



Mobile School Canteen Food Ordering System

Masurah Mohamad

Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA, Perak Branch Tapah Campus,
Perak, Malaysia
masur480@uitm.edu.my

Lathifah Alfath

Faculty of Technology and Design
Universitas Pembangunan Jaya, Indonesia
lathifah.alfath@upj.ac.id

Nurul Farah Dieana binti Madzli

HPCS SDN BHD, 24-1 Jalan Pulau Lumut Q U/10/Q, Alam Budiman
Seksyen U10, Shah Alam, Selangor, Malaysia
2018286638@isiswa.uitm.edu.my

Article Info

Article history:

Received Aug 26, 2021

Revised Oct 21, 2021

Accepted Oct 30, 2021

Keywords:

Mobile Application
School Canteen Food
Primary School Student
Recommender System

ABSTRACT

Food ordering has been familiar nowadays. Everyone is very concerned about time and the necessities of life such as food. The food ordering application helps people to get their food easily and save lots of time. Most of the existing food ordering applications only focused on registered restaurants or food providers based on the specific location. However, there is no special food ordering application that focused on food ordering for school students and canteen food provider in Malaysia. Even though many food ordering applications are available to be used, the most apparent drawback to food ordering applications is that students are unable to use them during breaks at the school. Due to this problem, a mobile application named as Mobile School Canteen Food Ordering System is proposed as an alternative to the school students in selecting and ordering the food offered by the school canteen food provider. In addition, with the implementation of collaborative filtering technique, this system offered one additional function that will recommend the user on healthy meal that the children should consume according to the provided criteria such as foods that contain allergens. This project will benefit many students especially in primary schools whereas 75% of the respondents have agreed that the system is effective in choosing foods easily, facilitate and save their time to get food during breaks.

Corresponding Author:

Lathifah Alfath

Faculty of Technology and Design
Universitas Pembangunan Jaya, Indonesia
email: lathifah.alfath@upj.ac.id

1. Introduction

Due to Covid-19 in Malaysia, certain schools over the country keep going with the learning at school as usual. From here on, during recess time, the student still needs to get and buy food from a canteen. The proposed project is called Mobile School Canteen Food Ordering System. It is a mobile application system for students to get their food during the break. The project is targeted at students in primary school who must order food through the class leader as they are not allowed to go to the canteen. This is because the school does not want all of the students to congregate at the canteen due of the pandemic. Various problems faced by school students in the way they to get food during their breaks. Nowadays, people do not have much time to spend in the canteen by just being



there and waiting for the canteen staff to understand their food order. Many students visit the canteen during their lunch break. Consequently, they have limited epoch to order, eat, and compensation to their respective canteen [1]. Usually, people ought to visit the canteen and order the foods and they must wait in queue for a long time to get the orders. For this system, the targeted users are the students and staff of the school's canteen. Students are not allowed to bring a mobile phone to school because it will violate the school's rules. Hence, students can make orders before going to school, or the parents can help their kids place orders before they going to school. From the past experiences, the class leader is permitted to collect orders from the canteen. The ventilate around directory system involves a paper-based function to manage various files and receipts consequently. Maintaining crucial data in the files and receipts is full of risk, messy, and a tedious process. The purpose of this project is to develop a mobile application with recommended features. Therefore, this mobile application is proposed to make it easier for students to get their food during break time and reduce problems encountered in the past.

2. Literature Review

In many developing countries, underweight and overweight children are considered malnourished [2]. It is known that lack of healthy food intake is known as malnutrition, which means not only lack of enough food, but also lack of nutrients. If childrens are not well-nourished or are hungry, they may lack productivity and may be disruptive in class. Besides that, they may also be late or away from school for more days than well-nourished children and may also have learning difficulties. Eating patterns are usually established in childhood, so it is important to teach children how to select healthy food and why nutrition is important in the formative years.

Managing healty food for children is a challenging matter for parents mainly for the working mother[3]. An arrangement with school canteen by implementing nutrition education program has been proven to be beneficial to the childrens[4],[5]. Nevertheless, the existing manual process used by the school canteens faced a difficulty to beat and managing the knowledge of workers, clean canteen enviroment and preparing meals within a very short time of school break. In resolving this issue, online food ordering systems have been started to be developed[6]. The technology of recommender system considering nutritional information for school childrens can be integrated to the online applications. As introduced in [7], the food recommendation system has been developed to integrates both nutritional and user preferences-related information.

