Journal of Digital Business and Social Sciences

Journal homepage: jdbs.rsu.ac.th

Developing an AHP-Based Web Application for Internship Selection among Undergraduate Students

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Received 26 April 2024; Revised 17 May 2024; Accepted 28 May 2024;
Published Online 17 June 2024

Abstract

Internships for undergraduate students in the workplace will result in the opportunity to get a career in the future. If students can compare multi-criteria and multi-alternative in selecting appropriate internships, this will make decision-making much easier, and increase their future job opportunities. This research is aimed to develop a web application to recommend internship selection workplaces for undergraduate students and evaluate the quality and the satisfaction of the web applications by using the Analytical Hierarchy Process (AHP) technique to rank internship options. The quality assessment results by 4 experts found that the overall mean was 4.15 (high level), and the standard deviation was 0.74. The satisfaction assessment results of 96 users found that the overall mean is calculated at 3.90 (high level), and the standard deviation was 0.95. The criteria to use in considering the top 3 are good colleagues, suitable allowances/compensation, and welfare, respectively. Significant recommendations encompass the application of responsive web design principles to ensure compatibility across diverse devices, alongside the integration of UX/UI design principles aimed at enhancing the usability of websites.

Keywords: *Web Application; Internship; Analytical Hierarchy Process*

Please cite this article as: Wongvilaisakul, W., Kositritdhipala, N., & Wannachak, C. (2024, May). Developing Web Application to Recommend Internship Selection for Undergraduate Students. *Journal of Digital Business and Social Sciences*, *10*(1), Article JDB009, 1-17.

1. Introduction

Undergraduate students' internships help develop their overall skill set and increase their chances of getting a job upon graduation. Internships will help students gain real work experience. This allows students to apply what they have learned in the classroom to work that is in line with the needs of the labor market (Di Pietro, 2022). The internship should last 4 months or more so that students can develop skills in various fields so they can adequately prepare for future jobs (Alnajjar, 2020). During the internship, students will develop hard skills such as quality of work, competency in finishing the project, writing and speaking skills, and reliability in handling a task. They will also develop soft skills, such as punctuality, willingness to accept criticism, commitment to work, and interpersonal skills, especially relationships with colleagues (Tsuroyya, Tandyonomanu, & Huda, 2021).

In addition, internships also provide opportunities to work in a real-world environment. This helps students to develop professional awareness through work trials and earn money during internships. If students are considered to continue working full-time in the company after graduation, they will be familiar with the organization and job position, requiring little or no training, and they will be able to work immediately (Mala, Akash, & Jewel, 2020). If comparing the time it takes to start their first jobs after graduation, it was found that graduates who had completed internships spent a shorter period than graduates who had not completed vocational internships. Thus, educational institutions have prioritized internships for undergraduate students (Karakiraz, Üstündağ, Karataş, Ayşegül, & Özdemir, 2021). Administrators and faculties in educational institutions are responsible for encouraging students to participate in learning from real experiences. This should include supporting information in deciding on internships and recommending career paths. Participating students in internships will help shape their experiences and boost their confidence. It will also help students to experience the professional environment and understand the experiences after graduation (Grillo, 2023).

Panyapiwat Institute of Management (PIM) has a teaching model that emphasizes learning by doing actual work. It is also known as Work-Based Learning (WBL); students are required to do internships every year to gain professional experience. In considering students' choice of internship, it is a decision that consists of many criteria and many alternatives, where one student may have many criteria to consider when selecting an internship. Each criterion may be of different importance to each person. For example, some people give more importance to allowances or compensation than others. But some people may place the most importance on the skills and knowledge necessary to work. As there are many things to consider when choosing an internship, there may be many organizations to choose from too. Therefore, it takes time to consider depending on the satisfaction of each student. If students can compare the criteria that affect the decision in selecting internships and compare the alternatives, it will tremendously help make decision-making easier.

There are several techniques used for Multi-Criteria Decision Making (MCDM), such as Simple Additive Weighting (SAW), Analytical Hierarchy Process (AHP), and Technique for Order of Preference by Similarity to Ideal Solution (TOPSIS). Each technique has different strong points and application approaches depending on the nature of the issue, data availability, and alternatives used to support decision-making. However, the technique that can be used to support multi-criteria decision-making with a complex structure is the AHP technique by arranging variables in a hierarchy format and assigning a numerical priority value to each variable. If any variable has the highest importance, it will influence the decision-making outcome (Nolberto & Eloy, 2021). Additionally, the AHP technique can be developed to align with the decision-making goal of choosing an internship appropriately.

According to the literature review, MCDM research has developed tremendously, leading to MCDM methods being exhaustively used in several fields. MCDM methods have also been utilized in different areas (Sotoudeh-Anvari, 2022) of educational decisions in various ways, such as the selective and selection processes implementation for teachers. It has been carried out through data conversion and normalization stages which can help assist in decision-making for the multi-criteria selection process (Akmaludin, Gernaria, Rinawati, Arisawati, & Dewi, 2023), which will help to recommend the

selection of postgraduate education for postgraduate-seeking users (Wongvilaisakul, Netinant, & Rukhiran, 2023). However, most researchers have discovered that thousands of students worldwide encounter challenges in selecting courses and universities at the tertiary level that are appropriate for students. Therefore, it would create satisfaction if students were able to select courses or universities that matched their abilities and interests by using the Recommender System to help support students' decision-making (Lynn & Emanuel, 2020).

