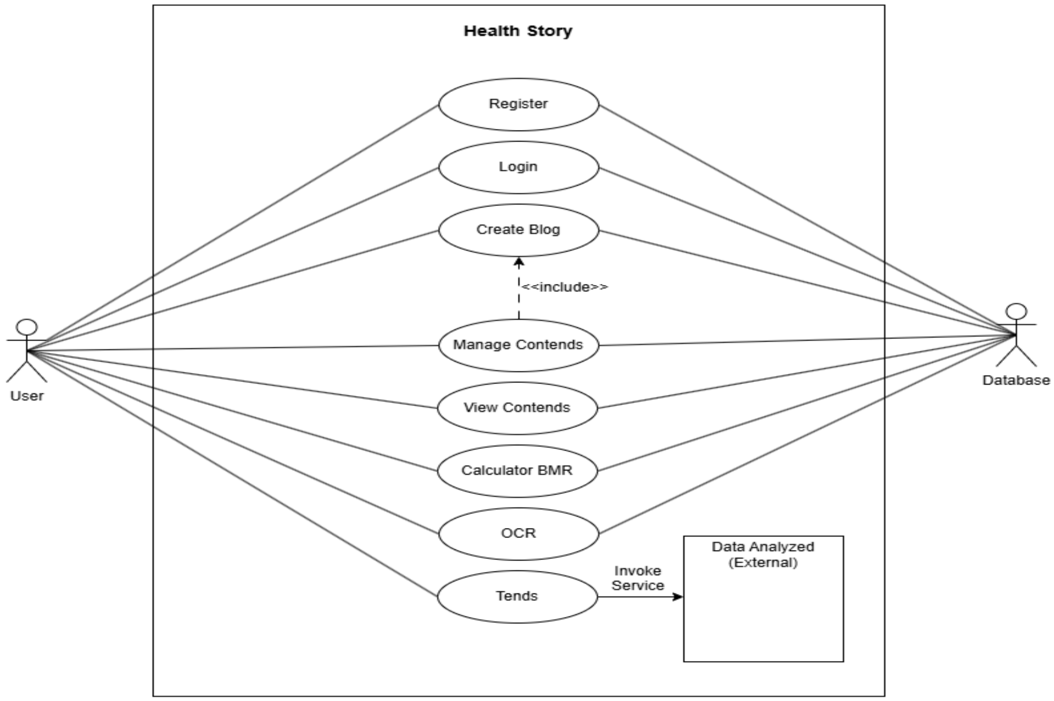

Figure 3. Use Case Diagram illustrating user interactions and functionalities within the Health Story system.

7.2. Web Application Development Outcomes

The development phase successfully produced the interactive Health Story web application, designed with a user-friendly interface. The main dashboard, shown in Figure 4, provides a primary menu for accessing core features such as calorie tracking, exercise video viewing, health blogging, and progress monitoring.

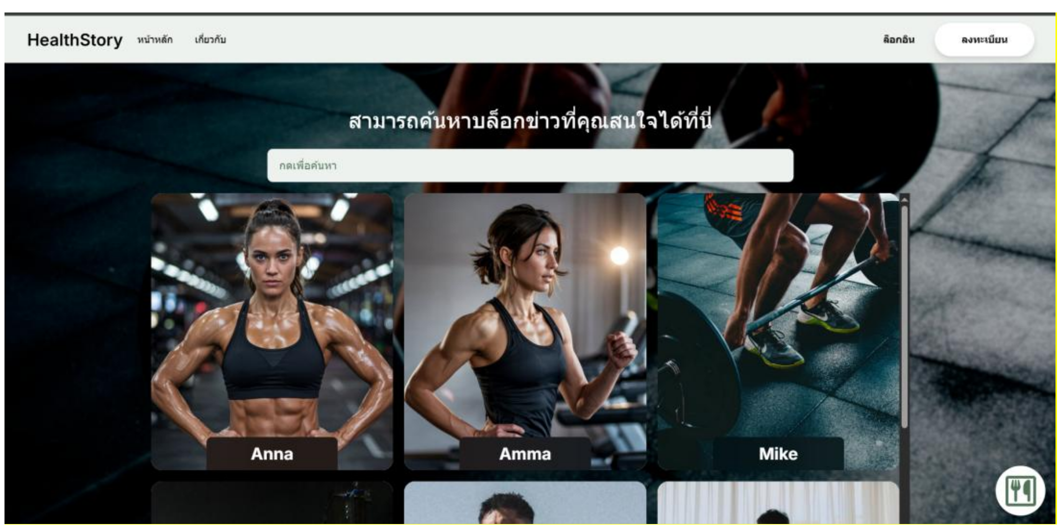

Figure 4. Main interface of the Health Story web application, showing key navigation and features.

