SEMARAK ILMU PUBLISHING

Journal of Advanced Research in Applied Sciences and Engineering Technology

Journal homepage:
https://semarakilmu.com.my/journals/index.php/applied_sciences_eng_tech/index
ISSN: 2462-1943

MEP: Malaysia Enteral Product Apps for Dietitian in Hospital Serdang

Siti Khadijah Ali[1,*], Fatin Faniza Kamarulzaman[1], Nuha Ismail[2]

[1] Department of Multimedia, Faculty of Computer Science and Information Technology, Universiti Putra Malaysia, 43400 UPM Serdang, Selangor, Malaysia
[2] Hospital Serdang, Ministry of Health, Selangor, Malaysia

ARTICLE INFO

Article history:
Received 15 June 2023
Received in revised form 10 August 2023
Accepted 13 September 2023
Available online 26 November 2023

Keywords:

Dietitian; Enteral nutrition; Feeding regime; Nutrient; Digital health; Health science

ABSTRACT

Enteral nutrition is an essential nutrition therapy that provides a complete source of nutrition for malnourished patients. Hence, dietitians will advise them to follow a complete diet. However, up to now, dietitians at Hospital Serdang have been facing difficulties due to the unsystematic storage of information on enteral products, and they are required to memorize all the nutrients of the products. To overcome this issue, a MEP (Malaysia Enteral Product) application for Dietitians was proposed to assist dietitians at Hospital Serdang. The MEP application was developed using the Agile methodology model. Agile was chosen because it is flexible and can be modified if required. Functions such as searching, viewing, comparing, and analysing products were included. As an initial observation, six dietitians from Hospital Serdang tested the MEP. All respondents were required to share their feedback using a provided Google form. Based on the feedback, all respondents agreed that the MEP application was able to provide precise enteral nutritional information and was able to reduce time and energy during the evaluation and planning of enteral nutrition interventions for patients.

1. Introduction

Enteral nutrition is a nutrition therapy that has been recognized as a safe, effective, and cost-effective method of providing adequate nutrition since the 1980s [1]. It is provided by dietitians to patients who have difficulty in eating or swallowing normally. The nutrition can be in the form of liquid that consists of protein, carbohydrates, fats, nutrients, and minerals. There are various ways for patients to consume it, such as through a tube that goes directly to the stomach or small intestines. Hence, it is important for dietitians to examine the ingredients in all enteral products [2-9].

A dietitian is a healthcare professional. According to Russell CA (1986), the role of a dietitian is to estimate the nutritional requirements and be responsible for prescribing and reviewing the feeding regimen for the nutritional assessment of patients. They work in hospitals to deliver Medical Nutrition Therapy (MNT) for patients, which includes nutrition therapy or enteral nutrition. It is the

* *Corresponding author.*
E-mail address: ctkhadijah@upm.edu.my

https://doi.org/10.37934/araset.34.1.6379

dietitian's responsibility to ensure that patients receive suitable nutrition based on the recommended amount, as different diseases require different calculations and, consequently, different nutrition and quantities.

In Malaysia, there are many enteral nutrition products produced or distributed by various companies or distributors, and it is the responsibility of dietitians to provide advice and suggestions to patients. However, most dietitians in Malaysia face challenges in manually reading and calculating the nutrition information. Hence, there is a need to address this issue. One possible solution is to implement health-related digital technologies such as mobile devices, specifically smartphones, to aid in decision-making [10-15]. There are various types of diet-related applications, such as myPace and MyFitnessPal. However, most commercial apps provide information related to foods and are not designed for dietitians [16-18]. Moreover, based on interviews with dietitians at Serdang Hospital, they need to calculate or access kilocalorie information in the product, which is not provided in most commercial apps. Consequently, dietitians have to independently assess identified apps and determine their suitability for their workflow. If the required information, such as kilocalories, is not provided, they need to calculate it manually. A study conducted by Mahmood *et al.,* shows the reduction in delayed initiation of enteral product for patients in the Intensive Care Unit (ICU) [19].

Therefore, a health-related smartphone application named "Malaysia Enteral Product" (MEP) is proposed to assist dietitians, specifically at Hospital Serdang, in making decisions. The decision-making process will be facilitated by assessing the kilocalorie(s) information in the products. Additionally, the application can provide nutrient comparisons among products for dietitian use, calculate prescription regimes to provide accurate measurements to dietitians and other users, and offer flexibility for users to add new information to existing products and include new products in the application.

2. Materials and Method

In this work, the Agile methodology was utilized to develop the proposed application. This is because Agile can encourage developers to work simultaneously on different phases of the project [20-24]. The Agile framework consists of six stages: requirements gathering, design, development, testing, implementation, and feedback (Figure 1).

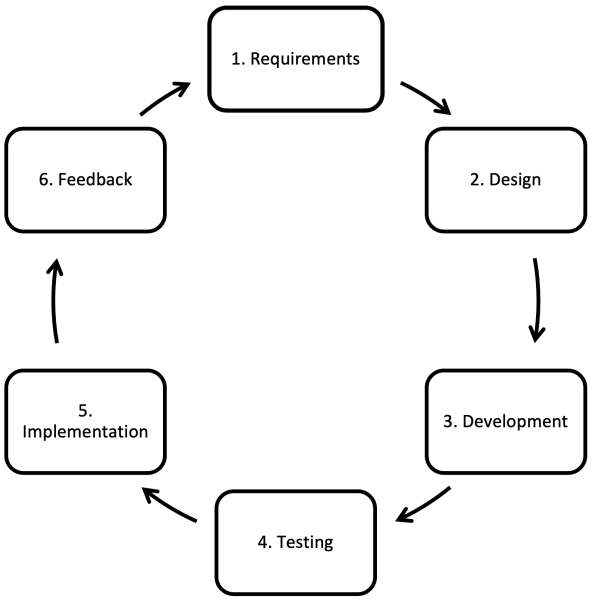


Fig. 1. Agile Model

2.1 Requirement Gathering Phase

This is the first stage before the development of the project, and it holds significant importance in the Agile model. During this stage, a list of all essential requirements and needs must be created to ensure the project's relevance and success. The collaboration for this project involves the Department of Dietetics at Serdang Hospital. The requirements were identified through several virtual meetings and conversations via WhatsApp to further explore these ideas. Some of these requirements include the problem statement and objectives of the project, the scope of the project, and reviews of previous similar projects. It is important to note that not all requirements will be discussed at once; some can be addressed later when the application is implemented, and its main functions are working as intended.