In this regard, there are issues in considering students' selections of internships. It can be considered as a Multi-Criteria Decision-Making method (MCDM), where MCDM becomes a reliable and efficient tool for policy making to offer the most appropriate alternatives. These influential factors and their relative importance help influence prioritizing alternatives. The MCDM approach depends on the employed algorithm and the criteria used (Kamari, Isvand, & Nazari, 2020). Thus, selecting the AHP algorithm to consider in internship selection will support students in comparing criteria that affect the decision in internship selection. AHP is used to make the best decision based on predetermined variables which are based on the determined variables. Eventually, the maximum results will be obtained and the decisions taken from the AHP algorithm will produce solutions that can be beneficial for students (Dewi & Putra, 2021). The model consists of four significant methods including hierarchy construction, pairwise comparison, obtaining a judgment matrix, computing local weight, and the consistency of comparisons and aggregation of local weight (Fashoto, Amaonwu, & Afolorunsho, 2018).

Currently, AHP technique is not used to support the selection of internships. Therefore, the research team has developed a research project to develop a web application to recommend internships for undergraduate students by using AHP. The objective is to facilitate students in selecting internships before receiving internships according to the course plan using a web application. The contribution of this study is to initiate a new and feasible MCDM model for internship selection among undergraduate students using AHP. Additionally, this research can be applied to the dynamic multi-criteria web application process, which comprises different criteria, alternatives, and preferences.

2. Objectives

1) To develop an AHP-based web application for internship selection among undergraduate students.

2) To evaluate the quality and the satisfaction of the web application.

3. Research methodology

3.1 Review AHP and apply for internship selection

From reviewing the principles of the AHP technique, which consists of 5 steps (Saaty, 1970), it can be applied in selecting an internship as follows:

1) Construct a hierarchy structure including:

- Set goals for decision-making including selecting an internship.
- Set criteria that need to be used in deciding goals such as welfare, working hours, and ease of transportation.
- Set relevant alternatives which means a job that consists of a position and a company, such as developer of company A, developer of company B, and tester of company C.

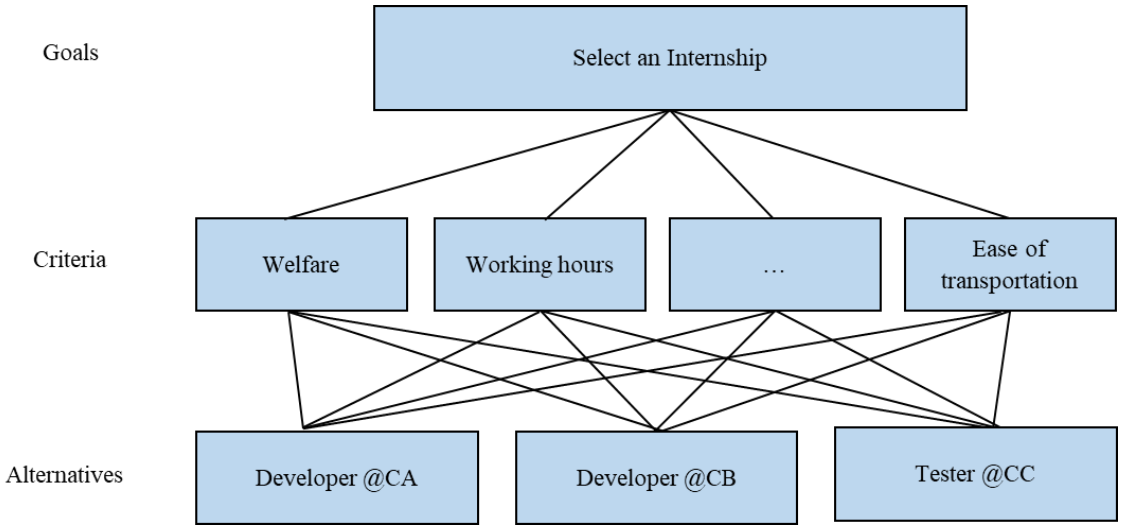

Figure 1 Hierarchy structures of AHP for internship selection.

From Figure 1, this displays the AHP technique structure that has been applied in an internship selection that consists of a hierarchical structure at 3 levels: Goals, Criteria, and Alternatives.

2) Pairwise comparison among criteria/alternatives

This step is to assign importance according to the user's satisfaction, consisting of criteria preferences and job preferences. By comparing them through pairwise comparison so the user can easily consider them using a scale from 1-9 as in Table 1. The user will give the value of importance for each pair. If n is given to represent the number of things, the number of comparisons can be found from the formula (n(n-1))/2 (Teknomo, 2006).

Table 1 Saaty's 1-9 scale for AHP (Saaty, 1996)

Intensity of importance	Definition	Explanation
1	Equal importance	Two activities contribute equally to the objective
3	Moderate importance	Experience and judgment slightly favor one over another
5	Strong importance	Experience and judgment strongly favor one over another
7	Very strong importance	Activity is strongly favored, and its dominance is demonstrated in practice
9	Absolute importance	Importance of one over another affirmed on the highest possible order
2, 4, 6, 8	Intermediate values	Used to represent compromise between the priorities list above

From Table 1, an example can be given by using a scale of 1-9 to value importance in criteria preferences, totaling 3 criteria, such as welfare, working hours, and ease of transportation, as shown in Figure 2.

