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# RehlaTech: An E-Application to Serve the Needs of the Female Pilgrims and Visitors of the Sacred Mosque (Al-Masjid Al Haram)

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## رحلتك: تطبيق الكتروني لخدمة احتياجات المرأة الحاجة و المعتمرة في المسجد الحرام

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### الملخص

حملت رؤية المملكة 2030 قيم راسخة في خدمة الحجاج وتمكينهم من أداء مناسك الحج والعمرة والزيارة بشكل مريح وتعزيز رحلتهم الدينية وتجربتهم الثقافية. على الرغم من توفر عدد كبير من الدراسات والتطبيقات التي تهدف لتحسين خدمات الضيافة المقدمة للحجاج، إلا أن عدد الأبحاث التي تستهدف حل مشكلات المرأة خلال مواسم الحج والعمرة والزيارة محدود. قدمت معظم التطبيقات والأدبيات أنواعاً محددة من الخدمات، ولم تكن شاملة، كما أنها لم تأخذ بعين الاعتبار الاحتياجات والمشاكل الخاصة بالمرأة. في هذه الدراسة، قرر فريق البحث اقتراح تطبيق للهواتف المحمول باسم " رحلتك " -وهو الأول من نوعه- لمساعدة ضيفات الرحمن في أداء فريضة الحج والعمرة. يعتبر التطبيق المقترح استمراراً لجهود المملكة في تقديم خدمات عالية الجودة لضيفات الرحمن، وتعزيز دور المرأة، وتحقيق أهداف رؤية 2030. سيحتوي التطبيق على خمسة أنواع رئيسية من الخدمات: العامة، الشرعية، الصحية، الاجتماعية، الثقافية. بالإضافة إلى ذلك، سيتم توفير تقنية مميزة للنساء من تتبع رحلتهم خلال الحج والعمرة، لمساعدتهن في تسهيل التجربة الدينية، وذلك بالاعتماد على التقنيات الحديثة.

### Abstract

The Kingdom's Vision 2030 carries a solid value in serving the pilgrims and enabling them to perform Hajj, Umrah, and visitation comfortably and enhance their religious journey and cultural experience. Despite the significant number of studies and applications conducted to improve the hospitality services directed to pilgrims, the number of research focusing on solving women's issues during Hajj, Umrah, and visitation seasons is limited. Most applications and literature were not comprehensive and did not consider women's special needs and issues. In this study, a mobile application called "RehlaTech" is proposed to assist the female guests of Rahman in performing Hajj and Umrah duties. The proposed Application is considered a continuation of the Kingdom's efforts to provide high-quality services to female pilgrims, enhance women's roles, and achieve the goals of vision 2030. The app will contain five main types of services, public, religious, health, social, and cultural. In addition, a unique technology will be provided that will allow women to track their journey during Hajj and Umrah to help them facilitate the religious experience by relying on modern technologies.

**Keywords:** Smart Hajj; Smart Umrah; Women services; Interactive Map; Smart Guide mobile application.

## 1. Introduction

Over the past decades, The Kingdom of Saudi Arabia has harnessed its capabilities to serve the Sacred Mosque visitors and provide them with all possible comforts. With the development of technology, the Kingdom has exploited these technologies to upgrade its services, making serving the pilgrims one of the leading programs within the 2030 vision [1]. Despite the availability of many applications and studies that seek to develop the services of pilgrims, it became clear from searching the literature the limitation of research and applications focusing on solving women's issues during Hajj, Umrah, and visitation seasons. Therefore, we present in this study, "RehlaTech Application," to digitize the woman's needs based on findings of the previous study called "A Map of Women's Needs in the Hajj and Umrah System" [2]. RehlaTech Application will provide an intelligent and interactive guided journey to assist women in performing their rituals correctly and other features to facilitate ritual performance, such as the Tawaf and Sai auto counter, prayer times and Qibla, and translation of the guidance signs. In addition, the Application will also provide various articles and videos on religious, cultural, and health topics.

## 2. Literature Review

### 2.1 Related Work

Searching the iPhone and Android app stores, we identified 27 applications specialized in different services that support pilgrims; none were developed especially for women. Table 1 lists these applications, the type of service they provide, and the number of the supported languages of each application in addition to the proposed application "RehlaTech".