2.2 Design Phase

In this phase, the basic idea of the system is established. The system architecture is designed, and key elements such as the flowchart, storyboard, first prototype, functionalities, and data modelling are created to lay the foundation for the final prototype in the next phase (Figure 2). This stage involves the conceptualization and initial design of the application, shaping how it will function and appear to users. It serves as a blueprint for the development process that follows.

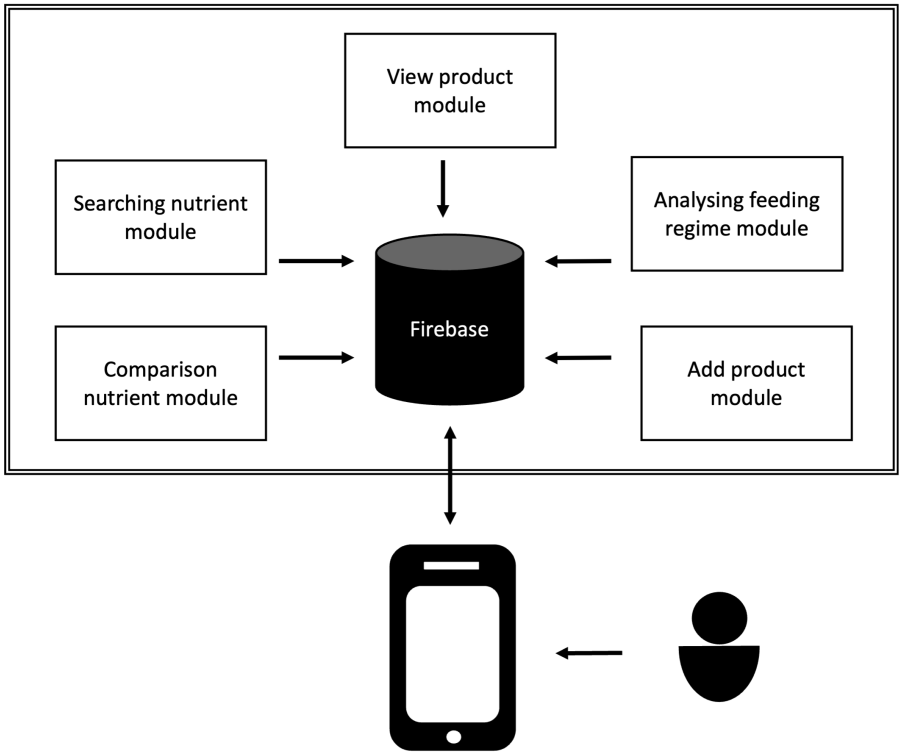


Fig. 2. System architecture for the MEP application with major system components

In the MEP application, five important functions have been identified based on the requirements of the dietitians at Hospital Serdang. These functions are designed to support the active involvement of dietitians in the application development [8]. The five key features are as follows:

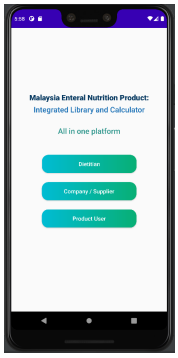
i. Comparison Nutrient Module: This module allows dietitians to advise patients about their diets by comparing the nutrient content of different products. It helps in making informed decisions about which products are most suitable for each patient's nutritional needs.
ii. Search Nutrient Module: The searching nutrient module enables both dietitians and patients to easily search for the nutrient content of specific products. This feature provides quick access to crucial nutritional information.
iii. View Nutrient Module: With the view product module, users can see detailed nutrient information of selected products. This module allows dietitians to review the nutritional content of various products in-depth.
iv. Analyse Feeding Regime Module: The analyse feeding regime module assists dietitians in determining the appropriate feeding regime or required amounts for patients. It streamlines the process of devising personalized nutrition plans.
v. Add Product Module: This module is specifically designed for suppliers to add new products to the application. It ensures that the application remains up-to-date with the latest enteral nutrition products available in the market.

By incorporating these essential functions, the MEP application aims to fulfil the specific needs of dietitians at Hospital Serdang, making it a valuable tool in their daily practice.

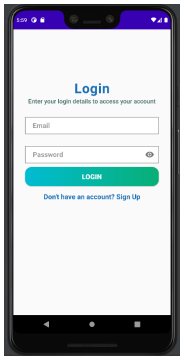
2.3 Development Phase

In this phase, the development process is carried out, utilizing the inputs from the requirements and design phase as a guide. The development is done using tools like Android Studio, which provides integration between the interface and database. Android Studio also offers an Android simulator to simulate the application's functionality. Throughout this phase, multiple feedback sessions were held with the dietitians at Serdang Hospital to gather their inputs and ensure that the application meets their needs.

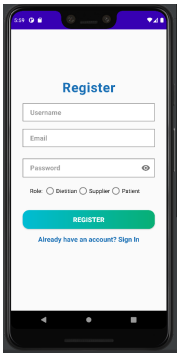
Figure 3 (a-i) displays the interface of the MEP application, showcasing the visual representation of the developed features and functionalities.



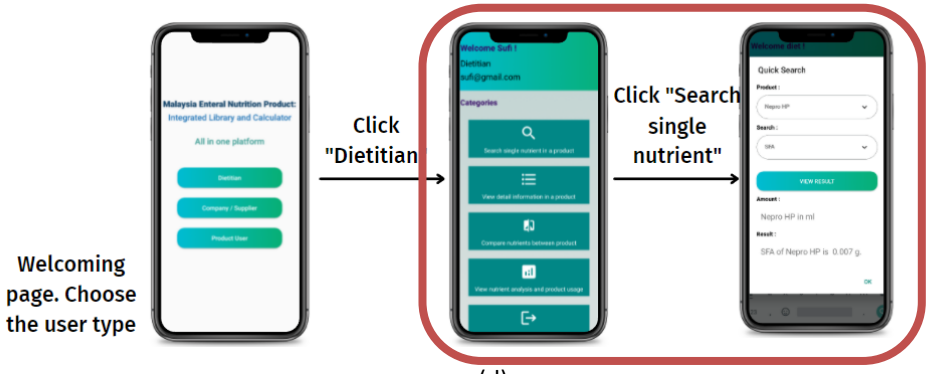
(a)