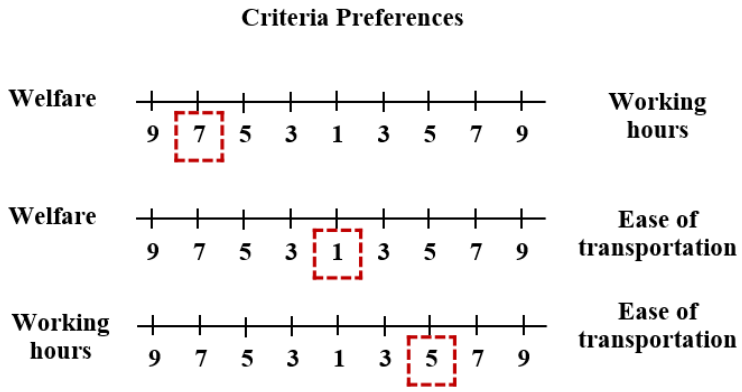

Figure 2 Example of developing 3 criteria preferences

From Figure 2, this displays an example of pairwise comparison of 3 criteria preferences. There are 3 matching pairs: Welfare - Working hours, Welfare - Ease of transportation, and Working hours - Ease of transportation. Each pair used a scale of 1-9 to rate satisfaction.

After developing criteria preferences to value the importance of the criteria according to user satisfaction, the next step will be to create alternative preferences or job preferences, one criterion at a time, until all criteria are completed. This can be seen in the example of valuing the importance of welfare criteria for 3 alternatives: developer of company A, developer of company B, and tester of company C, as shown in Figure 3.

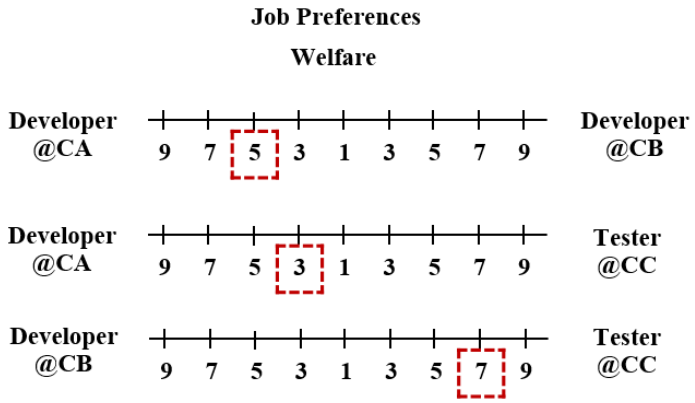

Figure 3 Example of Developing job preferences with 3 alternatives to welfare criteria

From Figure 3, this displays an example of pairwise comparison of job preferences in the welfare criteria of 3 alternatives. There are 3 possible pairs: - developer of company A - developer of company B, developer of company A - tester of company C, and developer of company B - tester of company C. Each pair uses a scale of 1-9 to rate satisfaction.

3) Transforming scores by converting scores from criteria preferences into matrix format and calculating weights in each row are shown in Table 2. The score values from job preferences in welfare criteria were transformed into a matrix format with priorities in each row, as shown in Table 3.

Table 2 Example of transformation for criteria preferences into matrix format and calculation of weights

Criteria	Welfare	Working hours	Ease of transportation	Weights
Welfare	1	7	1	**0.49**
Working hours	1/7	1	1/5	**0.08**
Ease of transportation	1	5	1	**0.44**

From Table 2, this displays an example of criteria preferences transformation into matrix format and weights calculations. Scores are converted from pairwise comparison of welfare, working hours, and ease of transportation criteria. Weights of each row are then calculated in the decimal form.

Table 3 Example of transformation for job preferences, welfare criteria into matrix format, and calculating priorities

Welfare				
Job	**Developer @CA**	**Developer @CB**	**Tester @CC**	**Priorities**
Developer @CA	1	5	3	**0.59**
Developer @CB	1/5	1	1/7	**0.08**
Tester @CC	1/3	7	1	**0.33**

From Table 3, this displays an example of job preferences of welfare criteria transformation to matrix form and calculating priorities by converting the pairwise comparison scores into the welfare criteria of developer of company A, developer of company B, and tester of company C. The values are then calculated and the priorities of each row are given in the decimal form.

4) Calculate Consistency Level to investigate whether the results obtained in step 3 are accurate and consistent with rationale or not.

5) Rank the Criteria/Alternatives calculated by multiplying the weights of each criterion with the priority value of each alternative.

In summary, AHP is a process that can be used to support a complex, multi-criteria decision-making that can be completed by assigning a numerical priority value to each variable. If any variable has the highest importance value, it will influence the decision results. which can be applied in selecting an appropriate internship alternative.

3.2 Review and design the criteria of internship selection

The research team reviewed 25 criteria for selecting internships from various research studies and then examined content validity using Item-Objective Congruence (IOC) from five experts in the fields of internship consultation and information technology. A total of 18 criteria were passed and then samples from 70 students of Faculty of Engineering and Technology, 3rd year, Panyapiwat Institute of Management, were given to consider according to their interests. There were 11 criteria passed.

