



Development of an Interactive Wayfinding System Using a Mobile Application in the College Building of University of Perpetual Help System Laguna-Jonelta

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Abstract

Wayfinding systems are essential tools designed to assist people in navigating through unfamiliar or complex environments. In academic institutions like the University of Perpetual Help System Laguna (UPHSL), the lack of an efficient navigation system can lead to lost time, missed classes, and a stressful experience for newcomers. The primary goal of this study is to develop an interactive wayfinding system using a mobile application in the college building of University of Perpetual Help System Laguna – JONELTA. The study is aligned with the ISO 25010:2023 (Systems and software Quality Requirements and Evaluation (SQuaRE) — Product quality model). The study utilized a descriptive developmental research design as it intended to design and develop a software in order to solve an underlying issue. Specifically, the researcher implemented a Rapid Application Development (RAD) in developing the software utilizing A-star (A*) search algorithm as a wayfinding system. The implementation resulted in the development of a fully functional mobile application with the following features: an interactive, college building; a search bar and directory for finding rooms, buildings, and facilities; real-time route calculation and optimized path suggestions; and a clean, user-friendly interface designed for ease of navigation.

Keywords: Software Development, Wayfinding System, A* Algorithm, Mobile Application, ISO 25010

1. Introduction

Wayfinding systems play a crucial role in helping individuals navigate unfamiliar or complex environments with ease and confidence. Whether in airports, hospitals, malls, or school campuses, these systems are designed to guide people from one location to another through signs, maps, or digital tools. In modern settings, digital wayfinding—especially through mobile applications—has emerged as a powerful solution that offers real-time, interactive, and personalized guidance (Shamsuddin, *et al.*, 2022) ^[14].

Wayfinding systems are essential tools designed to assist people in navigating through unfamiliar or complex environments. Traditionally, wayfinding relied on static maps, signboards, and verbal directions. However, these conventional tools often fall short in large facilities such as universities, where multi-floor buildings, unfamiliar room labels, and time-sensitive movement can overwhelm students, visitors, and even staff (Lakshman Srinivasan, *et al.*, 2025) ^[7]. Modern wayfinding solutions have evolved to incorporate digital technologies that offer interactive, real-time navigation through mobile applications—making guidance more accurate, personalized, and accessible.

Wayfinding tools are not only convenient but also inclusive, supporting students, staff, visitors, and individuals with limited spatial awareness. By reducing confusion, saving time, and improving overall user experience, wayfinding systems contribute to a more accessible, organized, and efficient environment for everyone. According to Gekas *et al.* (2023) ^[3], mobile navigation tools significantly reduced user frustration and improved wayfinding efficiency in campus environments.

Hoene and Blanke presented various technologies for indoor navigation, noting the challenges of GPS unreliability indoors and the need for hybrid systems like Wi-Fi triangulation or map-based algorithms. This supports the relevance of developing a mobile-based wayfinding application at UPHSL, as it addresses the same challenge of helping students and visitors navigate unfamiliar areas with less cognitive load.

The adoption of machine learning techniques for indoor positioning has been developing with the use of WiFi, Bluetooth, and other technologies (Roy & Chowdhury, 2021) ^[13]. A-star (A*) algorithm is a search algorithm that finds the shortest path between one point to another. It is a popular algorithm used for graph traversal (Ravikiran, 2025) ^[12]. According to Patel (2025) ^[11], A* is comparable to the Dijkstra's algorithm which can also be used to find the shortest path between two points. Furthermore, it is the most popular algorithm for pathfinding as it is flexible and can be used in different contexts. The utilization of A-star (A*) as a search algorithm for pathfinding has been done for a long time due to its efficiency, simplicity, and modularity (Foead, *et al.*, 2021) ^[2]. However, with the inconsistencies of map environment construction and pathfinding strategies, there are still many disadvantages of complex algorithms and path nodes. Therefore, the Delaunay triangulation algorithm is used to process complex obstacles to improve the efficiency of mobile robot path (Liu, *et al.*, 2021) ^[9].

AR and QR technologies improve indoor orientation and user interaction. While the system uses A* pathfinding and map overlays, this study supports the future direction of adding AR elements to improve visual guidance and interactivity in the wayfinding system mobile navigation app (Othman & Ariffin, 2022) ^[10]. Kaur and Singh (2021) ^[6] highlights the importance of searchable directories, floor-specific routing, and user-centered design in a university setting. This closely aligns with the goals of the navigation system, which also aims to enhance usability and quick access to facilities through real-time route generation. This closely aligns with the goals of the navigation system, which also aims to enhance usability and quick access to facilities through real-time route generation.