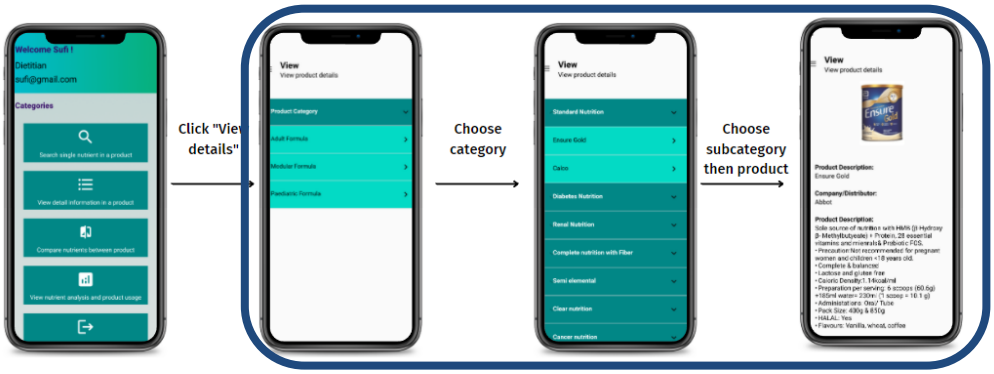
(b)



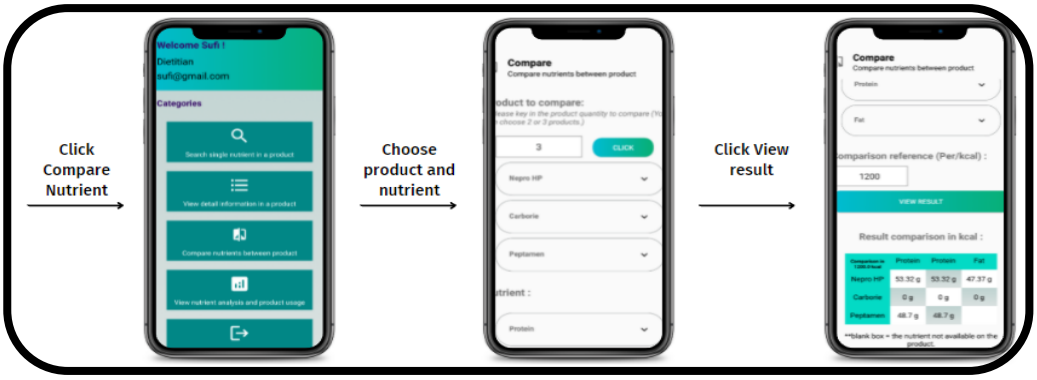
(c)


Welcoming page. Choose the user type
Click "Dietitian
Click "Search single nutrient"

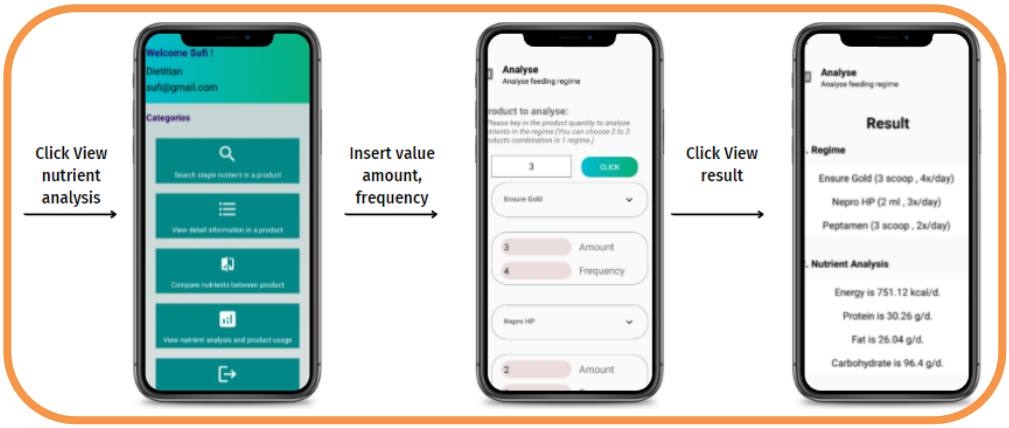
(d)


Click "Vie details"
Choose category
Choose subcategory then product

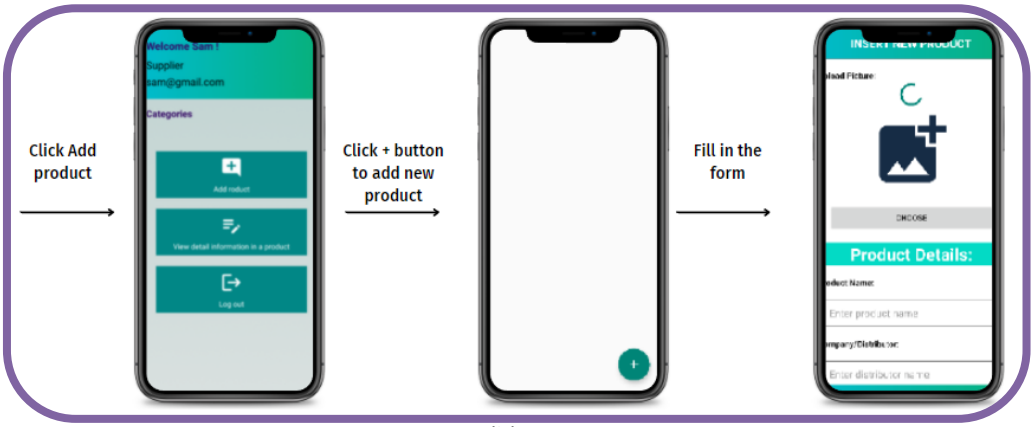
(e)


Click Compare Nutrient
Choose product and nutrient
Click View result

(f)


Click View nutrient analysis
Insert value amount, frequency
Click View result

(g)



(h)

Fig. 3. The interface of the MEP application: (a) User can choose the category their category as either "Dietitian", "Company/Supplier" or "Product User" (b) Layout for login account of this application (c) Layout for account registration of this application (d) Layout of search single nutrient module (e) Layout of view product detail module (f) Layout of comparing nutrient's module (g) Layout of analyse feeding regime module (h) Layout of add and update product module

Figure 3 highlights the five squares in different colours, each representing a specific module of the MEP application - Red Square: Search Nutrient Module, Blue Square: View Nutrient Module, Black Square: Comparison Nutrient Module, Orange Square: Analyse Feeding Module and Purple Square: Add and Update Product Module. These modules correspond to the key functions of the MEP application, as mentioned earlier. Additionally, Appendix 1.A presents the flowchart of the application, providing a visual representation of the sequence of steps and interactions within the application. The flowchart helps in understanding the overall structure and flow of the application's processes.