Table 4 Table of synthesis results of criteria for selecting internships

No.	Criteria Name	IOC from five experts							Survey from 70 students		
		1	2	3	4	5	Score	Results	Frequency	Percentage	Results
C1	Opportunity to receive job placement	1	1	-1	1	1	0.80	Passed the criteria	66	6.93	Passed the criteria
C2	Honorable and reputable	1	0	-1	0	1	0.40	Did not pass the criteria	-		
C3	Attractiveness of job and career	1	1	1	1	1	1.00	Passed the criteria	59	6.19	Passed the criteria
C4	Job and company's stability	1	1	1	1	1	1.00	Passed the criteria	59	6.19	Passed the criteria
C5	Company's reputation	1	1	0	1	1	0.80	Passed the criteria	51	5.35	Passed the criteria
C6	Facilities at work	1	0	0	1	1	0.60	Passed the criteria	65	6.82	Passed the criteria
C7	Well-known organization in the society	1	1	1	1	1	1.00	Passed the criteria	43	4.51	Did not pass the criteria
C8	Organizations that receive social awards	0	1	1	1	0	0.60	Passed the criteria	37	3.88	Did not pass the criteria
C9	Express their opinions on jobs	-1	-1	-1	1	1	0.40	Did not pass the criteria	-		
C10	CSR activities	0	0	1	0	0	0.20	Did not pass the criteria	-		
C11	Welfare	1	0	-1	1	1	0.60	Passed the criteria	60	6.30	Passed the criteria
C12	Appropriate allowances/compensation	1	0	1	1	1	0.80	Passed the criteria	65	6.82	Passed the criteria
C13	Working hours and holidays	1	0	-1	1	1	0.60	Passed the criteria	54	5.67	Passed the criteria
C14	Convenience of commuting to work	0	1	0	1	1	0.60	Passed the criteria	50	5.25	Passed the criteria
C15	Closed on public holidays	0	0	0	1	1	0.40	Did not pass the criteria	-		
C16	Improve online skills such as on Udemy	1	1	-1	1	1	0.80	Passed the criteria	36	3.78	Did not pass the criteria
C17	Work equipment is available to borrow	0	0	1	1	0	0.40	Did not pass the criteria	-		
C18	Breakfast, lunch, or dinner is provided	0	0	0	0	0	0.00	Did not pass the criteria	-		
C19	Challenge skills and abilities	1	1	1	1	1	1.00	Passed the criteria	46	4.83	Did not pass the criteria
C20	Sufficient knowledge, ability, and skills to perform the job	1	1	1	1	1	1.00	Passed the criteria	68	7.14	Passed the criteria
C21	Skills development test is provided	0	0	0	1	1	0.20	Did not pass the criteria	-		
C22	Basic training is provided so students can solve	1	1	1	1	1	1.00	Passed the criteria	31	3.25	Did not pass the criteria

No.	Criteria Name	IOC from five experts							Survey from 70 students		
		1	2	3	4	5	Score	Results	Frequency	Percentage	Results
	problems firsthand										
C23	Good colleagues	1	0	-1	1	1	0.60	Passed the criteria	70	7.35	Passed the criteria
C24	Career interest	1	0	0	1	1	0.60	Passed the criteria	49	5.14	Did not pass the criteria
C25	Company interest	1	0	0	1	1	0.60	Passed the criteria	44	4.62	Did not pass the criteria

From Table 4, this displays the synthesis results of internship selection criteria which consist of an IOC from five experts and a survey from 70 students. This resulted in a total of 11 criteria passed from 25 criteria.

3.3 Design the web application based on AHP technique

1) System Architecture

System architecture of the web application to recommend internship selection is in the form of full stack, which is creating a web application consisting of front-end and back-end using Javascript. There are four main parts, as shown in Figure 4.

- Frontend (React.js): React.js is a tool for creating complete and responsive web applications. Controls and displays are separated into components to make management and maintenance easier. It uses state management formats such as Redux to keep state changes in web applications neat and consistent.

- Backend (Node.js): Node.js is used to create a server that supports Express.js, a framework for managing requests and data transmission. This includes designing and building a routing system for managing various requests, such as retrieving data, adding data, and others.

- Database (Firebase + Database Service): Firebase is used as a space for activating and providing web application services in selecting the appropriate database service. It can store information related to internships, such as jobs, criteria, or other related information.

- Software Development Kits (SDK): The SDK is used to communicate between Frontend and Backend, as Firebase provides an SDK for Node.js that is used to connect and interact with Firebase services. Using the SDK, some methods, and classes makes accessing Firebase services easier and more convenient.

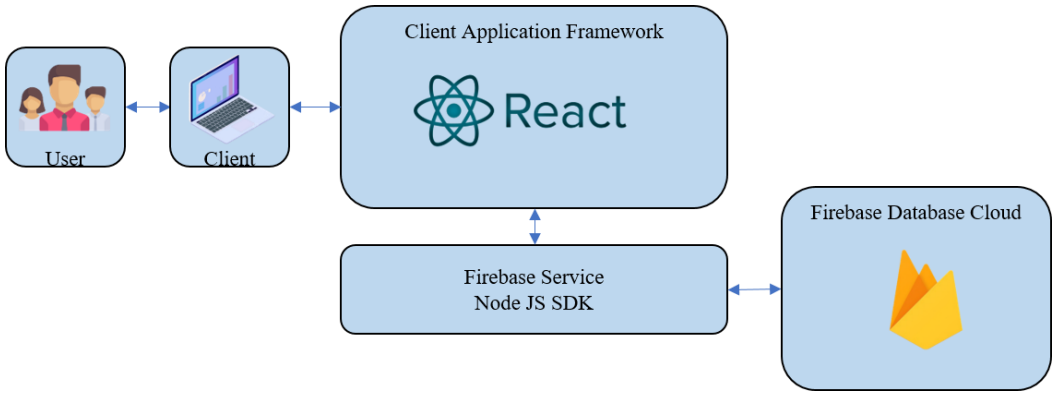

Figure 4 System architecture of web application

From Figure 4, this displays the system architecture of web applications to recommend internship selection comprising Frontend (React.js), Backend (Node.js), Database (Firebase + Database Service), and Software Development Kits (SDK). All these systems are in the form of full stack developer format.