In the study of Herlawati, *et al.* (2021) ^[4], it proved that an Android application can be utilized for pathfinding in the mall—giving information of specific places and calculating its distances from point A to point B. Liu, Wang, and Xu (2022) ^[8] in their study that the algorithm of A* can be altered or improved so that instead of returning to the starting point when an obstacle is encountered, the algorithm suggests an alternative path to the designated end point.

This study adopted a user-centered design approach as its operational framework with the utilization of the A* (A-star) algorithm for shortest path computation. The framework involves an input, process, output (IPO) framework where: (1) Input: User's selected starting point and destination; (2) Process: A* algorithm processes campus map data to generate the optimal route; and (3) Output: Real-time visual and textual directions displayed via a mobile interface. While its technological stack will include a React Native frontend and a JavaScript-based wayfinding logic as backend, while utilizing the Android platform and a custom image overlay-based interface (manual node placement) as mapping.

This research was also aligned with the International Organization for Standardization (ISO) and the International Electrotechnical Commission (IEC) directives for systems and software engineering - Systems and software Quality Requirements and Evaluation (SQuaRE) — Product quality model, or the ISO/IEC 20510:2023. This standardizes the product quality model of the information and communication technology (ICT) and software products which also serves as a guide for the development of specifications and evaluation requirements of the software created.

This study aimed to achieve the following objectives: (1) to develop a mobile-based wayfinding system for college building; (2) to provide interactive navigation for students

and visitors; (3) to include a searchable directory for campus locations and facilities; and (4) to develop a software based on ISO 25010:2023 (Systems and software Quality Requirements and Evaluation (SQuaRE) — Product quality model).

In academic institutions like the University of Perpetual Help System Laguna (UPHSL), the lack of an efficient navigation system can lead to lost time, missed classes, and a stressful experience for newcomers. Asif, *et al.* (2020) ^[1] emphasized the value of real-time indoor and outdoor campus navigation apps. Therefore, by introducing an interactive mobile-based wayfinding system, the university aims to modernize campus navigation, support daily academic activities, and improve the overall experience for its community. This study focuses on developing such a system, leveraging intuitive design, GPS, and intelligent pathfinding algorithms to help users locate destinations quickly and confidently within the college building.

The study is anchored on the Institutional Research Agenda for Efficient and Effective Management System, as well as the United Nations' Sustainable Development Goal 9, Industry, Innovation, and Infrastructure in relation to adaptation of mobile applications as part of campus navigation system.

Methodology

The study utilized a descriptive developmental research design as it intended to design and develop a software in order to solve an underlying issue. Specifically, the researcher implemented a Rapid Application Development (RAD) in developing the software.

The sample of the study were chosen using a random sampling technique of the people in the university, including students, faculty, staff and others who visit the University. A pre-development survey questionnaire was administered to a total of 184 respondents to assess the needs and challenges according to the respondents in order to develop a software tailored to their requirements. Furthermore, a questionnaire aligned with the requirements of ISO 25010:2023 was given to a total of 50 respondents who have tested the software prototype.

The researcher interpreted the data gathered from the respondents using the following statistical techniques: (1) Frequency distribution in order to determine the distribution of respondents acquired from the survey form responses; (2) Percentage to determine the proportion of respondents who provided a specific response, as well as to determine the most to least needed feature in the software, and; (3) Weighted Mean for the ISO 25010:2023 evaluation questionnaire in order to measure the perception of the respondents according to their test of software.

A searchable directory was implemented to allow users to locate classrooms, offices, and other campus facilities quickly. A pathfinding algorithm, such as A star(A*), was incorporated to compute the most efficient routes between user-selected points. To improve usability, the system featured a clean and responsive user interface with visual cues and step-by-step navigation instructions. The mobile application was developed using React and Android Studio to ensure compatibility for Android devices.

Results and Discussion

The primary goal of this study is to develop an interactive wayfinding system using a mobile application in the college building of University of Perpetual Help System Laguna – JONELTA.

