Application of the Addei Model in the Development of Website-Based Calorie Calculation Software

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Abstract

This research is a development research (Research and Development) with the ADDEI model which includes five stages: Analysis, Design, Development, Evaluation, and Implementation. The results of the analysis from field observations revealed that respondents wanted a feature that allows calorie calculations to be done quickly without looking at the formula. The flow of the user software design can calculate calorie, water, and macronutrient needs without logging in, as well as obtain food information and climbing preparation. The results of the validation of instrument experts showed an average percentage of 90% "Very Feasible", content experts 79.52% "Feasible", and media experts 93.75% "Very Feasible", GTMetrix testing produced a performance score of 100% with a grade "A", and testing using WAPT PRO 5.1 showed all metrics averaged 100% and small-scale testing with 13 respondents from nature-loving students throughout DIY reached 89.70%. The evaluation stage did not find any bugs, and development suggestions in the form of adding food images and information on water needs and climbing tips have been accommodated, including a water needs calculation feature based on national standards. Large-scale trials on 33 climbers using ISO 9126 showed the software to be highly suitable for use with a performance rating of 84%.

Keywords: ADDEI; Calorie calculation; Software

Introduction

The rapid development of information technology has had a significant impact on various aspects of human life, including health and fitness. Public awareness of the importance of maintaining a healthy diet and daily calorie intake is increasing, particularly in the context of preventing obesity, maintaining a healthy weight, and promoting a healthy lifestyle. However, many individuals still struggle to calculate their daily calorie needs accurately and practically. The results of the research by Karpęcka-Gałka et al. (2023) in a study entitled "Diet, Supplementation and Nutritional Habits of Climbers in High Mountain Conditions" The subjects in this study consisted of 28 men from Poland, aged between 23 and 42 years, who had participated in mountain expeditions at least once a year during the summer period. They stayed at altitudes above 3000 meters for at least 3 weeks. The study concluded that climbers have low calorie diet compared to high energy needs, too low protein supply, and too high fat supply and low carbohydrate supply.

Many climbers still have difficulty calculating their daily calorie needs accurately and practically Rezha et al. (2025, p. 74) stated that although the importance of calorie management has been widely discussed, many climbers still lack awareness of the importance of proper nutritional planning. Many climber focus solely on physical aspects such as fitness and equipment, without seriously and thoroughly considering nutritional needs. As a result, many climbers experience extreme fatigue, dehydration, or even health problems during their climb due to lack of energy. Calorie counting is often considered complicated due to the complexities of factors such as age, gender, physical activity level, and individual health conditions. Furthermore, the lack of access to easy-to-use and reliable tools or apps is a major obstacle for the general public. Many apps on the market have unfriendly interfaces or don't provide results that meet user needs, making calorie management less effective.

This situation emphasizes the need to develop information technology solutions that can help people calculate and monitor their daily calorie needs in a simple, accurate, and accessible way through digital devices. By utilizing website- based technology, users can easily obtain relevant and personalized information according to their individualneeds, thereby encouraging behavioral changes towards a healthier and more controlled lifestyle. According to Anthony (2024, p. 2), with technological advances and continuously updated development methods, the potential of website- based software is increasingly greater in improving operational efficiency and information accessibility. Further research in this area is important to explore new innovations that can be applied in the development of website-based software. Therefore, innovation in the development of website-based calorie calculation software is very important as a tool that supports efforts to improve the quality of life of the wider community.

In this context, web-based software can be an effective solution to help users calculate calorie needs and monitor daily food intake. With easy access through any internet- connected device, web-based applications offer users high flexibility in independently managing their health information. To produce software that is effective, efficient, and tailored to user needs, a systematic and user-oriented development approach is required. One development model that can be used is the ADDEI model, which is an acronym for Analysis, Design, Development, Evaluation, and Implementation. This model adopts a structured approach at each stage of development, allowing for more measurable and testable end results in terms of functionality and user experience.

The ADDEI model offers a structured and interactive approach, where each stage is interconnected and supports the success of the next stage. The ADDEI model is a modification of the ADDIE model designed to better suit the specific context and needs of development research. The ADDEI development model was chosen because it was based on time and budget constraints. In addition, if implementation is carried out first, more time and costs will be required for project schedule revisions (Valle et al., 2018 p. 21). The ADDEI development model is carried out with an evaluation stage first followed by the implementation stage. Evaluation before implementation helps ensure that the developed software is in accordance with user needs and established objectives. With evaluation, design errors, irrelevant features, or unmet needs can be identified and corrected early. According to Cahyadi, Dinata & Muharam (2024, pp. 525-526), evaluation before implementation helps ensure that the developed software is in accordance with user needs and established objectives. With evaluation, design errors, irrelevant features, or unmet needs can be identified and corrected early. This aligns with Hidayat & Nizar's (2021, p. 33) opinion that formative evaluation is conducted to validate and revise a product so that it is optimal and suitable for use before implementation. In the research of Anafi, Wiryokusumo, & Leksono (2021, pp. 435-436), the evaluation stage was conducted after product development and testing in small groups before widespread implementation.