2) Use Case Diagram

The Use Case Diagram of the web application shows the ability of users and admin to access the system. Users can select a job, which includes the name of the company and the name of the job position that users are interested in, and users can also select criteria that are used for consideration. This will help users make decisions based on individual needs and provide criterion preferences and job preferences with user-specified score values. Users can also display the results of the classification and the top 3 jobs can be ranked. The admin section, the criteria data, and job data can be inputted to be consistent with users' needs, as shown in Figure 5.

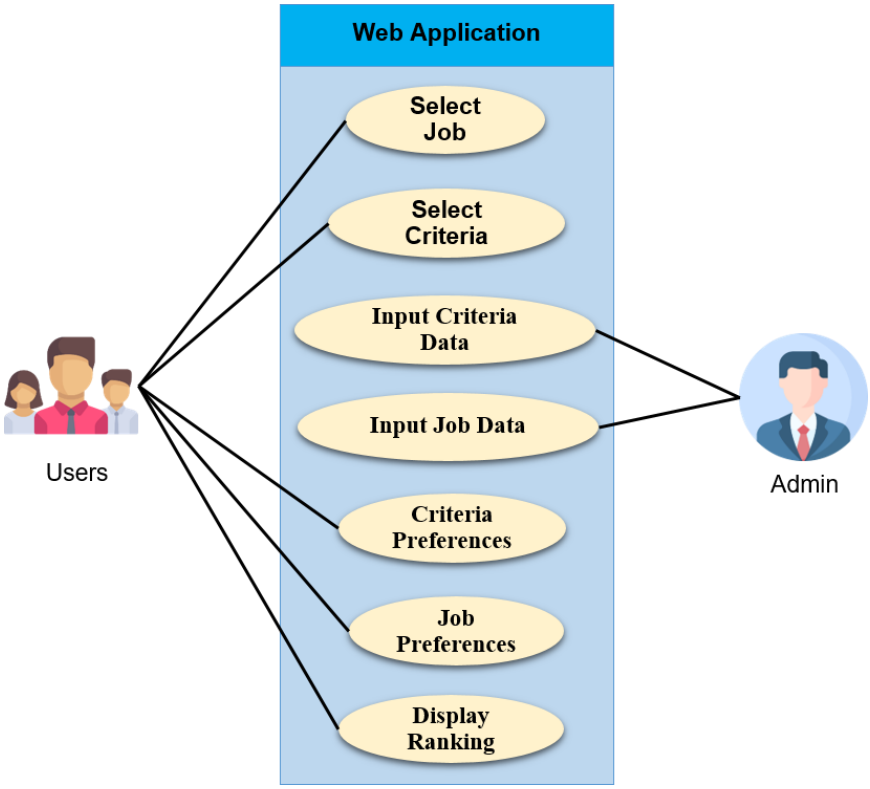

Figure 5 Use Case Diagram of web application

From Figure 5, this displays the Use Case Diagram of the web application to recommend internship selection. This will include users and admin's ability to access the system.

3) Class Diagram

The web application Class Diagram for recommending internship selection is shown in Figure 6.

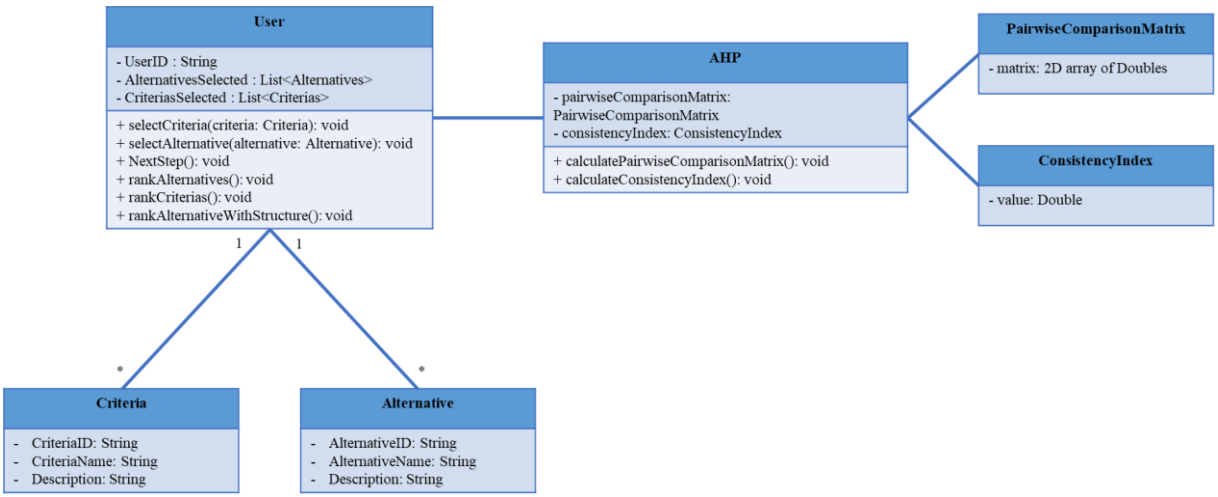

Figure 6 Use Case Diagram of web application

From Figure 6, this displays how users can make selections of criteria and alternatives using selectAlternative(alternative: Alternative) and selectCriteria(criteria: Criteria) methods, respectively. When the user has selected all the preferred criteria and alternatives, they can proceed with the NextStep() method to start the AHP process. The system will calculate the Pairwise Comparison Matrix and the Consistency Index in this process. The system will calculate the accuracy of the data used. It will calculate the Consistency Ratio, making it not to be higher than 0.1. The method will then rank the criteria and alternatives with the rankAlternatives() and rankCriterias() methods. These methods are arranged from the most to the least possible alternatives. The rankAlternativeWithStructure() method is also used for ranking the alternatives using a user-defined structure. This may mean weighting each criterion so that the selection of alternatives is consistent with the importance of criteria in cases where multiple dimensions or multiple criteria are considered. This system is a tool that can help users make decisions based on an analytic hierarchy process (AHP).