The researcher provided a pre-development survey questionnaire to determine the essential features of the application in order to cater the needs of the university population. Furthermore, a subsequent survey questionnaire was given to respondents who were able to test the software and its usability in the preferred location.

Pre-development Survey

Table 1: Respondents' Affiliation with the University

	Frequency	Percentage	Rank
Student	134	72.83%	1
Faculty	31	16.85%	2
Staff	15	8.15%	3
Others	4	2.17%	4
TOTAL	184	100.00%	

Table 1 showed that most of the respondents were students studying in UPHSL with a percentage of 72.83% of the total respondents. 16.85% of the respondents were faculty members, 8.15% were staff working in the University, while only 2.17% were others which may define that they were visitors in the University.

Table 2: Frequency of Visit in the University

	Frequency	Percentage	Rank
Daily	132	71.74%	1
Weekly	20	10.87%	3
Occasionally	28	15.22%	2
Newcomer	4	2.17%	4
TOTAL	184	100.00%	

Table 2 exhibits the respondents' frequency of visit to the University. 71.74% or 132 respondents go to the University daily, 15.22% are occasional visitors, while 10.87% go to the University weekly, and only 2.17% are newcomers.

Table 3: Respondents' Frequency of Difficulty in Navigating the UPHSL College Building

	Frequency	Percentage
Yes	114	61.96%
No	70	38.04%
TOTAL	184	100.00%

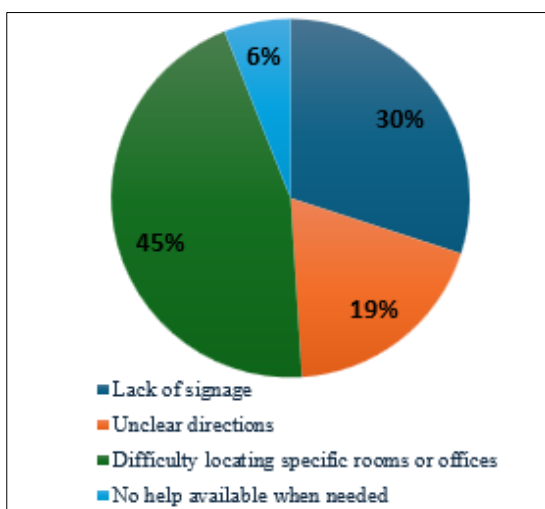


Fig 1: Main Challenges Experienced in Navigating the UPHSL College Building

61.96% or 114 respondents feel difficulty in navigating the UPHSL College Building. Out of 114 respondents who have difficulty navigating the building, 45% found it hard to locate specific rooms or offices, 30% said that it was because of the lack of signage, 19% had been given unclear directions, while 6% said that it was difficult as there was no help when needed.

Table 4: Respondents' Need for Help in Navigating the UPHSL College Building

	Frequency	Percentage
Yes	132	71.74%
No	52	28.26%
TOTAL	184	100.00%

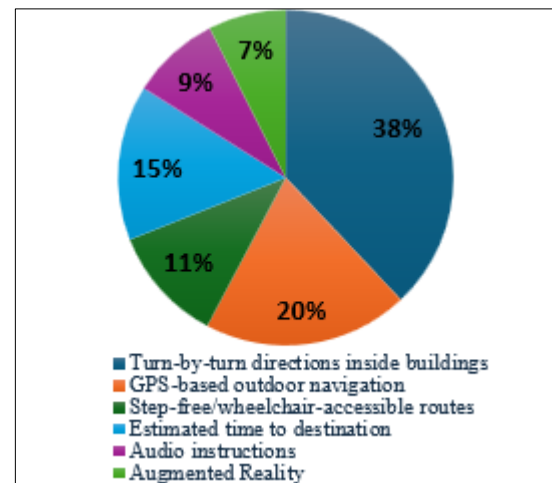


Fig 2: Navigation Features that would be Most Useful to Respondents

According to Table 4, 71.74% of the respondents needed help in navigating the College Building. Furthermore, they have suggested features that can be considered in the development of the navigation software, as seen in Figure 2. 38% believed that the application must include turn-by-turn directions inside the building, 20% suggested a GPS-based navigation system, and 15% felt the need of an "estimated time to destination" feature. Moreover, in consideration for persons with disability (PWD), 11% asked to include a step-free or wheel-chair accessible routes, 9% said that audio instructions must be included, while 7% suggested that the application must have augmented reality.