Searching the literature, we found several studies that proposed mobile applications to assist pilgrims by providing several services. E. Khan et al. [3] proposed the "Umrah E-Guide" application to help and instruct pilgrims in the Umrah by incorporating GPS Positioning and counting techniques, JSON protocol, and get Location function. H. Majid et al. [4] proposed an application system called "HAJJRAH" to solve common problems pilgrims face while performing the "Manasik" of Hajj and Umrah. The market analysis provided by the study showed that the features provided by the proposed application handle the common issues encountered by most pilgrims. A. Shaout, and S. Khan, [5] proposed an interactive guide to Hajj as an iOS application called "AlHajj." The app uses an interactive map to help users comprehend the Manasik of Hajj and provides each duty's locations and dates. M. A. Abdelazeez and A. Shaout [6] proposed a mobile translation application to help pilgrims communicate with each other using various languages and perform their duties accurately. The proposed system uses SMS as a method of communication with the server.

### 2.2 Limitations of the Current Studies

Based on this related work, most studies and applications offered specific types of services, were not comprehensive, and did not take into account the special needs and issues of women. In addition, no study or application was specifically designed to serve the female guests of the Sacred Mosque. Therefore, it is essential to develop an application to serve "Diyfat Al-Rahman" that considers their unique needs.

**Table 1.** Summary of related works.

Application	Types of Services				# of Language	Application	Types of Services				# of Language
	General	Religious	Health	Social & Cultural			General	Religious	Health	Social & Cultural S	

Hajj App [7]		✓	✓		1	الرفيق الذكي [21]		✓			2
التطوع الصحي [8]			✓		2	مناسك [22]		✓		✓	4
Al Maqsad [9]	✓				6	Arafat Sermon [23]		✓			11
تروية [10]	✓				7	Hisnii [24]		✓			3
Hajj Navigator [11]	✓				8	الحج ثلاثي الأبعاد [25]		✓			2
Hajj & Umrah Assistant [12]		✓			2	Ibaada [26]		✓			3
نظافة مكة [13]	✓				2	Muslim 3D [27]		✓			2
Miraj 360 [14]	✓				5	Sanar [28]			✓		2
Turjuman [15]	✓	✓		✓	15	أسعفني [29]			✓		9
عمرة البدل [16]	✓				2	Seha [30]			✓		6
Tawkeel [17]					5	Sehhaty [31]			✓		2
Nusuk [18]	✓				2	Zearh [32]			✓		2
المطوف [19]	✓	✓		✓	2	AlHaramain [33]	✓	✓	✓		5
Manasikana [20]	✓	✓	✓		7	RehlaTech	✓	✓	✓	✓	1

### 3. Methodology ( Materials and methods )

For the planning and development of the application, the researchers employed the waterfall development methodology. This sequential approach divides the project stages into successive sections so that each stage depends on the outputs of the previous stage [34]. The proposed method comprises six main phases: requirement identification and analysis, design, development, testing, deployment, and maintenance. The steps of the application methodology are illustrated in Figure 1.

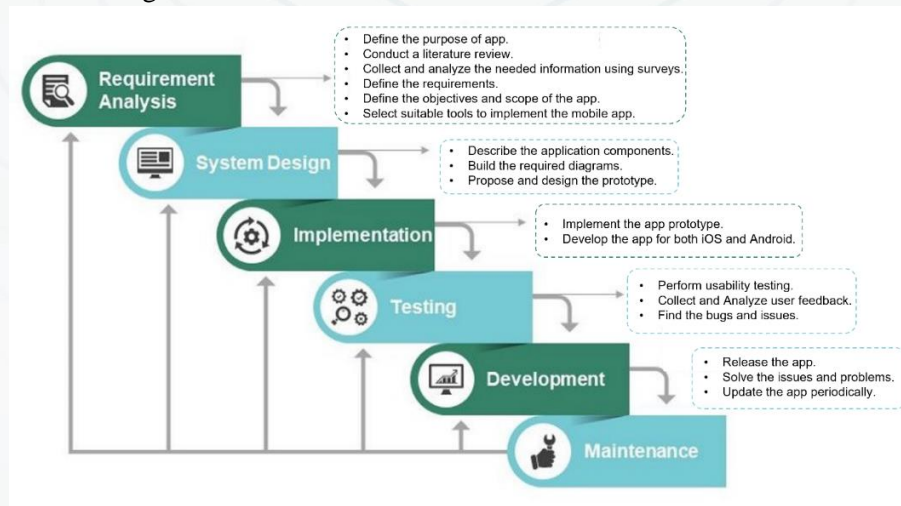


Figure 1. The steps of the methodology.