4) Process of Dynamic Multi-Criteria Web Application

Comprises:

- Difference Criteria where users can select different criteria according to their satisfaction, and there are a variety of criteria, totaling 11 criteria.

- Difference Alternative where users can select alternatives that are different according to their satisfaction, and there are various alternatives. In this case, it means a job that specifies the company name and the job title.

- Difference Preferences when users can select to rate satisfaction at 9 levels to be consistent with individual needs. This will affect the calculation to rank the top three alternatives with the highest users' scores, as shown in Figure 7.

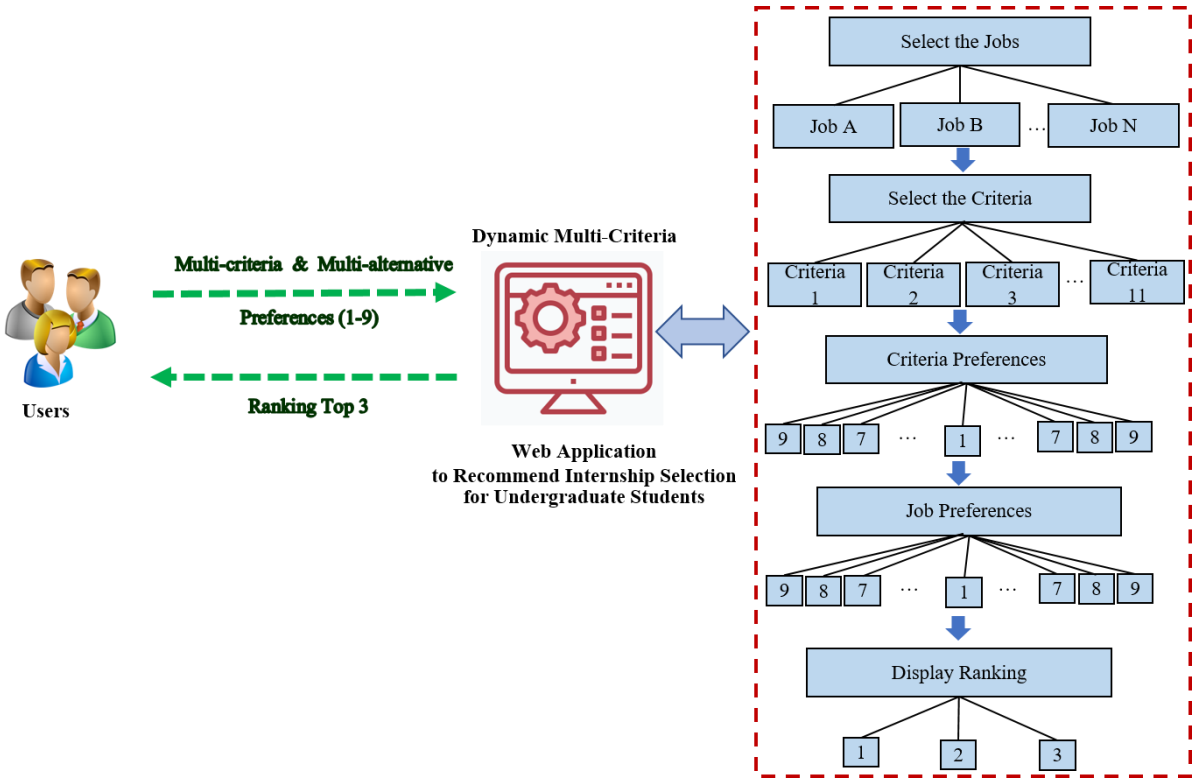

Figure 7 Process of Dynamic Multi-Criteria Web Application

From Figure 7, this displays the Dynamic Multi-Criteria Web Application process to recommend internship selection consisting of different criteria, alternatives, and preferences.

3.4 Develop the web application

The development of a web application consists of 3 main steps as shown in Figure 8:

STEP 1 Enter the Student ID, select the jobs, and select the criteria.

STEP 2 Select the criteria preferences and select the job preferences by using pairwise comparison and check the consistency of each pairwise.

STEP 3 Display the top three ranking of alternatives from the preferences from user.