Table 5: Respondents' Perceived Frequency of Searching for Specific Building Locations or Offices

	Frequency	Percentage	Rank
Frequently	56	30.43%	2
Occasionally	90	48.91%	1
Rarely	32	17.39%	3
Never	6	3.26%	4
TOTAL	184	100.00%	

Table 5 considers the frequency of need of the respondents in using the navigation application according to their perceived frequency of need for searching specific locations in the building. 48.91% of the respondents would only need to search for building locations occasionally. Meanwhile, 30.43% would need it frequently, only 17.39% would rarely need the application, while 3.26% say that they may never need the use of the software.

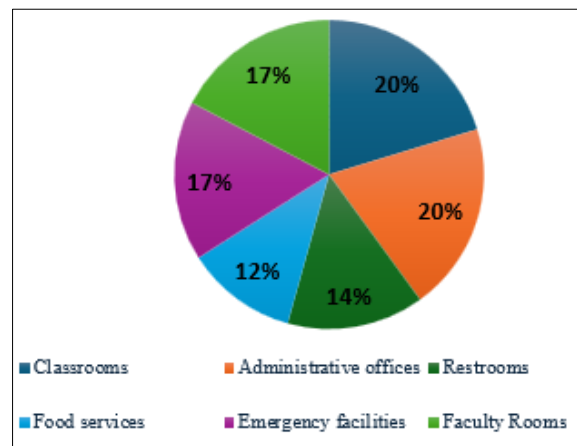


Fig 3: Categories that should be Included in the Building's Directory

Figure 3 shows the categories that the respondents suggest to be included in the directory. With 20% each, respondents mostly need classrooms and administrative offices in the application. Faculty rooms and emergency facilities are the

second most needed category with 17% each, while 14% of the responses expressed the need for restrooms, and only 12% were food services.

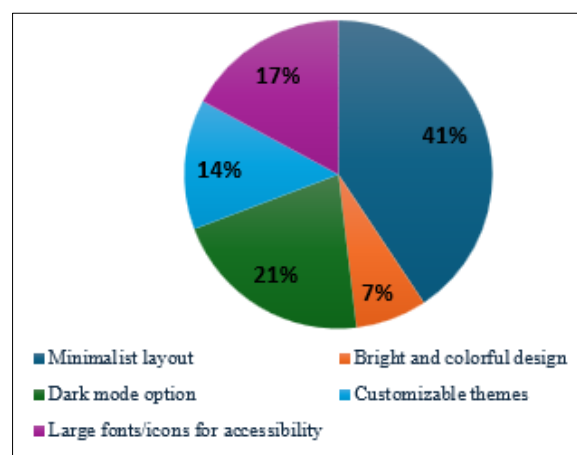


Fig 4: Respondents' Preferred Design Feature on the Application

Figure 4 notes the respondents' suggestions to be considered in the design of the application. Most of the responses suggested that the design must have a minimalist layout with 41% of the total responses. Furthermore, 21% asked for a dark mode option, 17% suggested having large fonts/icons in case of need, 14% said that the application should have a customizable design, while 7% were considering a bright and colorful design for the application.

Table 6: Importance of Real-Time Navigation in the UPHSL College Building according to Respondents

	Frequency	Percentage	Rank
Extremely important	80	43.48%	1
Very important	78	42.39%	2
Slightly important	22	11.96%	3
Not important	4	2.17%	4
Weighted Mean	1.73	Extremely Important	

Weighted Mean: 1.00-1.75-Extremely Important; 1.76-2.50-Very Important; 2.51-3.25-Slightly Important; 3.26-4.00-Not Important

Table 6 shows the respondents' perceived importance of real-time navigation in the UPHSL College Building. 43.48% of the respondents said that having real-time navigation in the building is extremely important. Meanwhile, 42.39% believed that it is very important, 11.96% thought that it was only slightly important, and only 2.17% deemed that it was

not important at all. With a weighted mean of 1.73, the real-time navigation in the College Building of UPHSL was deemed Extremely Important.