#### 3.1 Requirement and Analysis

The main objective of the proposed application is to assist and guide women throughout their journey and make it much more pleasant, easier, and safer. In order to achieve these objectives and ensure the value of the proposed services, the researchers designed a questionnaire consisting of 21 questions that target women to find their needs and measure the quality of services provided to them during the Hajj and Umrah seasons. The survey questions focused on five main types of services: public, religious, health, cultural, and social. The researchers analyzed the questionnaire results to determine the most important services the RehlaTech application can provide. Table 2 lists each question with its rank based on the answers.

**Table 2.** Questions and results of the Questionnaire.

Rank	Yes%	Scope	Question
1	91%	Health	Do you read health text messages (SMS) during the Hajj season and benefit from them?
2	88%	Religious	Do you prefer to communicate with a legal mufti through an application?
3	86%	Social and Cultural	Do you prefer to have organizers from the women's section when you arrive, during your stay, and until the completion of the "Manasik"?
4	86%	Health	Is there a gynecologist in the campaign?
5	82%	Health	Would you prefer a consultation with a specialized doctor using an application?
6	80%	Health	Do you need an application that provides instant first-aid instructions for emergency cases?
7	78%	Social and Cultural	Do you prefer to register for organized trips to visit historical sites and cultural and civilizational centers in Makkah and Madinah using an application?
8	78%	Social and Cultural	Do you prefer to order local souvenirs made in Saudi Arabia using an application?
9	76%	Health	Do you need to know which hospitals and health centers provide immediate medical care in an emergency?
10	68%	Religious	Are there enough applications that provide guidance and awareness of religious rituals in your language?
11	65%	General	Have you ever used an application to reserve housing units?
12	62%	General	Have you ever used an application to book public or private transportation services?
13	55%	General	Do you need an application to book services for the elderly and people with special needs?
14	54%	Religious	How many applications on your phone provide Quran, Duas services, and others?
15	48%	Health	Do you follow a special diet for a health condition?
16	45%	Religious	Does it embarrass you to ask legal mufti directly about your private issues?
17	38%	Health	Do you use health applications during the Hajj and Umrah season?
18	35%	General	Do you need an application to facilitate communication with others because of the language difference?
19	29%	General	Do you need an application to translate signboards?
20	22%	Religious	Do you use an application that includes a link to the Sharia rulings for women?
21	09%	Health	Do you have any medical conditions?



### 3.2 Application Design

The project's scope focuses on building a centralized platform for females who seek religious travel; by providing interactive content, general content, and direct communication; to guide them during the Hajj and Umrah seasons. The application will focus on five main types of services including public, religious, health, social, and cultural, as mentioned in Table 3.

**Table 3.** Application services.

Service	Details	
Interactive Content	<ul style="list-style-type: none"> <li>The main feature of the application, called "Smart Hajj / Umrah Journey," enables women to learn about Hajj or Umrah procedures and view them through an interactive map. The map allows women to view religious rites and know what to do at each stage according to time and place. In addition, we will support their journey by providing many widgets, such as prayer times and Qibla, Tawaf and Sai auto counter, and translation of the guidance signs.</li> </ul>	
General Content	Religious Services	<ul style="list-style-type: none"> <li>Provide indicative religious content.</li> <li>Provide links to Sharia rulings for women.</li> </ul>
	Health Services	<ul style="list-style-type: none"> <li>Provide health awareness content.</li> <li>Health Awareness through notifications.</li> <li>Directory of hospitals and health centers with contact numbers and geographical locations.</li> </ul>
	Social and Cultural Services	<ul style="list-style-type: none"> <li>Provide a list of stores specializing in souvenirs made in Saudi Arabia.</li> <li>Provide a service for tourism companies to organize trips for those interested in visiting religious and heritage monuments.</li> <li>Opening the field of volunteering and seasonal jobs.</li> </ul>
Direct Communication	Religious and Health Services	<ul style="list-style-type: none"> <li>Provide an e-service that enables women to inquire about all religious questions and fatwas and health consultations by live agents.</li> </ul>