Figure 3(f) displays the interface for the nutrient comparison function, which was identified as one of the crucial features requested by the dietitians. This module allows dietitians to compare the nutrient content of different selected products, aiding in making informed decisions for their patients' dietary plans. Table 1 presents the formula used to measure the chosen nutrient in the selected products. The table likely includes the calculations or equations used by the application to quantify and compare specific nutrients present in various enteral products. Both the interface and the formula provided in Figure 3(f) and Table 1, respectively, play a significant role in empowering dietitians to assess and recommend the most appropriate nutritional options for their patients.

Table 1
Formula used for calculation in comparing nutrient function

Comparison in G kcal	Nutrient 1 (Unit Nutrient 1)	Nutrient 2 (Unit Nutrient 2)	Nutrient 3 (Unit Nutrient 3)
Product A	$\frac{G}{Energy\ Product\ A \times Nutrient\ 1}$	$\frac{G}{Energy\ Product\ A \times Nutrient\ 2}$	$\frac{G}{Energy\ Product\ B \times Nutrient\ 3}$
Product B	$\frac{G}{Energy\ Product\ B \times Nutrient\ 1}$	$\frac{G}{Energy\ Product\ B \times Nutrient\ 2}$	$\frac{G}{Energy\ Product\ B \times Nutrient\ 3}$
Product C	$\frac{G}{Energy\ Product\ C \times Nutrient\ 1}$	$\frac{G}{Energy\ Product\ B \times Nutrient\ 2}$	$\frac{G}{Energy\ Product\ B \times Nutrient\ 3}$

Feeding regime analysis is the second important feature in the application, as requested by the dietitians (Figure 3(g)). This module allows dietitians to analyse and determine suitable feeding regimes or required amounts for patients, helping to create personalized nutrition plans.

Table 2
Formula to analyse the feeding regime

Regime	$Product\ A\ \left(A\ Amount, B\ \frac{x}{d}\right) + Product\ B\ \left(C\ Amount, D\ \frac{x}{d}\right) + Product\ C\ \left(E\ Amount, F\ \frac{x}{d}\right)$
Nutrient Analysis	
Energy	$=Energy\ (Product\ A) \times A \times B) + Energy\ (Product\ B) \times C \times D) + Energy\ (Product\ C) \times E \times F)$
Protein	$= Protein(Product\ A) \times A \times B) + Protein\ (Product\ B) \times C \times D) + Protein\ (Product\ C) \times E \times F)$
Fat	$= Fat(Product\ A) \times A \times B) + Fat\ (Product\ B) \times C \times D) + Fat\ (Product\ C) \times E \times F)$
Carbohydrate	$= Carbohydrate(Product\ A) \times A \times B) + Carbohydrate\ (Product\ B) \times C \times D) + Carbohydrate\ (Product\ C) \times E \times F)$
Nutrient 1	$= Nutrient\ 1(Product\ A) \times A \times B) + Nutrient\ 1\ (Product\ B) \times C \times D) + Nutrient\ 1\ (Product\ C) \times E \times F)$
Nutrient 2	$= Nutrient\ 2(Product\ A) \times A \times B) + Nutrient\ 2\ (Product\ B) \times C \times D) + Nutrient\ 2\ (Product\ C) \times E \times F)$
Nutrient 3	$= Nutrient\ 3(Product\ A) \times A \times B) + Nutrient\ 3(Product\ B) \times C \times D) + Nutrient\ 3\ (Product\ C) \times E \times F)$

These formulas (Table 1 and 2) were designed by the clinical dietitians at Hospital Serdang to aid them during consultation sessions with patients. While there might not be specific scientific references for these formulas, they have been developed based on the dietitians' expertise and knowledge in the field.

Regarding the nutrient information provided by the supplier and stored in the database, dietitians can utilize the formula in Table 1 to calculate the amount of a particular nutrient, such as Vitamin C, in different products. For example, if they need to know the amount of Vitamin C in three products, namely Product A, Product B, and Product C, they can use the nutrient information provided by the supplier and apply the formula to obtain the Vitamin C content for each product. This allows dietitians to make well-informed decisions and recommendations during their consultations with patients, considering the specific nutrient content of different products.

2.4 Testing Phase

In this phase, both functional and non-functional requirements were identified to ensure the proposed application's accuracy and effectiveness. The application underwent testing by users, which included both alpha and beta tests.

During the initial testing phase, six dietitians from Serdang Hospital were selected to test the application's functionality and provide valuable feedback. To gather feedback, a series of surveys were conducted, allowing the dietitians to share their thoughts, suggestions, and identify any potential issues or areas for improvement.

The alpha test involved the internal testing of the application by the development team to assess its performance and identify any bugs or errors that needed to be addressed before the beta test. The beta test, on the other hand, was conducted with real users (the six dietitians in this case) to evaluate the application's usability and functionality in a real-world environment.

By involving users in the testing process and conducting surveys to gather feedback, the developers were able to iteratively refine and improve the application, ensuring that it met the dietitians' requirements and provided a seamless user experience.

2.5 Implementation Phase

After the test phase was successful, the proposed application underwent improvements and refinements based on the feedback and findings gathered from the alpha and beta tests. The identified issues and suggestions from the dietitians were carefully addressed, and any bugs or errors were fixed.

Once all the necessary improvements were implemented, the application was deemed ready for deployment and use by the real users: the dietitians at Serdang Hospital. The development team ensured that the final version of the application met the specific requirements of the dietitians and provided a reliable, user-friendly, and efficient tool for their daily work.

With the successful completion of the testing phase and the incorporation of necessary enhancements, the MEP application was fully prepared to support the dietitians at Serdang Hospital in their nutrition assessment and planning for patients. Its launch marked the practical implementation of the solution, benefitting both the dietitians and the patients they serve.

3. Results and Discussion

The approach used to gather feedback from the users, in this case, the dietitians at Serdang Hospital, involved providing them with a survey and conducting informal interview sessions. The survey questionnaire was designed to cover various aspects, including demographic data and the evaluation of the functions available in the dietitian interface of the MEP application. The specific functions assessed in the survey included - The function to search for individual nutrients, the function to display product details, the function to compare nutrients among different products and the function to analyse the diet plan.

The evaluation of these dietitian interface functions was essential to assess the application's functionality, user interaction, and design from the perspective of the end-users, the dietitians themselves. In addition to the structured survey, informal interview sessions were conducted to complement the data gathered. During these informal interviews, the researcher engaged with the respondents in a more relaxed and conversational manner, asking open-ended questions and encouraging them to share their thoughts, experiences, and any additional feedback they had regarding the application. By combining the structured survey and informal interviews, the research team obtained a comprehensive understanding of the dietitians' perspectives, preferences, and insights. This valuable feedback played a critical role in further refining the MEP application and ensuring its effectiveness and user-friendliness in real-world scenarios at Serdang Hospital.