Table 7: Importance of a Simple and Intuitive Application Interface according to Respondents

	Frequency	Percentage	Rank
Extremely important	86	46.74%	1
Very important	86	46.74%	1
Slightly important	10	5.43%	3
Not important	2	1.09%	4
Weighted Mean	1.61	Extremely Important	

Weighted Mean: 1.00-1.75-Extremely Important; 1.76-2.50-Very Important; 2.51-3.25-Slightly Important; 3.26-4.00-Not Important

Table 7 illustrated the importance of a simple and intuitive application interface according to the respondents. With 86 respondents each, the respondents considered a simple and intuitive interface both extremely and very important. On the other hand, 5.43% said that it was only slightly important and 1.09% believed that it was not important at all. Therefore, with a weighted mean of 1.61, the importance of having a simple and intuitive application interface was extremely important to the respondents.

Table 8: Respondents' Perceived Experience in using Similar Navigation Apps such as Google Maps, Apple Maps, etc.

	Frequency	Percentage	Rank
Excellent	94	51.09%	1
Good	82	44.57%	2
Poor	0	0.00%	4
Never used any	8	4.35%	3
Weighted Mean	1.58	Excellent	

Weighted Mean: 1.00-1.75-Excellent; 1.76-2.50-Good; 2.51-3.25-Poor; 3.26-4.00-Never used any

Table 8 presents the respondents' experiences in using similar navigation applications such as Google Maps and Apple Maps. Most of the respondents had excellent reviews of the applications. Moreover, 44.57% also showed good reviews, while 4.35% of the respondents said that they have never used any navigation app. On the other hand, no respondents had poor experience in using a navigation software.

To summarize the pre-development survey, most of the respondents of the pre-software development survey were students, while some were staff and faculty who are also mostly spending their time within the premises of the University almost daily.

Respondents found challenges in navigating the University's College Building. Specifically, they found it difficult to find

specific rooms and offices during their stay.

Furthermore, respondents suggested that the application should include specific navigation features, especially turn-by-turn directions inside buildings and a GPS-based navigation system.

Respondents occasionally find themselves looking for specific rooms and buildings, particularly classrooms and administrative offices, which they have also advocated to be specified in the application. Respondents also recommended developing a minimalist layout for the application.

Moreover, while most of the respondents were not having trouble in similar navigation applications such as Google Maps and Apple Maps, they have expressed the importance of real-time navigation as well as a simple and intuitive application for the expected users in the University.

Development Stage

The implementation resulted in the development of a fully functional mobile application with the following features:

- An interactive, college building.
- A search bar and directory for finding rooms, buildings, and facilities.
- Real-time route calculation and optimized path suggestions.
- A clean, user-friendly interface designed for ease of navigation.