2.1 Recommendation system

In a general way, recommendation systems are algorithms that aimed at suggesting applicable items to users such as items being movies to watch, things to purchase, or anything else depending on industries. Recommender systems are critical in some industries as they can generate a huge amount of income when they are efficient or also be a way to stand out significantly from competitors [8]. In addition, the recommendation system is a mechanism that systematically collects knowledge that might be of interest to a user from a vast amount of information. Developing a system that supports online user decisions, recommending a customizable, highly matched product or project is a main issue in the recommended system area [9]. In addition, the recommended technique, also known as personalized knowledge filtering, is used to predict whether a given user would like a specific project (predictive issue) or to classify a collection of N items of interest to a given user (top-N recommendation) issue[10]. The recommendation system proactively provides users with things that may be of interest, basically by connecting users and projects in some way. There are several techniques such as collaborative filtering and content-based filtering are used to construct the recommendation system.

2.2 Collaborative Filtering

Collaborative Filtering is the process of filtering or evaluating items using the opinion of people[11]. Although the word collaborative filtering (CF) has only been around for a little over a decade, CF is rooted in something that humans have been doing for decades which is sharing thoughts with others. In addition, the developers of one of the first recommended systems, Tapestry (other earlier recommended systems include rule-based recommendations and user customization), coined the term "collaborative filtering (CF)," which has been widely adopted, irrespective of the facts that the recommendations do not cooperate with the recipients, and the recommendations which propose especially interesting points[12].

2.3 Content-based Filtering

Content-based filtering will store the content information about each item to be recommended[13]. This information would be used to suggest items that are similar to those previously recommended by the consumer. It is based on how similar certain items to each other or similar to user preferences and also represented by the mean of subset content features. Focusing on probabilistic approaches, learning as a constraint satisfaction problem is considered in, where the user profile is learned by considering contextual independence[14].

3. Methodology

A well-organized methodology plays significant roles to complete the project. A waterfall model well known as System Development Life Cycle (SDLC)[15] used to understand the users' need and to ensure that the project is on the right track. This project starts with a planning phase then followed by an information gathering stage, the requirement from healthy website and page. The third phase is design phase which is designing the interface and the database design application. Then the development phase is done by embedding the program and activate the database connection. The fifth phase is testing the prototype among the parents and the owner of the canteen. Figure 1 is the system architecture.