The application integrates a calorie input system, allowing users to manually enter meal calorie content, which the system automatically aggregates (Figure 5). Furthermore, an OCR-powered food nutrition label scanning system was implemented to facilitate convenient calorie input directly from food labels (Figure 6).

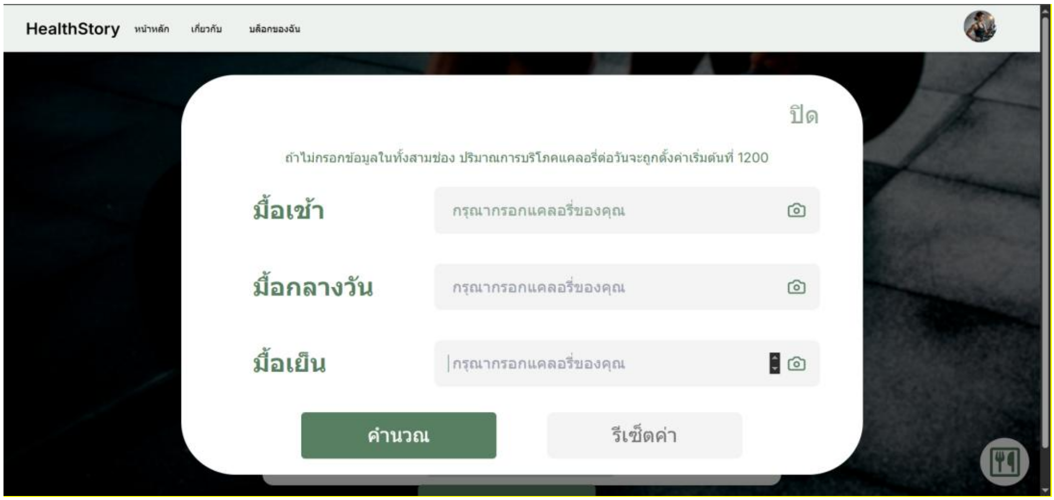

Figure 5. Interface for manual input of meal calorie content.

Figure 6. OCR-powered system for scanning and inputting food nutrition label data.

A core feature developed is the AI-based data analysis module, which processes daily food consumption behaviors to predict potential weight loss outcomes and recommend personalized exercise patterns, as demonstrated in Figure 7.

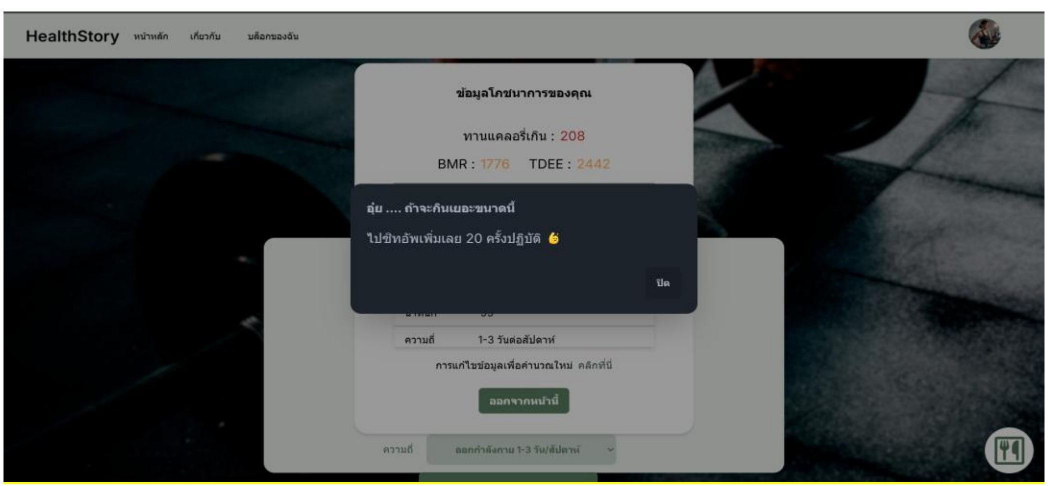

Figure 7. Interface displaying AI-based analysis of eating behavior and personalized exercise recommendations.