#### 3.2.1 Application Components

The application consists of six main components, as illustrated in Figure 2:

##### A) The Mobile Application

The application provides various information that will support women during their journey, including interactive widgets, such as the Tawaf and Sai auto counter, prayer times and Qibla, and translation of the guidance signs. In addition, integration with third-party applications such as Google Maps, Google Translate to be a one-stop shop for women. Furthermore, there will be a different way of communicating with women using live chat, and agents will be assigned according to the categories and languages. The application will also provide a guide for women through articles and videos in several areas, such as health, social, religious, and other general information.

##### B) Content Management System

A content management system (CMS) is a system that manages the content and builds an interactive environment. It allows users to create, manage, and modify digital content without requiring specialized technical knowledge [35]. The proposed application relied on CMS to add articles and visual information such as health, religious, and social-cultural articles. As a result,

this system is dynamic and supports adding different topics and categories in different languages. There will also be a moderator to monitor digital content and regulate women's comments in the application.

### C) Customer Support System

A customer support system is a set of practices and procedures to assist customers with questions or service issues. Customer support can be conducted via multiple channels, including phone, email, or live chat. Based on our statistics from the previous questionnaire, women face embarrassment when they inquire about their health or religious questions. Therefore, agents of health practitioners and religious scholars were assigned to answer their questions directly through a live chat according to the chosen category and language.

### D) Admin Panel

An application manager is responsible for creating the basic structure, reviewing and managing content, communications between agents and women, application operations and users, and displaying complete information in the dashboard to monitor KPIs.

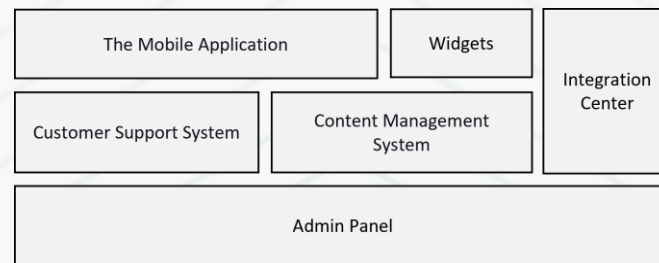


Figure 2. The diagram of main application components.

### 3.2.2 Application Process Flow

Figure 3 shows the flow chart of the application to give a brief idea of how the system works for the administrator, content creator, customer support, and the customer (female pilgrims).