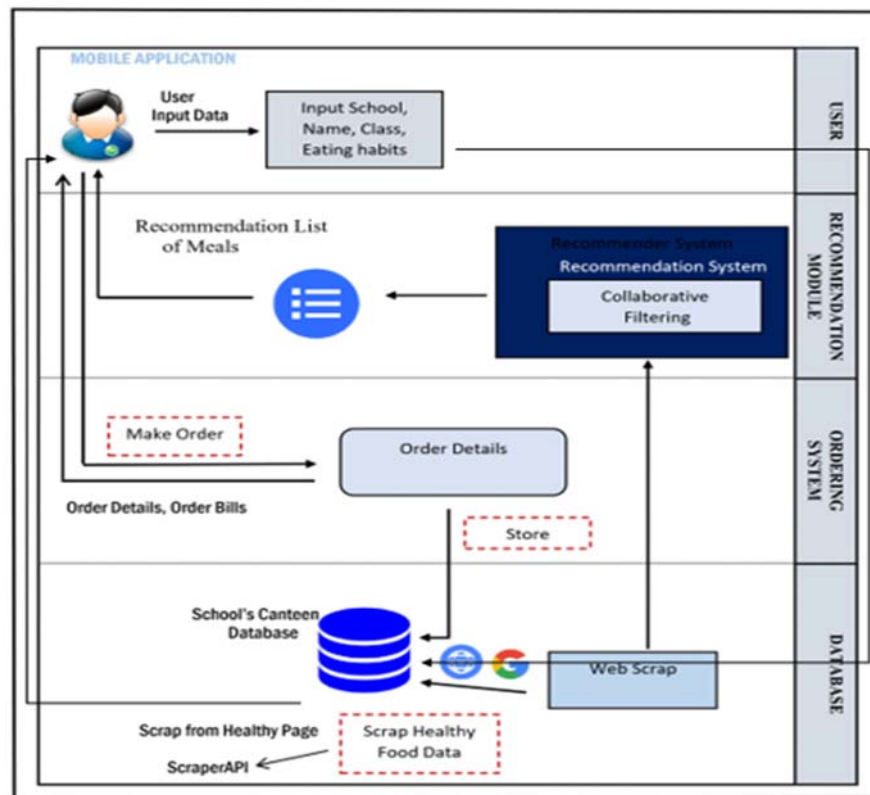


Figure 1. System architecture

The system architecture is a conceptual model that describe the structure, behaviour and overall views of the system. The application and the database are deployed in a server and access by two types of users: user or parent and admin. First, the admin will register and submit the menu and food into the system. Second, the user will access to the system to view the menu and make an order. The order will be received by the canteen and all details will be stored in the system database.

The system consists of a database that stores all the details, such as user details, order details, and menu details. The following subsection explains the development of the recommendation system.

3.1 Recommendation system development

Collaborative filtering (CF) will be included in the development of the recommendation part. Figure 2 presents the process of collecting data for the recommendation process.

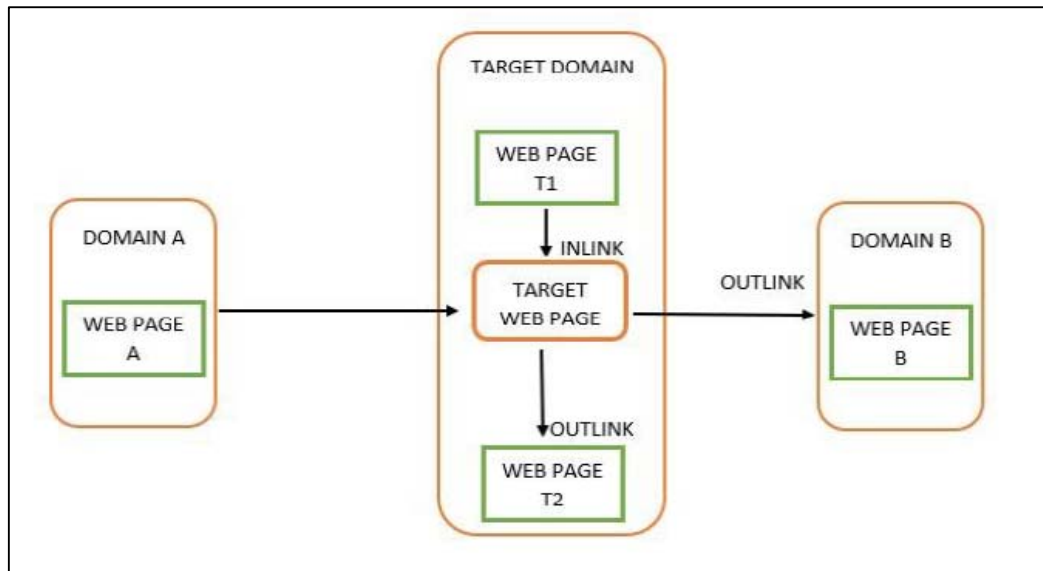


Figure 2. Collaborative filtering process

In this application, CF is used to determine an appropriate meal, especially for students who need a healthy meal. It will be processed based on the ranking of the user. It will suggest a food list and the student can choose and make an order what they want. The proposed system will start with login process. Then the user needs to login into the system using the registered username and password. Next, user needs to rate healthy menus based on her or his interests. After that, the scoring results will be displayed, and meals will be recommended based on the previous users' ratings. To make a recommendation meal, previous data need to be collected from different contents or related pages.

4. Results and Analysis

The main point of this section is to analyze the result that corresponds to the implementation of Mobile School Canteen Food Ordering System toward school canteen and student. The discussions will cover the Requirement analysis, Interface design and post-survey analysis.

4.1 Requirement Analysis

The collection of information and feedback is acquired through two forms of resources. The first resource is from feedback gathered from the interview conducted with the random user include parents and student. The second resource is from the pre-survey and post-survey conducted to find out the thought and feedback of the user. The pre-survey involved 50 random respondents among primary school students' parent to identify the problem and their understanding while using the application. The survey result has confirmed that the majority primary school student's parent interested and able to manage the application as revealed in Figure 3, which shows the rating for the application.