To foster user engagement and motivation, the platform enables users to create interactive health blogs. This feature allows individuals to share their healthy journeys, set personal goals, and reflect on past behaviors, as illustrated in Figures 8 and 9.

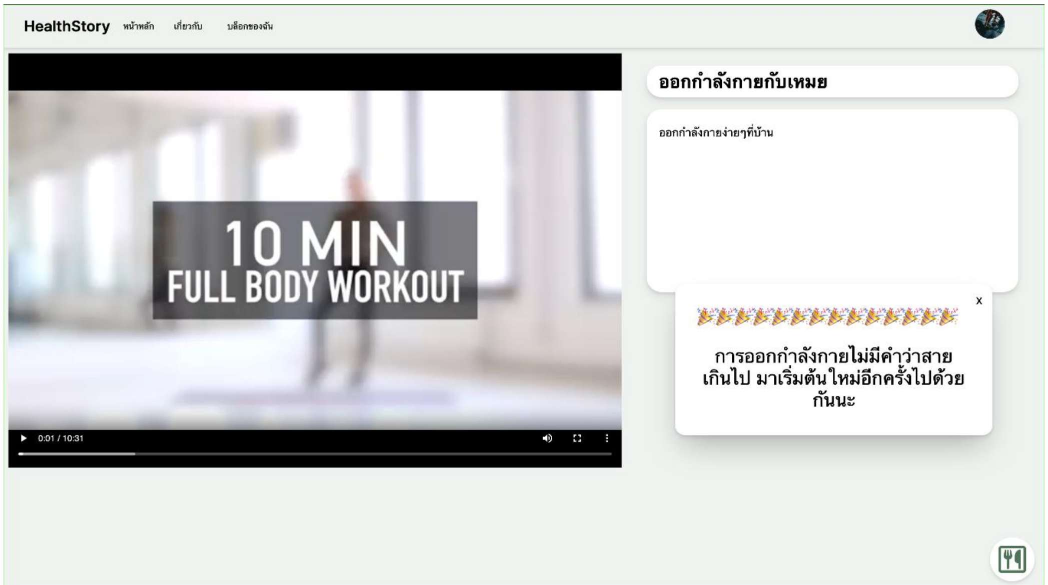

Figure 8. Example of an interactive health blog creation interface.