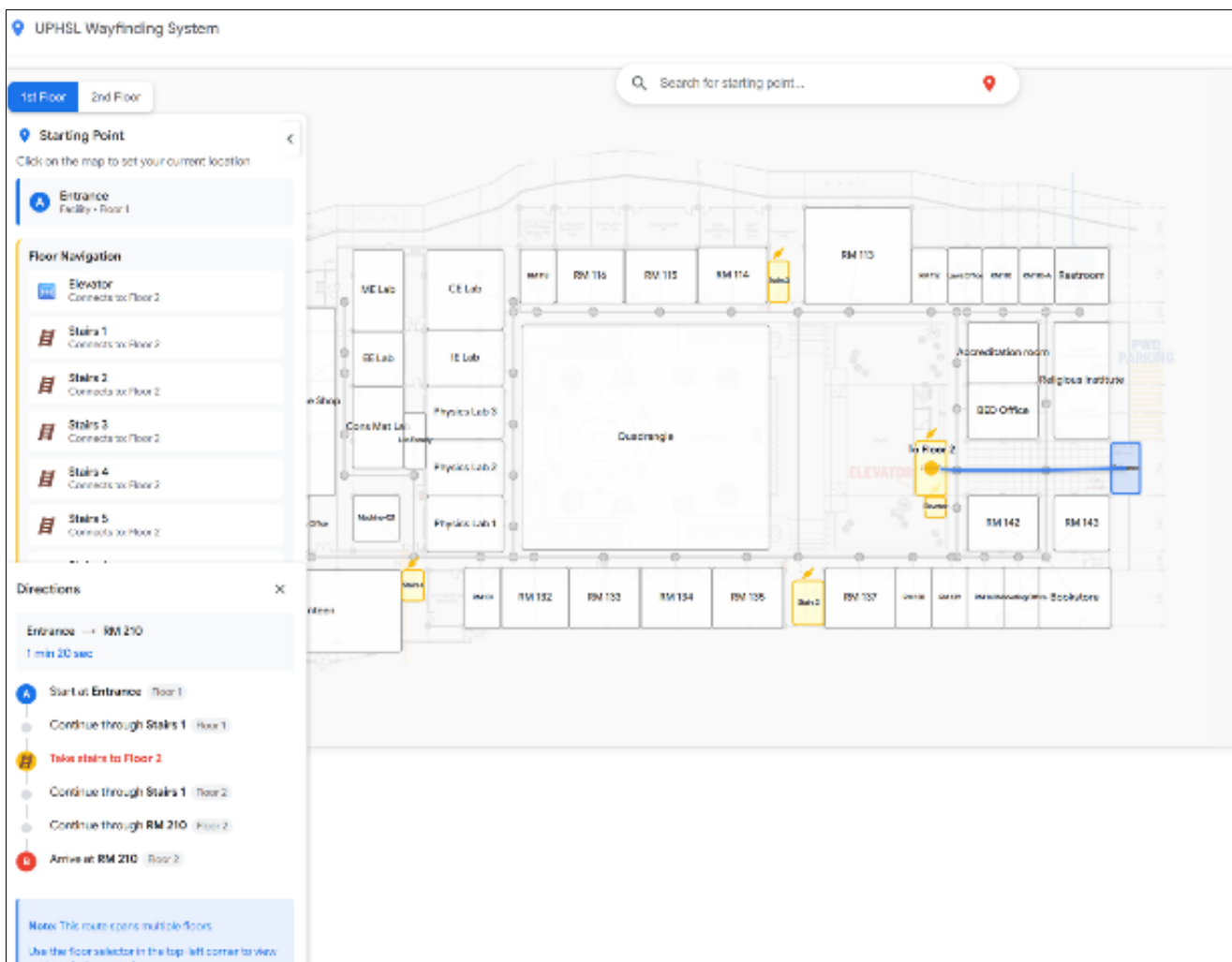
**Fig 5:** Web Interface

Figure 5 shows the user selects the Entrance as the starting point and sets RM 210 (Room 210) as the destination. The

system processes this request and visually displays a clear path, incorporating both floor transitions and directional cues.



Fig 6: Mobile Interface

Figure 6 displays the mobile interface of the UPHSL Wayfinding System, a smartphone-based indoor navigation app for the University of Perpetual Help System Laguna. Users can select a starting point and destination, and the system generates a multi-floor route using intelligent pathfinding.

Post-Development Testing Evaluation

Respondents, who were chosen randomly, were asked to test and evaluate the application after the initial development of software. The evaluation sheet was based on the pre-existing evaluation sheet according to the ISO 25010:2023.

Table 9: Weighted Mean according to Functionality of the Application

	Weighted Mean	Interpretation	Rank
Functional Completeness	4.12	Very Good	3
Functional Correctness	4.34	Excellent	2
Functional Appropriateness	4.72	Excellent	1
Weighted Mean	4.39	Excellent	

Legend: 1.00-1.80-Poor; 1.81-2.60-Fair; 2.61-3.40-Good; 3.41-4.20-Very Good; 4.20-5.00-Excellent

Table 9 displays the respondents' evaluation according to the functionality of the application. A software's functional

completeness refers to the degree to which the set of functions covers all the specified tasks and their objectives. Having a weighted mean of 4.12, the system's functional correctness is evaluated Very Good. Furthermore, the functional correctness measures the degree to which a system provides the correct results with precision. With a weighted mean of 4.34, the software's functional correctness is Excellent. Lastly, the functional appropriateness is the degree to which the functions facilitate the accomplishment of specified tasks and objectives. With a 4.72 weighted mean, it ranks first among the Functionality category and is deemed Excellent.

Obtaining a total weighted mean of 4.39, the functionality of the developed software is measured as Excellent.

Table 10: Weighted Mean according to Reliability of the Application

	Weighted Mean	Interpretation	Rank
Availability	4.76	Excellent	1
Recoverability	3.78	Very Good	2
Weighted Mean	4.27	Excellent	

Legend: 1.00-1.80-Poor; 1.81-2.60-Fair; 2.61-3.40-Good; 3.41-4.20-Very Good; 4.20-5.00-Excellent

Table 10 exhibits the respondents' evaluation of the software

according to its reliability. With a weighted mean of 4.76, the availability of the application is Excellent which means that the system is operational and accessible when required for use. On the other hand, the recoverability of the software, which refers to the degree to which, in the event of an interruption or a failure, the system can recover the data directly affected and re-establish the desired state of the system, is measured at 3.78 with an interpretation of Very Good.