Features User	Recommendation	View Menu	Order Menu	Colour	Interface
User 1	Best recommendation	Functional	Really need this feature	Interactive	Easy to understand
User 2	Easy to view menu	I like the features	Easy to choose menu	Colourful	Interesting
User 3	It's a good function	User-Friendly	Easy to make an order	Kids love	Easy to view
User 4	Good for children	Good page	Good function	Suitable for kids' app	Functioning well
User 5	Knowledgeable	Good info	Easy to order	Attractive	User-friendly
User 6	Good function	Easy to choose the menu	Important features	Fun	Good interface
User 7	Good recommendation	Easy to view menu	Useful pages	Very nice	Interesting interface
User 8	The food is nice	Best menu	I like the features	I like the pages	Easy to understand
User 9	The food is suitable for the kids	Useful pages	Functioning well	Good	Easy to use
User 10	The info is useful	Useful information	Easy to understand	Interactive	Very nice

Figure 3. The rating for application

User can rate it as a good application when the user testing the application. The most user like the option "is easy to make an order that provided by the application". Furthermore, the user's perception of the ordering system which shown on Figure 5 displayed that all users were understand about the features and functions on each of the application. Furthermore, with the elements on the system that shows information on the interfaces, it enhances user's perception and understanding.

4.2 The application interface

This application has two (2) different user types namely user/parent and administrator. Every user has his/her role in this application. Table 1 depicts the description of every user type in this application.

Table 1. Type of user

Type of user	Description
User/Parent	Parent of primary school students
Administrator	One of canteen staff or owner of canteen who will manage the implementation of system and monitor the use of this system.

Figure 4 illustrates the make order page, which enables users to place their orders. On that page, the user must input their name, class, meal, and any additional meals required, as well as the pickup time. The receipt will be generated on the same page after you have completed all of the

fields. Meanwhile, Figure 5 indicates the meal recommendation interface for the user. The recommendation page is a main feature of this application that allows users to learn about nutritious foods for children, especially primary school students. The user can select the sort of meal from a menu that includes bread, rice, and pasta on that page. They can also select whether or not to take foods that contain allergens, such as seafood.

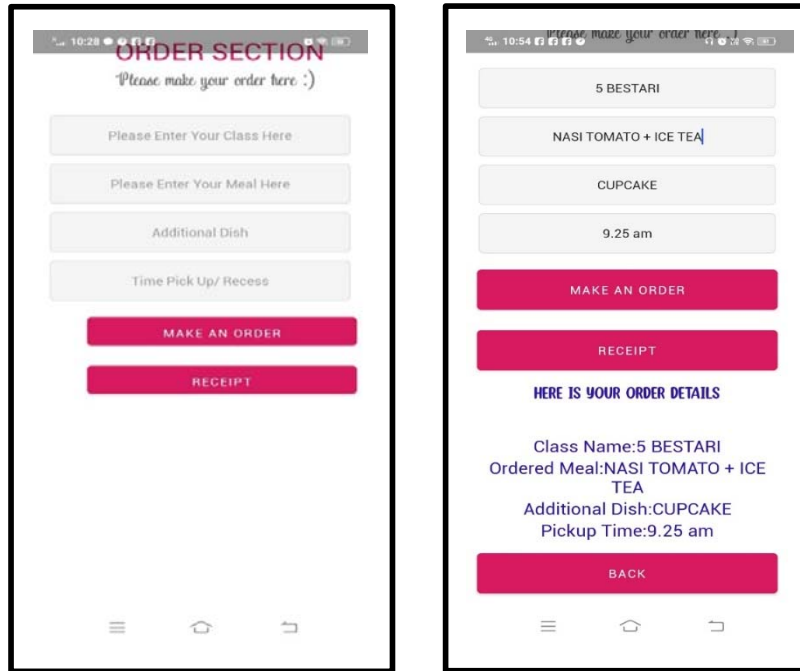


Figure 4. Interfaces of make order page and receipt generation for the user.