The structured survey which is based on the Yes-or-No questions were utilized to assess the specific function of the MEP application. The simplicity of these questions makes it easier to interpret the results based on the respondents' experience with the application. The quick answers and responses provided valuable insights into the effectiveness of the function.

The assessment involved five questions aimed at observing the performance of the "finding a single nutrient" function within the application. These questions covered various aspects related to the functionality, user interaction, and design of this specific function. The assessment sought to understand the following aspects:

Table 3
Important aspects in the structured survey

	Function 1: Search Single Nutrient	***Function 2: View Product Detail***	***Function 3: Comparing Nutrient***	***Function 4: Feeding Regime Analysis***
Meeting Needs	Whether the function adequately met the dietitians' needs in finding a single nutrient in the products.	Determine whether the function adequately meets the dietitians' requirements for displaying product details. This involves ensuring that all essential information about the products is readily available and presented in a clear and organized manner.	Determine whether the function adequately meets the dietitians' requirements for comparing nutrients among different products. This involves ensuring that the comparison process is comprehensive and provides valuable insights for making informed decisions.	Determine whether the function adequately meets the dietitians' requirements for analysing feeding regimes and determining suitable amounts for patients. This involves ensuring that the analysis process is comprehensive, accurate, and assists dietitians in making informed decisions for patient nutrition plans.
Functional Efficiency	How efficiently the function performed its task of searching for individual nutrients?	Evaluate how efficiently the function performs in displaying product details. It should be able to retrieve and present the information quickly and accurately	Evaluate how efficiently the function performs nutrient comparisons. It should swiftly process the data and present the comparison results in a clear and organized manner.	Evaluate how efficiently the function performs the feeding regime analysis. It should be able to process data and calculate suitable feeding regimes promptly and accurately.
Ease of Use – Question	Whether the function was user-friendly and easy to navigate.	Assess whether the function is user-friendly and intuitive in its design, making it easy for dietitians to access and navigate through the product details.	Assess whether the function is user-friendly and intuitive in its design, allowing dietitians to conduct nutrient comparisons easily and without confusion.	Assess whether the function is user-friendly and intuitive in its design, allowing dietitians to conduct feeding regime analysis without confusion or complications.
Interface Clarity	Whether the design of the function was visually appealing and user-friendly.	Consider the visual appeal and user-friendliness of the function's interface. The design should be engaging, aesthetically pleasing, and conducive to efficient use.	Consider the visual design and layout of the nutrient comparison feature. The interface should be visually appealing, engaging, and conducive to efficient use.	Consider the visual design and layout of the feeding regime analysis feature. The interface should be visually appealing, engaging, and conducive to efficient use.
Guidelines and Support	Whether the application provided sufficient guidelines and support to assist the users in utilizing this function effectively.	Evaluate whether the application provides sufficient guidelines and support to assist users (dietitians) in utilizing the product details display function effectively. This may include tooltips, on-screen prompts, or user guides.	Evaluate whether the application provides adequate guidelines and support to assist users (dietitians) in effectively utilizing the nutrient comparison function. This may include tooltips, help prompts, or user guides.	Evaluate whether the application provides sufficient guidelines and support to assist users (dietitians) in effectively utilizing the feeding regime analysis function. This may include tooltips, on-screen prompts, or user guides.

By employing yes-or-no questions in this assessment, the researchers were able to gather clear and concise feedback from the dietitians, helping to identify any areas that needed improvement and

refining the function to better meet the users' expectations and requirements. In section 2.4, it was mentioned that the project is still in its initial stage, and the demographic data for the study consisted of six dietitians from Serdang Hospital. Here is a summary of the demographic information of the respondents:

Nationality	All respondents are 100% Malaysian citizens. - 5 Malays (83.3%) - 1 Chinese (16.7%)
Gender	All respondents are female, accounting for 100% of the participants.
Age Range	The age range of the respondents falls between 31 and 50 years old. - 5 respondents are between 31 and 40 years old (83.3%). - 1 respondent is between 41 and 50 years old (16.7%).
Profession	All respondents are 100% dietitians working at Serdang Hospital.

This demographic information provides an overview of the characteristics of the dietitians who participated in the study, helping to understand the composition of the participant group. The feedback and insights gathered from these dietitians played a crucial role in evaluating and improving the MEP application's functionality and usability.

3.1 Function 1: Search Single Nutrient

Figure 4 illustrates the positive feedback received from all six users (dietitians) regarding the "finding a single nutrient" function in the MEP application. The respondents expressed satisfaction with this function, stating that it effectively met their requirements of quickly finding nutritional information about a product. The positive feedback highlighted the following points:

Meeting Needs	All respondents agree that the application is able to help them in finding their needs
Functional Efficiency	The function was rated as highly efficient, implying that it delivered the desired nutrient information promptly and accurately.
Ease of Use	All respondents found the function to be easy to use, indicating that the application's design and user interface were user-friendly.
Interface Clarity	The respondents found the interface easy to understand, making it simple for them to access the necessary nutritional data.
Guidelines and Support	The dietitians did not require additional guidelines or support to utilize the application effectively, indicating that the function's design was intuitive and self-explanatory.

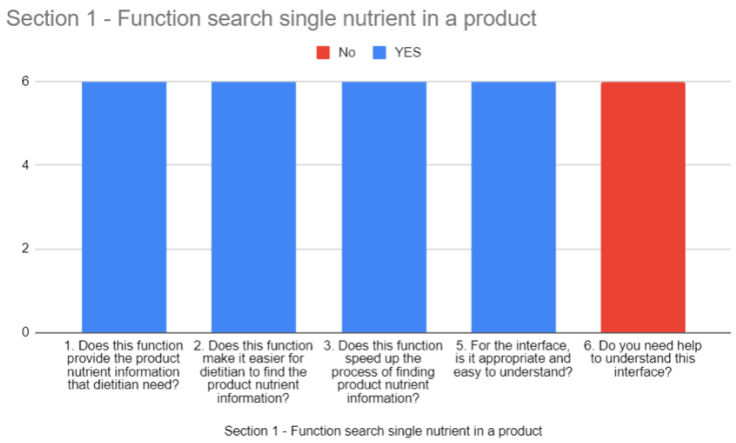


Fig. 4. Feedback of general information of MEP application by the users

Additionally, the feedback emphasized that the application's "finding a single nutrient" feature was rated most positively by all respondents. The dietitians appreciated how the application significantly saved them time compared to using traditional methods such as catalogues or internet searches. With just one click, they could access all the essential nutritional information they needed, streamlining their workflow and enhancing efficiency in their daily practice. Overall, the positive responses from the users confirm the successful implementation of this function in the MEP application, catering to the specific needs and preferences of the dietitians at Serdang Hospital.