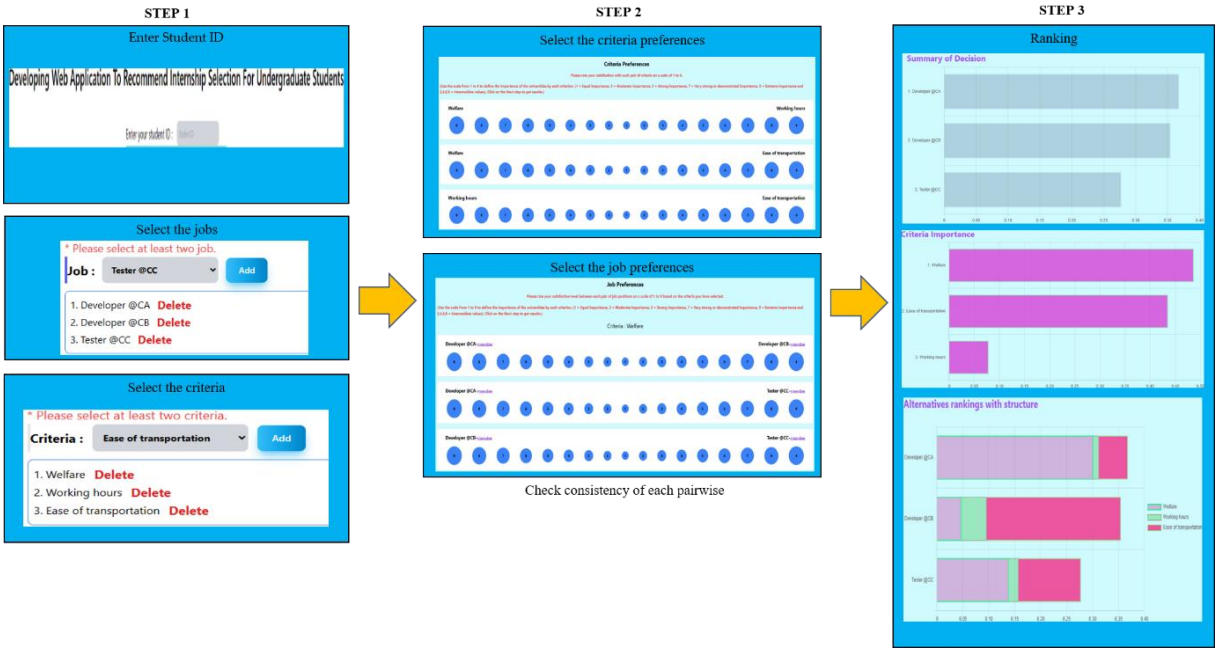

Figure 8 Three steps of web application in users' view

From Figure 8, this displays web application steps to recommend internship selection in users' view. It comprises 3 steps: job and criteria selection, preferences criteria selection, and job preferences selection and then displays the ranking.

3.5 Evaluate the web application

1) The quality assessment by 4 experts comprises:

- Web application development expert
- UX/UI design expert
- Expert from Counseling and Career Development for Student Center (CCDS), Faculty of Engineering and Technology, Panyapiwat Institute of Management
- Expert in mathematics for decision making

2) The satisfaction assessment by 96 users from the Faculty of Engineering and Technology, Panyapiwat Institute of Management

4. Results

4.1 The results of the analysis for the criteria selection used in deciding on internships

The selection criteria used in deciding on an internship via the web application from 96 users ranking from most to least is shown in Table 5.

Table 5 Ranking of selection criteria used in deciding on an internship (N = 96)

Rank	Criteria Name	Percentage
1	Good colleagues	22.15
2	Suitable allowances/compensation	18.99
3	Welfare	15.03
4	Sufficient knowledge, ability, and skills to perform the job	10.44
5	Working hours and holidays	7.12
6	Attractiveness of job and career	6.96
7	Opportunity to receive job placement	6.96
8	Convenience of commuting to work	6.65
9	Stability of job/company	3.64
10	Work facilities	1.11

From Table 5, the most frequently selected criteria were ranked from most to least. It was found that the top 3 criteria that users chose to consider were: good colleagues which is equivalent to 22.15 percent, suitable allowances/compensation which is equivalent to 18.99 percent, and welfare which is equivalent to 15.03 percent.

4.2 The quality assessment

The evaluation uses a rating scale system which has 5 levels of evaluation values based on the Likert's Scale with criteria for arranging the average satisfaction score as follows:

4.50-5.00 means the most level
3.50-4.49 means high level
2.50-3.49 means moderate level
1.50-2.49 means less level
1.00-1.49 means the least level

Table 6 Quality assessment results from experts (N = 4)

Assessment list	$\bar{x}$	S.D.	Quality assessment criteria
Aspects of meeting the needs of web application users			
1. The web application's ability to display overall ranking results	4.50	0.58	Most level
2. The web application's ability to display criteria ranking results	4.50	0.58	Most level
3. The web application's ability to display establishment ranking results.	4.50	0.58	Most level
Average	4.50	0.58	Most level
Aspects of working according to functionality			
1. Convenience in using various commands in the menu	4.25	0.96	High level
2. The web application covers an actual usage	4.00	0.82	High level
3. The web application has systems in place to prevent errors that may occur	4.00	0.82	High level
4. The accuracy of the results obtained by comparing pairwise values	4.50	0.58	Most level
5. The accuracy of the results obtained from the processing of the web application	4.25	0.96	High level

Assessment list	$\bar{x}$	S.D.	Quality assessment criteria
6. Web application reliability	4.25	0.96	High level
Average	4.21	0.85	High level
Aspects of user-friendliness for web application			
1. Suitability in choosing the type, size, and color of fonts on web applications	3.00	0.82	Moderate level
2. Suitability of using text to explain the meaning of each menu	4.00	0.82	High level
3. Proper positioning of web application components and menus	3.50	0.58	High level
4. Using words that users are familiar with and can easily understand.	4.25	0.96	High level
5. Suitability for interacting with users	4.00	0.82	High level
Average	3.75	0.80	High level
Overall average	4.15	0.74	High level

From Table 6, it is found that the areas with the highest average assessment scores are: aspects of meeting the needs of web application users with an average value equal to ($\bar{x}$ = 4.50), followed by the aspect that works according to functionality ($\bar{x}$ = 4.21), and the least aspect is the ease of use for the web application ($\bar{x}$ = 3.75).