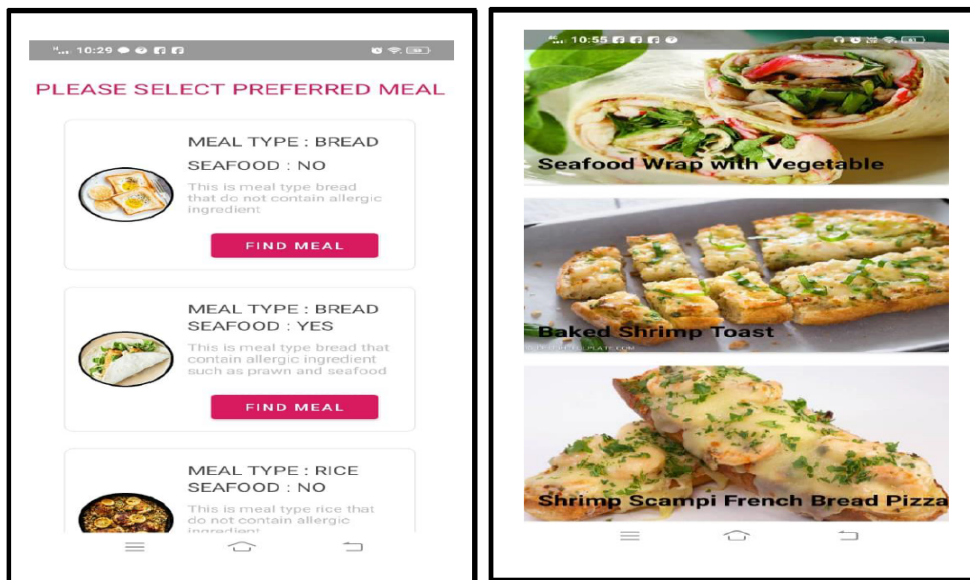


Figure 5. Interface for the healthy food recommendation.

4.3 Post-survey analysis

For this project, a post-survey has been conducted to evaluate users' satisfaction toward the development of this mobile application. The post-survey is based on usability testing where 50 respondents who are the parents of primary school students have been selected. All the respondents can represent the actual use of this application since the purpose of usability testing is to gather feedback from the real users of the targeted group to accomplish a specific task. Usability testing also important for future enhancement as well as a significant part in the success of a mobile apps innovation. The testing elements are shown in Table 1.

Table 1. Testing element

No	Question	Descriptions
1	Do you have any experience using online food ordering system with healthy menu recommendation?	User experience in any food online ordering system with healthy menu recommendation.
2	Is the ordering proses easier with the application?	User perception on the ordering system ease of use
3	Does all the functions in the application works?	The functionality of the application

Figure 8 shows the result of users' experience of mobile food ordering application with healthy recommender system.

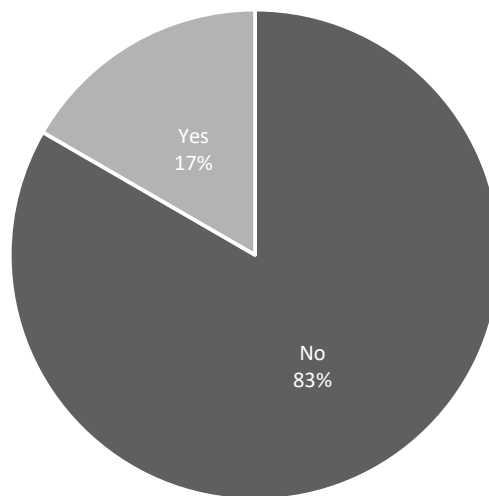


Figure 8. User's Experience of Application

Only 17% of the users have experienced with online food ordering system that support food recommender with healthy foods. Based on the comments of the parents who answer 'No' for the question, they mentioned that the popular online food ordering system such as Food Panda provides menu that are not suitable for school students and they did not aware any healthy food have been recommended by the application.

Furthermore, Figure 9 shows the pie chart of users' perception on the application ease of use. Although most of the users never experiencing such kind of application with recommender system, majority of them (75%) have remarked that the application is not difficult to be used with minimal interfaces. For the functional test that need them to answer question three, no errors have been detection in the application.

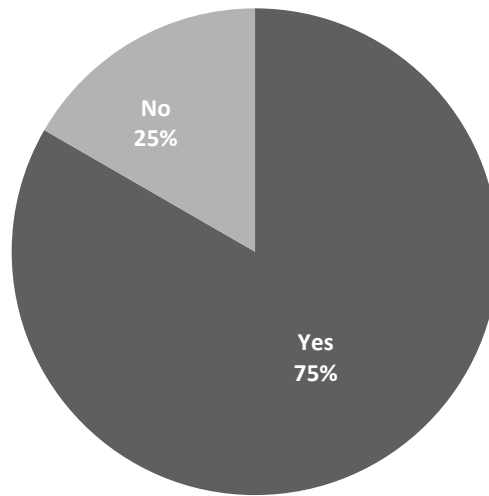


Figure 9. User's Perception of the ordering system

Additionally, black box system functional testing has also been conducted in order to evaluate the proposed system. The testing includes button testing, link testing, form testing, and recommendation testing. All the buttons are functioning well, the links are redirected to the correct page, correct meal has been recommended and the data are correctly stored in the database.