3.2 Function 2: View Product Detail

In Figure 5, the evaluation of the "product details display" function involves considering various aspects to ensure its effectiveness and user-friendliness. By evaluating aspects in Table 3, the researchers can gather valuable feedback to refine and enhance the "product details display" function. This evaluation will help ensure that the function is optimized to meet the specific needs of the dietitians at Serdang Hospital, ultimately contributing to an efficient and user-friendly experience with the MEP application.

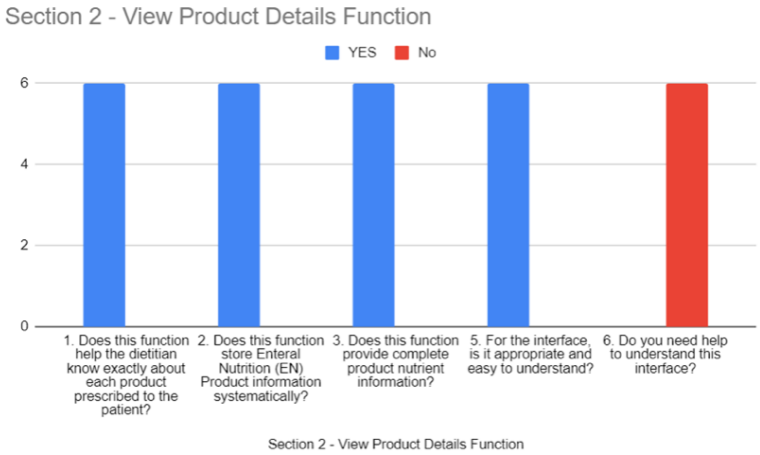


Fig. 5. Feedback of view product detail function of MEP application by the users

The evaluation of the "product details display" function received positive feedback from all six respondents, the dietitians at Serdang Hospital. They expressed satisfaction with this feature, stating that it effectively met their requirements by providing systematic access to comprehensive information about enteral nutrition products. The positive feedback highlighted the following points:

Meeting Needs	The application was able to provide all the necessary details required for enteral feeding products.
Functional Efficiency	The function was rated as highly efficient, meaning it efficiently presented all the relevant information about enteral feeding products.
Ease of Use	All respondents found the function easy to use, indicating that the application's design and user interface were user-friendly and intuitive.
Interface Clarity	The respondents found the interface easy to understand, making it straightforward for them to access and view the details of enteral nutrition products.
Guidelines and Support	The dietitians did not require additional instructions or guidelines to use the application effectively, demonstrating that the function's design was self-explanatory and straightforward.

Moreover, the feedback emphasized that the "product details display" feature was rated most positively by all respondents. The dietitians appreciated how the application provided them with all the necessary details required for enteral feeding products, such as the product name, distributor, product description, ingredients, indications, nutritional information, retail price, and product availability. This comprehensive information proved valuable in supporting their decision-making process and nutritional assessment for patients.

The positive responses from the users affirm the successful implementation of this function in the MEP application, aligning with the dietitians' needs and expectations. The feature's efficiency and user-friendliness contributed to its positive reception among the dietitians, making it a valuable tool in their daily practice at Serdang Hospital.

3.3 Function 3: Comparing Nutrient

In Figure 6, the evaluation of the "nutrient comparison" function involves considering several important aspects to ensure its effectiveness and user-friendliness. By evaluating aspects in Table 3, the researchers can obtain valuable feedback to further enhance and optimize the "nutrient comparison" function. This evaluation will help ensure that the function is tailored to meet the specific needs of the dietitians at Serdang Hospital, providing a seamless and valuable experience with the MEP application.

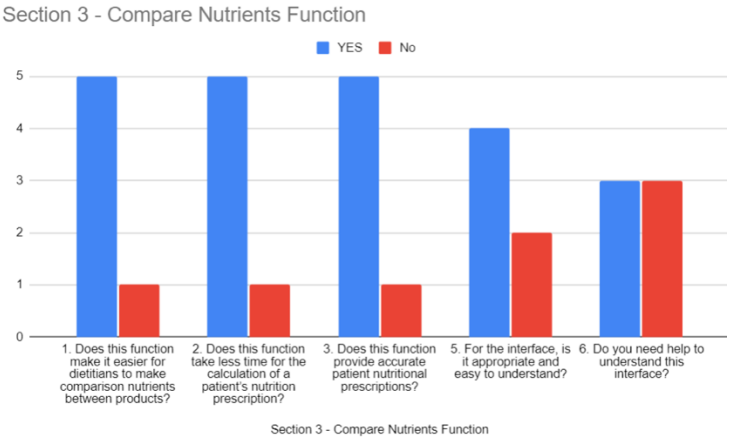


Fig. 6. Feedback of nutrient comparison of MEP application by the users

The evaluation of the "nutrient comparison" function received positive feedback from 5 out of 6 respondents, indicating that it makes it easier for them to compare nutrients between products. Additionally, 5 out of 6 respondents found the feature to be highly effective and efficient in calculating and providing nutritional prescriptions to patients. Furthermore, 4 out of 6 respondents stated that the user interface of this function is easy to understand.

However, during the informal interview session, one major problem with the functionality was highlighted. Some respondents faced an issue where their device automatically logged them out when using this function. This issue can be frustrating, especially when the respondents are in the midst of entering certain values, and the application unexpectedly logs them out.

To address this issue and further improve the functionality of the nutrient comparison feature, it is suggested to provide clear visual instructions for all possible actions, including the direction of the arrow or other navigation elements. This enhancement would improve the overall functionality and increase the learnability of the application, making it more user-friendly and seamless for dietitians to utilize.

Overall, while the nutrient comparison function received positive feedback from most respondents, addressing the issue related to unexpected logouts and providing clearer instructions would contribute to a more effective and enjoyable user experience. By incorporating these improvements, the MEP application can better meet the needs and expectations of the dietitians at Serdang Hospital, enhancing their efficiency and effectiveness in nutritional assessments and patient care.

3.4 Function 4: Feeding Regime Analysis

In Figure 7, the evaluation of the "feeding regime" function involves assessing various aspects to ensure its effectiveness and user-friendliness. y conducting this evaluation, the researchers can obtain valuable feedback on the "feeding regime" function and identify any areas for improvement. This assessment will help ensure that the function is optimized to meet the specific needs of the dietitians at Serdang Hospital, enhancing their ability to analyse and plan appropriate feeding regimes for their patients using the MEP application.