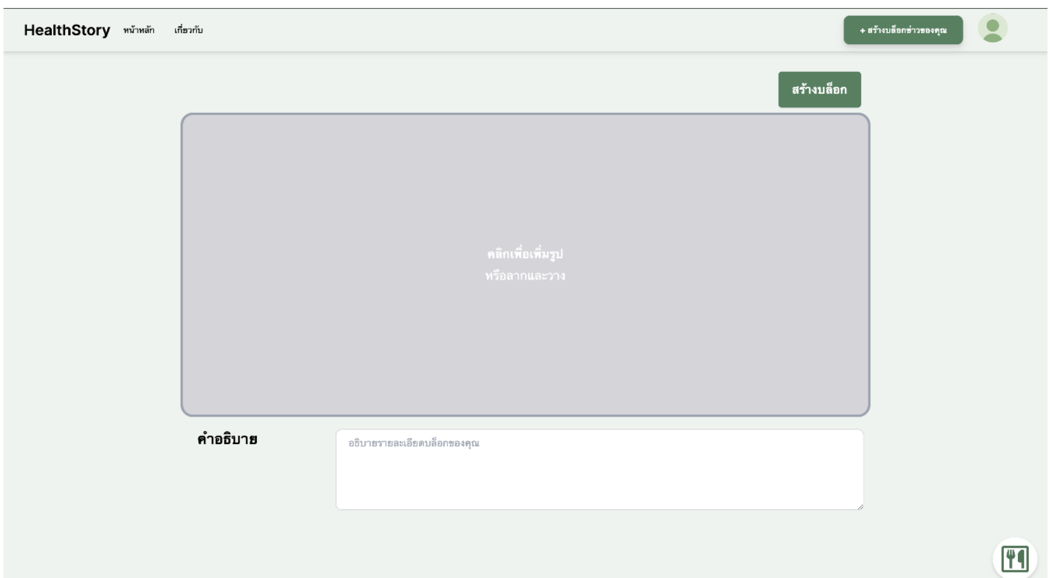

Figure 9. User interface for creating and managing personal health blogs and reflecting on progress.

7.3. System Evaluation Results

The final phase involved a comprehensive evaluation of the Health Story web application's performance across five key perspectives: user capability, system capability, system quality and efficiency, design appropriateness, and security. Data was collected from 30 participants, comprising IT professionals and university students, through questionnaires and system logs (e.g., Google Analytics, User Logs) to assess real-world usability and gather feedback for future enhancements.

Table 1 presents the detailed evaluation results, showing the average scores ($\bar{X}$), standard deviations (S.D.), and corresponding performance levels for each criterion.

Table 1. Average Scores, Standard Deviations, and Performance Levels of the Health Story Web Application Evaluation.

Evaluation list	Evaluation		
	$\overline{X}$	S.D.	Results
1. User capabilities			
1.1 Users can understand how to work on the Register page	4.53	0.74	Excellent
1.2 Users can understand how to work on the Login page	4.86	0.35	Excellent
1.3 Users can understand how to work on the Home page	4.80	0.41	Excellent
1.4 Users can understand how to work on the Blog creation page	4.80	0.41	Excellent
1.5 Users can understand how to work on the Content creation page	4.66	0.48	Excellent
1.6 Users can understand how to work on the Calorie calculation Popup	4.80	0.41	Excellent
Total	**4.74**	**0.47**	**Excellent**
2 System capabilities			
2.1 Users can use the system to register	4.86	0.35	Excellent
2.2 Users can use the system to login	4.93	0.25	Excellent
2.3 The system can display results on the Home page correctly	4.80	0.41	Excellent
2.4 The system can create blocks according to the user's needs	4.86	0.35	Excellent
2.5 The system can create content according to the user's needs and display uploaded videos correctly	4.93	0.25	Excellent
2.6 The system can display the calculation results of the amount of nutrients that should be received per day	4.73	0.45	Excellent
2.7 The system can display encouraging messages While the user is using the system	4.73	0.45	Excellent
Total	**4.83**	**0.36**	**Excellent**
3 Evaluation of the system in terms of quality and performance			
3.1 Accuracy of data storage registered	4.73	0.45	Excellent
3.2 Accuracy of data update	4.73	0.45	Excellent
3.3 Speed of processing and user response	4.86	0.35	Excellent
Total	**4.77**	**0.42**	**Excellent**
4 Evaluation of system design characteristics			
4.1 Design that is one the users find easy to understand and convenient to use	4.73	0.45	Excellent
4.2 Users find font type, font size and color selection of fonts displayed in the system appropriate	4.86	0.35	Excellent
4.3 Users find the color selection in the system appropriate	4.66	0.48	Excellent
4.4 Users are familiar with the design and find it easy to follow	4.80	0.41	Excellent
Total	**4.76**	**0.42**	**Excellent**
5 Evaluation of system security			
5.1 Encryption for security	4.78	0.42	Excellent
5.2 There are rules and precautions for posting video clips appropriately	4.86	0.35	Excellent
Total	**4.82**	**0.39**	**Excellent**
Overall	**4.79**	**0.41**	**Excellent**

Table 1 clearly demonstrates the excellent overall performance of the Health Story Web Application, an AI-driven tool for food label analysis, eating behavior prediction, and personalized exercise recommendations. The application achieved a high average score of 4.79 (SD = 0.41).