Overall, the reliability of the application is still Excellent as it received a weighted mean of 4.27.

Table 11: Weighted Mean according to Usability of the Application

	Weighted Mean	Interpretation	Rank
Learnability	4.68	Excellent	1
User interface aesthetics	4.46	Excellent	2
Accessibility	3.80	Very Good	3
Weighted Mean	4.31	Excellent	

Legend: 1.00-1.80-Poor; 1.81-2.60-Fair; 2.61-3.40-Good; 3.41-4.20-Very Good; 4.20-5.00-Excellent

Table 11 provides for the measurement of the application's usability based on its pilot testing. The learnability of the application means that a system can be used by specified users to achieve specified goals of learning to use the product or system with effectiveness, efficiency, freedom from risk and satisfaction in a specified context of use. With a weighted mean of 4.68, the learnability of the software is Excellent. Moreover, the user interface aesthetics, which is the degree to which a user interface enables pleasing and satisfying interaction for the user, is Excellent as it obtained a weighted mean of 4.46. Lastly, the application's accessibility, or the degree of which a system can be used by people with the widest range of characteristics and capabilities to achieve a specified goal in a specified context of use, garnered a weighted mean of 3.80 which can be interpreted as Very Good.

Therefore, with a total weighted mean of 4.31, the software's usability is Excellent.

Table 12: Weighted Mean according to Performance Efficiency of the Application

	Weighted Mean	Interpretation	Rank
Time Behavior	3.94	Very Good	2
Resource Utilization	4.46	Excellent	1
Capacity	3.60	Very Good	3
Weighted Mean	4.00	Very Good	

Legend: 1.00-1.80-Poor; 1.81-2.60-Fair; 2.61-3.40-Good; 3.41-4.20-Very Good; 4.20-5.00-Excellent

Table 12 is the evaluation of the application's performance efficiency. Firstly, the time behavior of the software is deemed Very Good with a weighted mean of 3.94, which means that the response and processing times of a system, when performing its functions, meet requirements. Furthermore, the resource utilization of the application, which is the degree to which the amounts and types of resources used by a system, when performing, meet requirements, is Excellent as it obtained a weighted mean of 4.46. Meanwhile, a software's capacity is the maximum limits of a system parameter meet requirements. With a weighted mean of 3.60, the capacity of the application is Very Good.

With a total weighted mean of 4.00, the performance

efficiency of the first test of the application is measured Very Good.

Table 13: Weighted Mean according to Compatibility of the Application

	Weighted Mean	Interpretation	Rank
Coexistence	4.02	Very Good	1
Interoperability	3.70	Very Good	2
Weighted Mean	3.86	Very Good	

Legend: 1.00-1.80-Poor; 1.81-2.60-Fair; 2.61-3.40-Good; 3.41-4.20-Very Good; 4.20-5.00-Excellent

Table 13 illustrates the weighted mean of the compatibility of the application. The software's coexistence or the degree to which a system can perform its required functions efficiently while sharing a common environment and resources with other products, without detrimental impact on any other product, is Very Good as it received a weighted mean of 4.02. Meanwhile, the interoperability of the system, with a weighted mean of 3.70, is Very Good as well, which means that the system can exchange information and use the information that has been exchanged with other systems. Thus, the compatibility of the application with other systems is Very Good, having a weighted mean of 3.86.

Table 14: Weighted Mean according to Security of the Application

	Weighted Mean	Interpretation	Rank
Confidentiality	4.48	Excellent	1
Integrity	4.48	Excellent	1
Accountability	4.26	Excellent	3
Weighted Mean	4.41	Excellent	

Legend: 1.00-1.80-Poor; 1.81-2.60-Fair; 2.61-3.40-Good; 3.41-4.20-Very Good; 4.20-5.00-Excellent

Table 14 shows the measurement of the security of the application. First, confidentiality is the degree to which a system ensures that data are accessible only to those authorized to have access. It is measured Excellent with a weighted mean of 4.48. Also, with a weighted mean of 4.48, the integrity of the application is deemed Excellent, which means the system can prevent unauthorized access to, or modification of, computer programs or data. Also measured as Excellent with a weighted mean of 4.26, the application is deemed accountable; meaning, the actions of an entity can be traced uniquely to the entity.