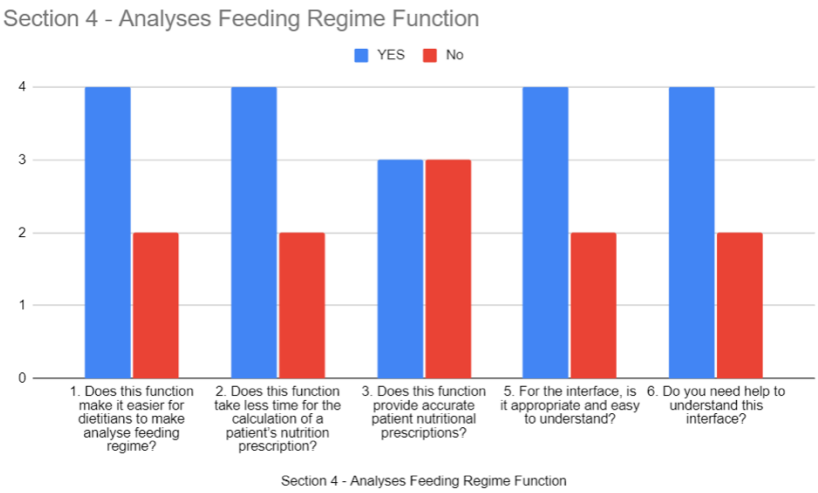


Fig. 7. Feedback of feeding regime analysis of MEP application by the users

The evaluation of the "feeding regime" function received positive feedback from 4 out of 6 respondents, indicating that it facilitates the analysis of the diet plan and efficiently calculates the patient's diet prescription. Additionally, 3 out of 6 respondents found that the function accurately reflects the patient's diet prescription.

While 4 out of 6 respondents stated that the user interface of this function is easy to understand, it is noteworthy that 4 out of 6 respondents agreed that this function would benefit from guidelines or specific instructions to assist users in effectively utilizing the application. This suggests that providing clearer instructions or guidance could enhance the user experience and improve the learnability of the application.

However, during the evaluation, one major problem with the functionality was highlighted: Some respondents faced an issue where their device automatically logged them out when using this function. This issue can be disruptive and frustrating, particularly when the respondents are in the middle of entering certain values, and the application unexpectedly logs them out.

To address the issue related to unexpected logouts and to further enhance the functionality of the feeding regime feature, it is suggested to provide clear visual instructions for all possible actions, including the direction of the arrow or other navigation elements. Additionally, implementing measures to prevent automatic logouts during critical tasks could significantly improve the user experience.

Overall, while the feeding regime function received positive feedback from most respondents, addressing the issue of unexpected logouts and providing clearer instructions would contribute to a more effective and user-friendly experience. By incorporating these improvements, the MEP application can better meet the needs and expectations of the dietitians at Serdang Hospital, enhancing their efficiency in analysing and planning appropriate feeding regimes for their patients.

3.5 Broader Contribution

Absolutely, involving healthcare professionals in the development of health-related digital technologies is crucial for creating effective and user-friendly solutions. Healthcare professionals, such as doctors, nurses, dietitians, and other specialists, have valuable insights into the needs and challenges of patients and healthcare settings. They possess in-depth knowledge about the clinical workflows, patient care requirements, and the specific context in which the technology will be used.

By collaborating with healthcare professionals during the development process, software developers can gain a better understanding of the practical requirements and ensure that the technology aligns with the real-world needs of medical professionals and patients. Healthcare professionals can provide valuable feedback, contribute to the design and functionality of the technology, and identify potential usability issues or safety concerns.

Moreover, involving healthcare professionals in the development phase increases the chances of successful implementation and adoption of the technology in clinical settings. When healthcare professionals are part of the development process, they are more likely to embrace and effectively utilize the technology as it aligns with their workflows and enhances patient care.

Overall, collaboration between software developers and healthcare professionals fosters the creation of health-related digital technologies that are not only technically sound but also user-friendly, safe, and well-suited to the needs of both healthcare providers and patients. This approach ensures that the technology can make a meaningful impact in healthcare and improve patient outcomes.

4. Conclusion

The aim of this project was to develop a mobile application that not only assists dietitians at Serdang Hospital in obtaining accurate information about enteral nutrition products but also supports them in performing nutrient comparisons between products and prescribing regimens for patients. The successful achievement of this goal resulted in the development of the MEP application, which offers various functionalities for dietitians, including searching for single nutrients, viewing product details, comparing nutrients, and analysing nutrition regimes. The agile model was chosen as the methodology for this project due to its flexibility, allowing for changes and adaptations as needed throughout the development process. The testing phase was conducted using an online platform, Google Forms, and feedback was collected through questionnaires. All respondents agreed that the MEP application provided more accurate information on enteral nutrition, saving time and energy in assessing and planning interventions for patients. Despite receiving positive feedback, the evaluation highlighted the importance of testing the application with more users to ensure its effectiveness in various hospital settings. As part of the next steps, the MEP application will be tested in other hospitals across Malaysia, possibly starting with a hospital in Selangor. Concurrently, the application will continue to be developed as a website platform to enhance user accessibility, particularly for dietitians and suppliers, facilitating the efficient entry of product details. By expanding the application's usage to other hospitals and continuously refining its features, the MEP application has the potential to become a valuable tool for dietitians and healthcare professionals involved in enteral nutrition management, ultimately contributing to improved patient care and outcomes.

Acknowledgement
This work was presented in International Symposium Computer Science for Smart Agriculture, Education and Medical (CSSAEM): Perspective from Indonesia and Malaysia. This work was funded by a grant from Ministry of Higher Education of Malaysia (FRGS/1/2019/ICT02/UPM/02/3) and Universiti Putra Malaysia (Geran- IPM: UPM/800/2/2/4 – Geran Putra)

References

[1] Yi, Dae Yong. "Enteral nutrition in pediatric patients." *Pediatric gastroenterology, hepatology & nutrition* 21, no. 1 (2018): 12-19. https://doi.org/10.5223/pghn.2018.21.1.12

[2] Chen, Juliana, Jessica Lieffers, Adrian Bauman, Rhona Hanning, and Margaret Allman-Farinelli. "Designing health apps to support dietetic professional practice and their patients: qualitative results from an international survey." *JMIR mHealth and uHealth* 5, no. 3 (2017): e6945. https://doi.org/10.2196/mhealth.6945

[3] Hassan-Ghomi, Majid, Bahareh Nikooyeh, Soudabeh Motamed, and Tirang R. Neyestani. "Efficacy of commercial formulas in comparison with home-made formulas for enteral feeding: A critical review." *Medical Journal of the Islamic Republic of Iran* 31 (2017): 55. https://doi.org/10.14196/mjiri.31.55