Performance consistently rated 'excellent ' across all criteria: System capabilities (system requirements) received the highest average score of 4.83 (SD = 0.36), reflecting robust functionality. Security evaluation (safety testing) was also notably strong, with an average of 4.82 (SD = 0.39). System quality and performance (non-functional testing) averaged 4.77 (SD = 0.42), showing strong performance though with slightly more user response variability. Design characteristics (usability testing) scored 4.76 (SD = 0.42), affirming its usability. Even the lowest-scoring category, User capabilities (user requirements), maintained a strong average of 4.74 (SD = 0.47), indicating effective fulfillment of user needs.

8. Discussions

The evaluation of the Health Story web application, designed to integrate health tracking with narrative-based self-reflection, robustly demonstrates its significant potential to promote sustainable health behaviors. A key finding is that users were not only able to track quantitative data, such as food intake and exercise, but also found value in the interactive blog feature for recording their feelings and personal experiences. This qualitative aspect of self-tracking appears to be a powerful motivator, fostering continued engagement and heightened awareness of personal health behaviors. This aligns with findings from the 2024 Thai Health Report, which underscores the pivotal role of digital technology in promoting health, particularly through enhancing intrinsic motivation and self-efficacy—factors critical for sustained behavioral change (ThaiHealth, 2024). Similarly, the efficacy of mobile health (mHealth) apps in supporting user control over health behaviors, including diet and exercise, through tools like reminders and progress tracking (Ghazwani et al., 2024), resonates with Health Story's promotion of proactive self-care.

A central strength of the Health Story system lies in its strategic integration of information technology with behavioral change psychology. Beyond mere calorie counting or step tracking, the application deliberately creates a space for storytelling and self-reflection. This narrative approach significantly enhances user engagement and intrinsic motivation, fostering a deeper personal connection to health goals. This concept is firmly grounded in Deci and Ryan's (2000) Self-Determination Theory (SDT), which posits that autonomy, competence, and relatedness are fundamental psychological needs driving intrinsic motivation. By offering personalized recommendations (enhancing competence), enabling free expression (supporting autonomy), and potentially fostering a sense of community or shared experience (relatedness), Health Story cultivates these essential components for sustainable health behaviors (Ryan & Deci, 2000). Furthermore, the application's high user satisfaction and ease of use, as reflected in our performance metrics (refer to Table 1), are consistent with Nielsen's (1994) user-centered design principles, which prioritize usability, rapid response, and consistency with user expectations. The strong performance in system capabilities and AI accuracy (over 90% in analysis and prediction), reported in our results, directly underpins the user's perception of competence and trustworthiness in the personalized recommendations.

Despite these promising findings, this study has several limitations that warrant consideration. Firstly, the study relied primarily on self-reported data for eating behaviors and exercise patterns, which may be subject to recall bias or social desirability. Secondly, the duration of the study was relatively short, limiting our ability to assess the long-term sustainability of the observed health behavior changes. Future research should consider longer-term observational studies with objective measures where feasible. Thirdly, the sample group was localized, potentially limiting the generalizability of these findings to diverse populations or cultural contexts.

Building on this research, future health behavior promotion system designs should continue to integrate both technological advancements (e.g., more sophisticated self-tracking, responsive UI/UX, multi-source data integration) and profound psychological insights (e.g., narrative reflection, personalized motivational nudges) to foster sustainable motivation, long-term engagement, and demonstrable, lasting health behavior change. Further research could explore the impact of integrating emotional data on eating behavior prediction, expanding the cultural diversity of the food database, and conducting larger-scale, longitudinal studies to confirm the long-term efficacy and generalizability of the Health Story application.

9. Conclusion

The core objective of this research was to develop Health Story, a web application leveraging artificial intelligence to analyze nutrition labels and eating behaviors. Based on Self-Tracking and Narrative Psychology, the application aimed to deliver personalized exercise recommendations to foster sustainable health behaviors. Its development adhered to a structured Software Development Life Cycle (SDLC) through the Waterfall Model, encompassing requirements analysis, design, development, testing, and evaluation.