Overall, the system's security is Excellent with a total weighted mean of 4.41.

Table 15: Weighted Mean according to Portability of the Application

	Weighted Mean	Interpretation	Rank
Adaptability	4.64	Excellent	1
Installability	4.14	Very Good	2
Weighted Mean	4.39	Excellent	

Legend: 1.00-1.80-Poor; 1.81-2.60-Fair; 2.61-3.40-Good; 3.41-4.20-Very Good; 4.20-5.00-Excellent

The portability of the application is presented in Table 15. Specifically, its adaptability and installability. Adaptability means that the application can effectively and efficiently be adapted for different or evolving hardware, software or other operational or usage environments. It is evaluated as Excellent with a weighted mean of 4.64. On the other hand, an application's installability shows the software's

effectiveness and efficiency with which a product or system can be successfully installed and/or uninstalled in specified environment. With a 4.14 weighted mean, it is only measured at Very Good. The application's portability obtained a weighted mean of 4.39; therefore, the portability is Excellent.

Table 16: Summary of Weighted Means according to the Evaluation Categories

	Weighted Mean	Interpretation	Rank
Functionality	4.39	Excellent	2
Reliability	4.27	Excellent	5
Usability	4.31	Excellent	4
Performance Efficiency	4.00	Very Good	6
Compatibility	3.86	Very Good	7
Security	4.41	Excellent	1
Portability	4.39	Excellent	2
Total Weighted Mean	4.23	Excellent	

Legend: 1.00-1.80-Poor; 1.81-2.60-Fair; 2.61-3.40-Good; 3.41-4.20-Very Good; 4.20-5.00-Excellent

Based on Table 16, the application testers found the initial development of the software to be excellent; specifically, in terms of security, functionality, and portability. With a total weighted mean of 4.23, the development of the application is Excellent according to the standards set by ISO 25010:2023. While there are still minimal points to improve, this proves that the application is ready for use.

The implementation of an interactive wayfinding mobile application showed significant potential in improving campus navigation. Students, particularly newcomers, expressed relief at being able to quickly locate unfamiliar classrooms and offices. This aligns with the Gekas *et al.* (2023) ^[3], which states that mobile navigation tools significantly reduced user frustration and improved wayfinding efficiency in campus environments.

The integration of A Star(A*) algorithm with the campus map addressed the limitations of static maps and signage, especially in indoor areas where GPS signal weakens. Challenges encountered include occasional location inaccuracies due to GPS with the map being unable to track indoor areas. Additionally, the current system relies on an outdated floor plan, which may not reflect recent changes in room assignments or building layout, potentially affecting navigation accuracy. Liu, Wang, and Xu (2022) ^[8] stated that the algorithm of A* can be altered or improved so that instead of returning to the starting point when an obstacle is encountered, the algorithm suggests an alternative path to the designated end point.

The study emphasizes the value of user-centered design and real-time feedback in creating technological solutions for everyday problems within educational settings. Schools aiming to modernize their infrastructure and improve accessibility may benefit from adopting similar systems.

Conclusion

The Interactive Wayfinding System for the College Building of UPHSL represents a significant advancement in campus navigation technologies, offering an effective and user-centric solution to a long-standing problem.

By combining modern mobile technologies with intelligent routing algorithms and custom campus mapping, the system enhances orientation, reduces time lost due to misdirection, and promotes a smoother user experience across the university community. The implementation of such systems

has the potential to serve as a model for other institutions seeking to modernize and digitize their campus navigation infrastructure.

Future Directions

The future development of this software must incorporate the enhancement of indoor navigation capabilities such as the integration of Bluetooth, Wi-Fi triangulation, or AR markers as there is unreliability of the GPS performance in indoor use. Since the current application is only available in Android mobile operating systems, it is recommended that the application be available to iOS users to widen the user demographic.

It is expected for the application to be updated regularly. Updates must include improvements on the map accuracy, emergency alerts, and multilingual support. Furthermore, the application is still limited to the second floor of the College Building, which is a point of improvement to widen the coverage of the directory to include the third and fourth floors of the building.

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