[4] Russell, C. A. "Role of dietitians in enteral feeding." *Gut* 27, no. Suppl 1 (1986): 58-60. https://doi.org/10.1136/gut.27.Suppl_1.58

[5] Savino, Patricia. "Knowledge of constituent ingredients in enteral nutrition formulas can make a difference in patient response to enteral feeding." *Nutrition in clinical Practice* 33, no. 1 (2018): 90-98. https://doi.org/10.1177/0884533617724759

[6] Shinozaki, Nana, and Kentaro Murakami. "Evaluation of the ability of diet-tracking mobile applications to estimate energy and nutrient intake in Japan." *Nutrients* 12, no. 11 (2020): 3327. https://doi.org/10.3390/nu12113327

[7] Rollo, Megan E., Clare E. Collins, and Lesley MacDonald-Wicks. "Evaluation of the introduction of an e-health skills component for dietetics students." *Telemedicine and e-Health* 23, no. 11 (2017): 930-933. https://doi.org/10.1089/tmj.2016.0250

[8] Harricharan, Michelle, Raymond Gemen, Laura Fernández Celemín, David Fletcher, Anne E. de Looy, Josephine Wills, and Julie Barnett. "Integrating mobile technology with routine dietetic practice: the case of myPace for weight management." *Proceedings of the Nutrition Society* 74, no. 2 (2015): 125-129. https://doi.org/10.1017/S0029665115000105

[9] Mescoloto, Samantha Bittencourt, Simone Caivano, and Semíramis Martins Álvares Domene. "Evaluation of a mobile application for estimation of food intake." *Revista de Nutrição* 30 (2017): 91-98. https://doi.org/10.1590/1678-98652017000100009

[10] Chen, Juliana, Jessica Lieffers, Adrian Bauman, Rhona Hanning, and Margaret Allman-Farinelli. "Designing health apps to support dietetic professional practice and their patients: qualitative results from an international survey." *JMIR mHealth and uHealth* 5, no. 3 (2017): e6945. https://doi.org/10.2196/mhealth.6945

[11] Lieffers, Jessica RL, Renata F. Valaitis, Tessy George, Mark Wilson, Janice Macdonald, and Rhona M. Hanning. "A qualitative evaluation of the eatracker® mobile app." *Nutrients* 10, no. 10 (2018): 1462. https://doi.org/10.3390/nu10101462

[12] Fakih El Khoury, Cosette, Rik Crutzen, Jos MGA Schols, Ruud JG Halfens, and Mirey Karavetian. "A dietary mobile app for patients undergoing hemodialysis: Prospective pilot study to improve dietary intakes." *Journal of Medical Internet Research* 22, no. 7 (2020): e17817. https://doi.org/10.2196/17817

[13] Klein, Jillian. "Utilization of mobile nutrition applications by patients with chronic kidney disease." *Journal of Renal Nutrition* 29, no. 1 (2019): e5-e7. https://doi.org/10.1053/j.jrn.2018.02.007

[14] Vasiloglou, Maria F., Isabel Marcano, Sergio Lizama, Ioannis Papathanail, Elias K. Spanakis, and Stavroula Mougiakakou. "Multimedia data-based mobile applications for dietary assessment." *Journal of diabetes science and technology* 17, no. 4 (2023): 1056-1065. https://doi.org/10.1177/19322968221085026

[15] Nasrudin, Mohd Wafi, Nurfatin Syahirah Ahmad Zainuddin, Raja Abdullah Raja Ahmad, Rashidah Che Yob, Mohd Zamri Zahir Ahmad, Wan Azani Mustafa, Vijayasarveswari Veeraperumal, and Nur Diana Mastura Zulkifli. "Smart Management Waiting System for Outpatient Clinic." *Journal of Advanced Research in Applied Sciences and Engineering Technology* 29, no. 3 (2023): 48-61. https://doi.org/10.37934/araset.29.3.4861

[16] Larson, Dagny, Jacqueline Henning, and Marissa Burgermaster. "Smartphone Applications (Apps) for Nutrition Education: A Qualitative Analysis of Outpatient Dietitian Perspectives." *Journal of Nutrition Education and Behavior* (2023). https://doi.org/10.1016/j.jneb.2023.05.247

[17] DiFilippo, Kristen Nicole, Wenhao Huang, and Karen M. Chapman-Novakofski. "A new tool for nutrition app quality evaluation (AQEL): development, validation, and reliability testing." *JMIR mHealth and uHealth* 5, no. 10 (2017): e7441. https://doi.org/10.2196/mhealth.7441

[18] Boudreaux, Edwin D., Molly E. Waring, Rashelle B. Hayes, Rajani S. Sadasivam, Sean Mullen, and Sherry Pagoto. "Evaluating and selecting mobile health apps: strategies for healthcare providers and healthcare organizations." *Translational behavioral medicine* 4, no. 4 (2014): 363-371. https://doi.org/10.1007/s13142-014-0293-9

[19] Mahmood, Sultan, Leah Hoffman, Ijlal Akbar Ali, Yan D. Zhao, Allshine Chen, and Karen Allen. "Smart phone/device application to improve delivery of enteral nutrition in adult patients admitted to the medical intensive care

unit." *Nutrition and Metabolic Insights* 12 (2019): 1178638818820299. https://doi.org/10.1177/1178638818820299

[20] Erickson, John, Kalle Lyytinen, and Keng Siau. "Agile modeling, agile software development, and extreme programming: the state of research." *Journal of Database Management (JDM)* 16, no. 4 (2005): 88-100. https://doi.org/10.4018/jdm.2005100105

[21] Zhang, Yuefeng, and Shailesh Patel. "Agile model-driven development in practice." *IEEE software* 28, no. 2 (2010): 84-91. https://doi.org/10.1109/MS.2010.85

[22] Balaji, Sundramoorthy, and M. Sundararajan Murugaiyan. "Waterfall vs. V-Model vs. Agile: A comparative study on SDLC." *International Journal of Information Technology and Business Management* 2, no. 1 (2012): 26-30.

[23] Flora, Harleen Kaur. "Adopting an agile approach for the development of mobile applications." (2018).

[24] Jeong, Yang-Jae, Ji-Hyeon Lee, and Gyu-Sang Shin. "Development process of mobile application SW based on agile methodology." In *2008 10th International Conference on Advanced Communication Technology*, vol. 1, pp. 362-366. IEEE, 2008. https://doi.org/10.1109/ICACT.2008.4493779