Evaluation of Health Story revealed excellent system performance. The application accurately processed nutrition label data and predicted eating behaviors using its AI model, allowing for precise, individualized exercise pattern recommendations. Users consistently found the system easy to use, with a clear user interface designed to facilitate self-tracking and encourage positive behavioral shifts.

Regarding health behavior impact, users showed a clear tendency towards healthier food choices and regular exercise following the personalized recommendations. The application's AI model demonstrated high reliability and accuracy, with an average accuracy exceeding 90% in nutrition label analysis and close alignment with actual user-reported eating behaviors. To ensure the credibility of these performance metrics, the AI prediction module underwent a rigorous validation process using a dataset consisting of food label records and user logs. The data was divided using an 80/20 training and testing split to evaluate the model's generalizability. Beyond simple accuracy, the model's robustness was confirmed through multiple evaluation metrics, including a high F1-score (indicating a balance between precision and recall) and a low Root Mean Square Error (RMSE), which verified the precision of the behavior prediction logic. These strong performance metrics contributed to high user satisfaction across various criteria, including the usefulness of recommendations, ease of use, and encouragement of self-care.

Collectively, these findings confirm that the Health Story system effectively meets its objective of promoting personalized health behaviors and holds substantial promise for future scalability and enhancement.

10. Recommendations

Based on the promising results and insights gained from the Health Story web application, several key recommendations are proposed to enhance its efficacy, user experience, and broader applicability, paving the way for its future development and widespread adoption. These recommendations are structured to align with both technological advancements and deeper psychological integration:

1. Advanced AI Model Development and Data Integration
To further enhance the precision and personalization of recommendations, future efforts should prioritize improving the AI models. This includes: 1) Increased Accuracy: Developing AI models with even higher accuracy in predicting eating behavior and analyzing nutrition labels, 2) Complex Data Analysis: Integrating a wider array of data sources, such as real-time user stress levels, emotional states, and contextual information (e.g., social settings), to provide more nuanced and accurate predictions of eating behavior, especially during periods of emotional fluctuation, and 3) Expanded Food Database: Continuously expanding the food database to include diverse nutritional information from multiple countries and cultures.

2. User Experience (UX) and Engagement Enhancements
Optimizing the user interface and experience is crucial for sustained engagement and motivation: 1) UI/UX Refinements: Streamlining the menu structure, improving navigation, and enhancing the overall visual design to ensure a more intuitive and user-friendly experience, 2) New User Onboarding: Implementing a comprehensive recommendation function or guided tours for new users to facilitate quick adaptation and understanding of the application's features, 3) Direct Communication Features: Developing interactive communication channels, such as an in-app chat system, enabling users to directly contact experts (e.g., dietitians, trainers) or an AI chatbot for immediate support and personalized advice, and 4) Proactive Motivational Nudges: Implementing functions to send personalized messages that proactively encourage healthy food choices, regular exercise, or provide motivational support, aligning with the narrative and self-reflection features.

3. Broadening Scope and Accessibility
To maximize the application's impact and reach a wider audience: 1) Diverse Exercise Options: Expanding the database of exercise options to cater to various user groups, including specific populations such as the elderly, individuals with chronic health conditions, or those with different fitness levels and 2) Multi-Language Support: Developing multi-language capabilities, such as English, to enhance global accessibility and broaden the user market.

4. Security and Long-term Evaluation
Ensuring data integrity, privacy, and continuous improvement are paramount: 1) Enhanced Data Security: Employing modern data encryption technologies to robustly protect personal and sensitive health information, 2) Transparent Privacy Policy: Establishing and clearly communicating a comprehensive privacy policy to build and maintain user trust and confidence in data security, 3) Continuous Monitoring and Evaluation: Implementing mechanisms for long-

term usage monitoring and ongoing assessment of user satisfaction to identify emerging needs and areas for iterative improvement. In conclusion, the future development of Health Story should strategically integrate technological advancements with profound insights from behavioral psychology, particularly focusing on storytelling and self-reflection, to empower users in sustainably improving their health behaviors and well-being. And 4) Health Story will integrate wearable devices and real-time biometric data, such as heart rate and step counts. This transition from manual logs to automated data streams enables the AI to provide more precise, dynamic, and real-time exercise adjustments based on the user's actual physiological state.

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