4.3 The satisfaction assessment

Table 7 Results of user satisfaction assessment (N = 96)

Assessment list	$\bar{x}$	S.D.	Satisfaction assessment criteria
Performance and benefits of web applications			
1. Ease of access for web applications	4.04	0.92	High level
2. Suitability of the menu for using web applications	3.81	0.92	High level
3. The web application is easy to use and not complex	4.03	0.91	High level
4. Speed of response of web applications	3.99	0.96	High level
5. Information obtained from web applications are accurate and complete	4.13	0.86	High level
6. Language used in web application is appropriate and the meaning is clearly conveyed	4.24	0.83	High level
Average	4.04	0.90	High level
Web application design and management			
1. The design, modernity, and interest of the home page	3.45	1.06	Moderate level
2. The layout of the website is easy to read and use	3.78	1.11	High level
3. Font size and font style is easy to read and looks nice	3.86	0.98	High level
Average	3.70	1.05	High level
Overall satisfaction with the use of web application			
1. Are you overall satisfied with the use of the web application?	3.96	0.90	High level
Average	3.96	0.90	High level
Overall average	3.90	0.95	High level

From Table 7, it is found that the evaluation results of users in the areas with the highest average assessment scores are: performance and benefits of web applications with an average value of ($\bar{x}$ = 4.04), followed by overall satisfaction with the use of web applications ($\bar{x}$ = 3.96) and the least aspect is web application design and management ($\bar{x}$ = 3.70).

5. Discussion

Developing an AHP-based web application for internship selection among undergraduate students with the following results:

1. Reviewing AHP and applying for internship selection allows the research team to understand the AHP work process and be able to apply it appropriately.

2. Review and design the criteria of internship selection to understand the criteria for selecting internships to use in selecting appropriate criteria from experts and using them appropriately. From the design of the criteria used in selecting internships from 4 experts, it was found that some criteria still do not have a direct influence on the decision-making of the target group of students. Therefore, the aforementioned criteria were given to the target group of 70 students to consider their interest in the criteria to be used in deciding on internships, totaling 11 criteria. When the said criteria were put into use, from 96 users, it was found that the top 3 criteria that users selected to consider were good colleagues, suitable allowances/compensation, and welfare. This is because the group of users were third-year students who had already completed an internship. In the second year, they are familiar with their colleagues, which makes them most interested in this criterion. This is not consistent with the research of Aknar, Basci, and Kartal (2023) which found that the factor of ease of transportation was the criterion that received the most attention. This is because the target group of students has experience in taking previous routes to complete an internship. Most of the internships are in city areas with convenient public transportation. Therefore, there may not be much importance given to this criterion.

3. Design the web application based on the AHP technique using the system architecture in the form of full stack, which is a format for creating both Front-end and Back-end web applications that support decision-making with AHP techniques using the dynamic multi-criteria web application.

4. Develop the web application with structure, positioning, and essential components for ease of use, such as selecting a job and scoring pairwise comparisons in criteria preferences and job preferences, as well as displaying summary graphs that display information to support users' decision-making.

5. Evaluate the web application

From the quality evaluation of 4 experts, the evaluation items were as follows: 1) in terms of meeting the needs of web application users, 2) in being able to work according to functionality, and 3) in terms of ease of use of the web application. The results of the quality assessment found that the overall mean in all aspects ($\bar{x}$ = 4.15) and standard deviation (S.D. = 0.74) showed that the web application passed the quality assessment criteria at a high level. Suggestions from experts include improving the UX/UI, font size, and the background and background colors so that they don't blend. Therefore, design concepts such as the User Centered Design method are chosen because this method focuses more on the users targeted by the application. The method used in this research is sufficiently effective to design a user interface design and user experience for the web application (Adhitya, Andreswari, & Alam, 2021).

From evaluating the satisfaction of 96 general users, the evaluation items were as follows: 1) The efficiency and usefulness of the web application, 2) The design and layout of the web application, and 3) Overall satisfaction with the use of the web application. Results of the satisfaction assessment found that the overall mean in all aspects ($\bar{x}$ = 3.90) and standard deviation (S.D. = 0.95) showed that the web application passed the satisfaction evaluation criteria at a high level. The areas with the highest average evaluation scores are performance and benefits of web applications with the satisfaction evaluation results at a high level. The least aspect is in terms of designing and managing the format of the web application, such as the suitability of using fonts and font colors. The satisfaction evaluation

results were at a high level. Important suggestions from user groups include web applications should be developed to support use on all devices. This is also known as Responsive Web Design (RWD), which is in line with the research of Naveen Bharathi and Kavitha Margret (2020), which found that Responsive Web Design (RWD) is the best alternative for web design that can improve users' experience.

6. Conclusion

This research has two main objectives: 1) To develop an AHP-based web application for internship selection among undergraduate students. 2) To evaluate the quality and satisfaction of the web application by evaluating the quality assessment results by experts. The overall mean is at a high level, and the results of the overall user assessment mean are also at a high level. Significant recommendations encompass the application of responsive web design principles to ensure compatibility across diverse devices, alongside the integration of UX/UI design principles aimed at enhancing the usability of websites. Techniques other than AHP should be applied to allow comparison between techniques. MCDM may produce various outcomes depending on the particular issue. Thus, incorporating new MCDM techniques based on new viewpoints could guarantee the outcome's reliability (Behera & Beura, 2023). The research results should be compared between the target groups that are different between the group who have never had an internship and the group who have had an internship previously.

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