Through the ADDEI model, the software development process focuses not only on technical aspects but also ensures that the final result is truly relevant, useful, and user- friendly. Therefore, this model is particularly well-suited for developing website-based calorie calculation software, which requires a balance between technical functionality and optimal user experience.

Research Methods

This research uses the ADDEI (Analysis, Design, Development, Evaluation, and Implementation) method, where an evaluation is conducted before implementation to minimize errors during large-scale trials. In the Analysis stage, user needs are explored and problems are identified thoroughly to ensure that software development begins with a proper understanding. Next, the Design stage designs the system architecture, user interface, and logical and intuitive interaction flow. In the Development stage, the design that has been prepared is translated into real software by paying attention to the principles of code efficiency, security, and system scalability. Then, the Evaluation stage is carried out to test the feasibility and functionality of the software, both through internal trials and input from end users. The final stage, Implementation, is the process of implementing and distributing the software more widely for use by target users, accompanied by documentation and training if necessary.

Figure 1. ADDEI development stages
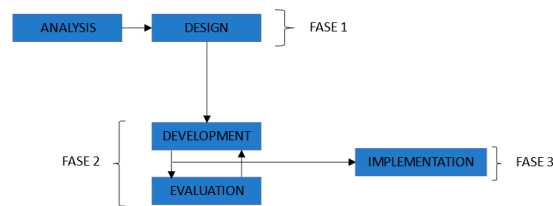
Source:(Valle et al., 2018 p. 22)

Results and Discussion

1. Analysis

This stage was conducted using an observational method, where researchers distributed a Google Form questionnaire to users, namely nature-loving students around the UNY campus who actively participate in mountain climbing activities every year. The results showed that the manual calorie calculation process was considered too complicated because it required users to understand calculation formulas and memorize the calorie content of various types of food. This complexity directly impacted user motivation, with many feeling reluctant to do it due to the significant time-consuming process. As a result, the logistics planning process tended to be repetitive and monotonous, without any variation in menus or consideration of more balanced nutrition. The absence of software that can help calculate calorie needs effectively and efficiently also posed a significant obstacle. Currently, calculating calorie needs is still done manually, which is not only time-consuming but also risks producing inaccurate estimates. Another challenge is the limited accessibility of information and practical tools for calculating calorie intake, making this process difficult for many people to implement.

Based on these findings, it can be concluded that there is a real need for web-based software that can simplify the calorie calculation process. This application is expected to facilitate users in automatically calculating daily calorie needs, provide appropriate food ingredient references, and increase efficiency and accuracy in food logistics planning. Therefore, this software is expected to be an innovative solution to the problems users have been facing.

2. Design

The design stage uses flowcharts and storyboards which are designed as a reference in creating applications.

Figure 2. Flowchart

The flow of the website-based software for calculating mountain climber calories, where the user in the first stage accesses the software browser website through the shared link then the user without the need to log in and enter anything will be displayed directly on the website-based software. The second stage the user inputs data on Weight, Height, Age, Gender and enters the duration of the climb taken in days after which the results will automatically appear such as TDEE, BMR, Water Requirements and Calorie Distribution based on macronutrients per gram. The user will choose food based on the food list listed in the website-based software and can also read information related to preparation before climbing the mountain.

Figure 3. Storyboard

Gambar	Keterangan
	Menu halaman awal yang berisi informasi utama yaitu berat badan, tinggi badan, usia, jenis kelamin dan aktivitas mendaki gunung/hari.
	Menu informasi tambahan berisi penjelasan tentang istilah TDEE, BMR dan juga informasi kalori yang dikeluarkan pada saat aktivitas mendaki gunung/menit berdasarkan usia serta kebutuhan air.
	Informasi jenis makanan yang telah diukur berdasarkan gram dan di jadikan URT (ukuran rumah tangga)
	Halaman utama merupakan hasil perhitungan dari data yang telah dimasukkan (berat badan, tinggi badan, usia, jenis kelamin, aktivitas mendaki gunung/menit) akan muncul TDEE, BMR dan kebutuhan makronutrien untuk aktivitas mendaki gunung serta kebutuhan air/liter

The next step after creating a flowchart is designing a storyboard. Storyboards can help the website development team systematically plan and organize the website's layout and visual design.

3. Development

After the website development team completed the design and coding, instrument and media validation were conducted during the development phase. This was conducted by three experts: a content

expert, an instrument expert, and a media expert. The following are the validation results from these three experts.

Table 1. Validation results

No	Aspek pengembangan	Hasil	Kategori
1	Pengujian validasi ahli media	93,75%	Sangat Layak
2	Pengujian validasi ahli instrumen	90 %	Sangat layak
3	Pengujian validasi ahli Konten	79,52 %	Layak

After validation by experts, operational testing was carried out on the Efficiency aspect using GTMetrix and Reliability using WAPT PRO 5.1.