5. Conclusion

Overall, the proposed Mobile School Canteen Food Ordering System could help students to have their food during breaks without having to deal with the problems that have been discussed before. Although this work has proven effective in assisting the users, there are several limitations to be listed out. Firstly, this project does not include payment gateways. Payment must be made through the class representative of each class. To solve this issue, the class representative will collect the money from classmate that has made and order with the system. Secondly, this application is available for Android users only. However, the application has been designed to be flexible for rapid extension for improvement in the future.

References

- [1] R. B. Kale, R. K. Balwade, and V. B. Gawai, "Online Food Ordering System for College Canteen," *SAMRIDDHI A J. Phys. Sci. Eng. Technol.*, vol. 12, no. SUP 2, pp. 64–68, 2020.
- [2] V. T. Nga *et al.*, "School education and childhood obesity: A systemic review," *Diabetes & Metab. Syndr. Clin. Res. & Rev.*, vol. 13, no. 4, pp. 2495–2501, 2019.
- [3] L. Meeussen and C. Van Laar, "Feeling pressure to be a perfect mother relates to parental burnout and career ambitions," *Front. Psychol.*, vol. 9, p. 2113, 2018.
- [4] T. Jung, J. Huang, L. Eagan, and D. Oldenburg, "Influence of school-based nutrition education program on healthy eating literacy and healthy food choice among primary school children," *Int. J. Heal. Promot. Educ.*, vol. 57, no. 2, pp. 67–81, 2019.
- [5] D. A. Guitart, C. M. Pickering, and J. A. Byrne, "Color me healthy: Food diversity in school community gardens in two rapidly urbanising Australian cities," *Heal. & place*, vol. 26, pp. 110–117, 2014.
- [6] A. P. Kapoor and M. Vij, "Technology at the dinner table: Ordering food online through mobile apps," *J. Retail. Consum. Serv.*, vol. 43, pp. 342–351, 2018.
- [7] R. Y. Toledo, A. A. Alzahrani, and L. Martinez, "A food recommender system considering nutritional information and user preferences," *IEEE Access*, vol. 7, pp. 96695–96711, 2019.
- [8] X. Cai, Z. Hu, P. Zhao, W. Zhang, and J. Chen, "A hybrid recommendation system with many-objective evolutionary algorithm," *Expert Syst. Appl.*, vol. 159, p. 113648, 2020.

-
- [9] W. Nguyen, "A Literature Review of Collaborative Filtering Recommendation System using Matrix Factorization algorithms," 2021.
- [10] Y. Du, N. Sutton-Charani, S. Ranwez, and V. Ranwez, "EBCR: Empirical Bayes concordance ratio method to improve similarity measurement in memory-based collaborative filtering," *PLoS One*, vol. 16, no. 8, p. e0255929, 2021.
- [11] Y. Dou, H. Yang, and X. Deng, "A survey of collaborative filtering algorithms for social recommender systems," in *2016 12th International conference on semantics, knowledge and grids (SKG)*, 2016, pp. 40–46.
- [12] C. Feng, J. Liang, P. Song, and Z. Wang, "A fusion collaborative filtering method for sparse data in recommender systems," *Inf. Sci. (Ny)*, vol. 521, pp. 365–379, 2020.
- [13] G. K. Jha, M. Gaur, P. Ranjan, and H. K. Thakur, "A survey on trustworthy model of recommender system," *Int. J. Syst. Assur. Eng. Manag.*, pp. 1–18, 2021.
- [14] Y. Afoudi, M. Lazaar, and M. Al Achhab, "Hybrid recommendation system combined content-based filtering and collaborative prediction using artificial neural network," *Simul. Model. Pract. Theory*, vol. 113, p. 102375, 2021.
- [15] R. Scroggins, "SDLC and Development Methodologies," *Glob. J. Comput. Sci. Technol. C Softw. Data Eng.*, vol. 14, no. 7, pp. 0–2, 2014.