Figure 4. GTMetrix results

Based on the test results listed in the image. The results of the Efficiency performance test, it was found that the calorie calculation website for mountain climbing sports got a performance score of 100%, 98% Structure and a full load time of 404 milliseconds or

0.404 seconds. In line with the opinion of Nielsen, J., (2010) who stated that a website is said to be good if the time needed to load is less than 10 seconds. Based on the GTMetrix assessment scale, the calorie calculation website-based software for mountain climbing sports got a grade of "A" which means the software's performance Efficiency got the predicate "Very Good".

Table 2. WAPTPRO 5.1 Results

Metrics	Success	Failed	Persentase Sukses
Sessions	8	0	100%
Pages	28	0	100%
Hits	88	0	100%
Rata-ra	ta persentase Reli	ability	100%

Based on the table above, reliability testing using WAPTPRO 5.1 shows that all metrics get an average percentage of 100%, which can be described as a success in reliability testing.

After conducting validation and operational testing during the development phase, a small-scale trial was conducted with the target research subjects, nature-loving students. The goal was to obtain input and suggestions from the more experienced mountaineering participants. The following are the results of the small-scale trial.

Table 3. Results of small-scale trials

Aspek	Indikator	Rata rata Persentase	Interpretasi
Usability	Kebergunaan (Usefulness)	89,6%	Sangat Layak
	Kemudahan penggunaan (Ease of use)	89,6%	Sangat Layak
	Kemudahan Mempelajari (Ease of learning)	91,5%	Sangat Layak
	Kepuasan (Satisfaction)	88,1%	Sangat Layak

Small-scale trials demonstrated that the software successfully met user needs. These results suggest that the website- based calorie calculation software for mountain climbing is "Very Suitable" for large-scale trials.

4. Evaluation

a. Bug Fixes

In the evaluation of the bug section software, no errors or bug fixes were made. During expert testing and also small-scale testing software running well without any obstacles such as bug disturbances.

b. Content updates

Several suggestions were received regarding the content, including adding images of each micronutrient food list to provide users with a visual representation of the food. Information on water requirements and tips for preparing for a hike were also added.

c. Performance optimization Performance of website-based software There's no improvement in the calculation whatsoever, as access from the shared link to the web browser page is very fast using the internet. The data input process, including the calculation results, is also very fast, allowing users to see the results immediately after entering all the data, such as: weight, height, age, gender and enter the length of the climb in days.

a. New Features Added

A new feature added after validation is a calculation of water requirements per liter, allowing users to determine how many liters of water to carry during a climb. This calculation is based on the Indonesian PSKO (2014) calculation, which is based on the results of calculating the number of calories needed for mountain climbing.

5. Implementation

This large-scale trial was conducted with 33 mountain climbers, each with at least one climbing experience. Respondents completed an instrument validated by experts and tested on a small scale. The results of this large- scale trial were used to test the usability of ISO 9126.

Table 4. Results of large-scale trials
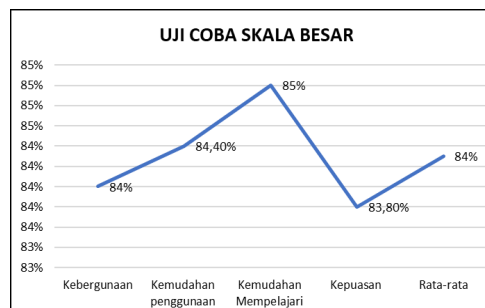
Based on the evaluation results of the four aspects of Usefulness, Ease of use, Ease of learning, and Satisfaction, website- based software calorie calculation for mountain climbing sports Overall, large-scale trials achieved an average performance percentage of 84% for each aspect, which falls into the "Very Suitable" category. This indicates that the software successfully met user needs.

Conclusion

Based on the results of research and testing conducted on website- based software for calculating calories for mountain climbing, it can be concluded that:

1. Analysis of user needs through questionnaires and observations shows that climbers want an application that can calculate calorie needs quickly and practically without using manual formulas.

2. The software's key features allow users to calculate TDEE, BMR, water requirements, and macronutrient breakdowns simply by entering personal data without logging in. The system also provides a food list and hiking preparation information to aid in nutrition and hydration planning.

3. Validation by IT and sports nutrition experts declared the software "Very Good" in terms of functionality and usability. The content was deemed "Good," and efficiency testing using GTMetrix earned an "A" grade. Reliability testing using WAPT PRO demonstrated stable performance with a 100% score.

4. The final evaluation showed the application was bug-free, performed optimally, and had an added feature to calculate water needs based on national standards. This application proved effective and efficient in supporting calorie and hydration planning for mountain climbers. A small-scale trial by 13 nature-loving students from Yogyakarta (DIY).

5. Large-scale trials by 33 climbers showed "Very Appropriate" results, both in terms of usability, ease of use, ease of learning, and user satisfaction based on ISO 9126 standards.

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