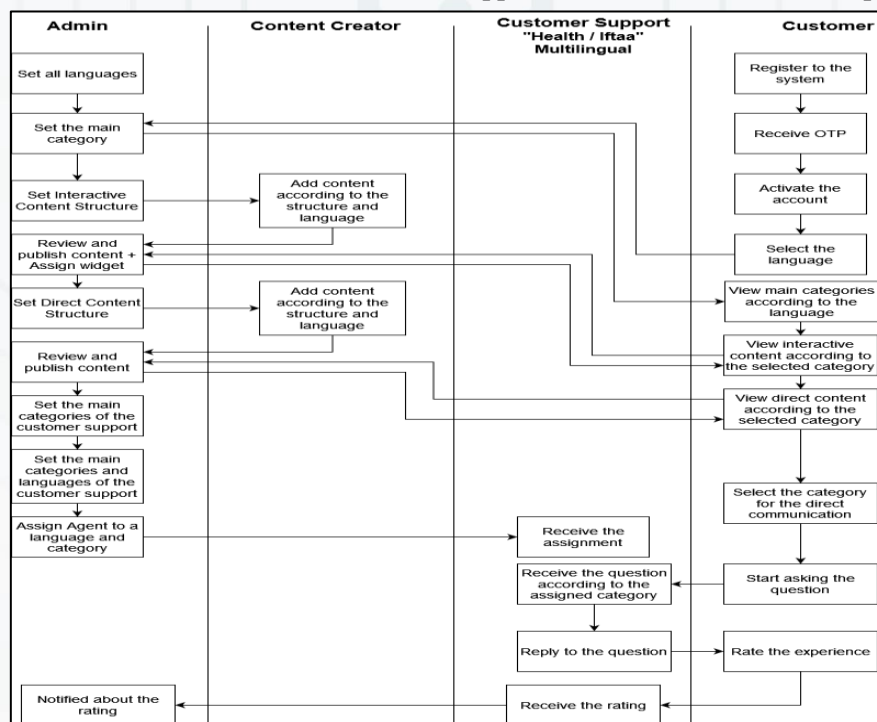
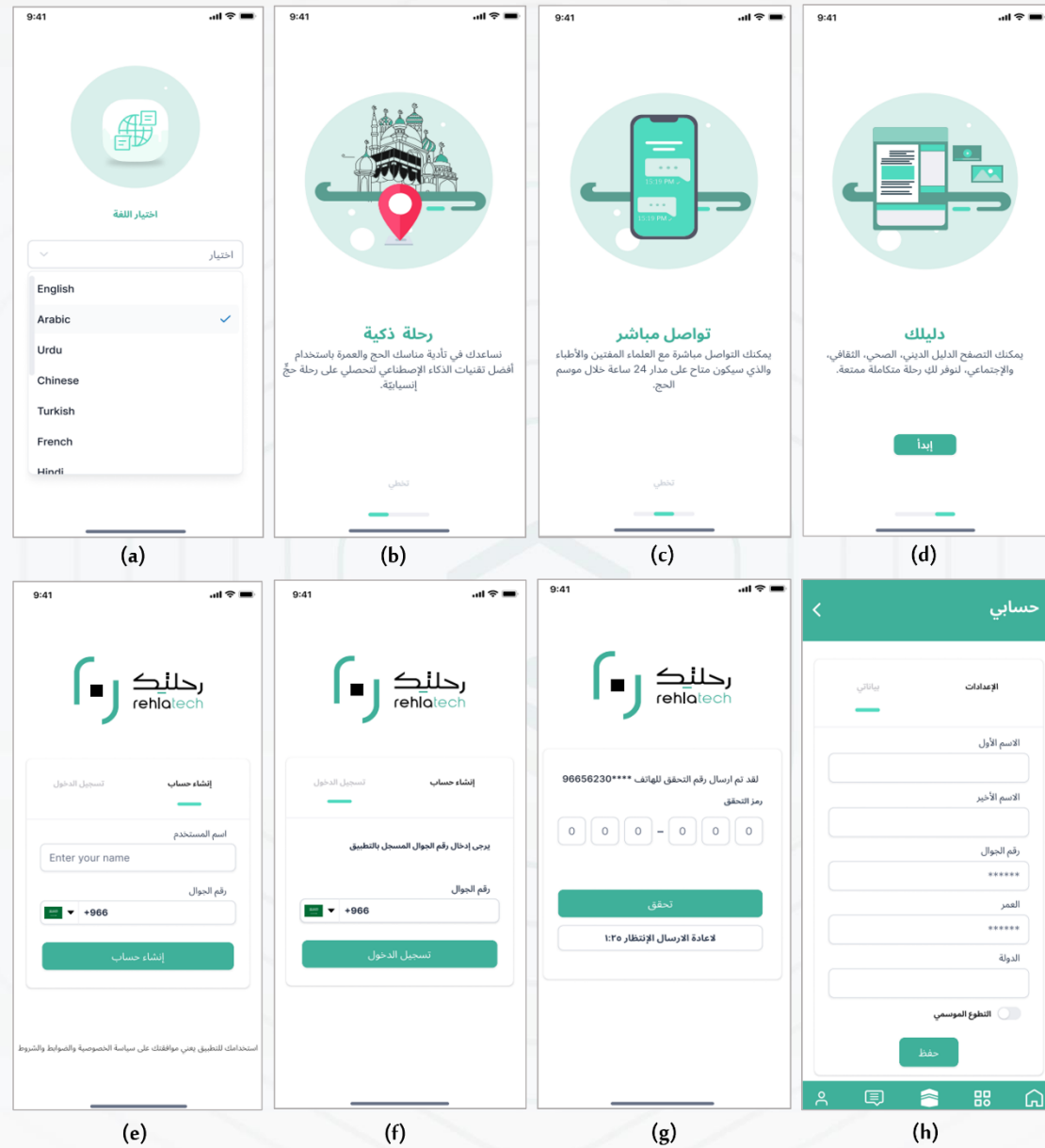


Figure 3. Users process flow diagram.

### 3.2.3 Application Prototype

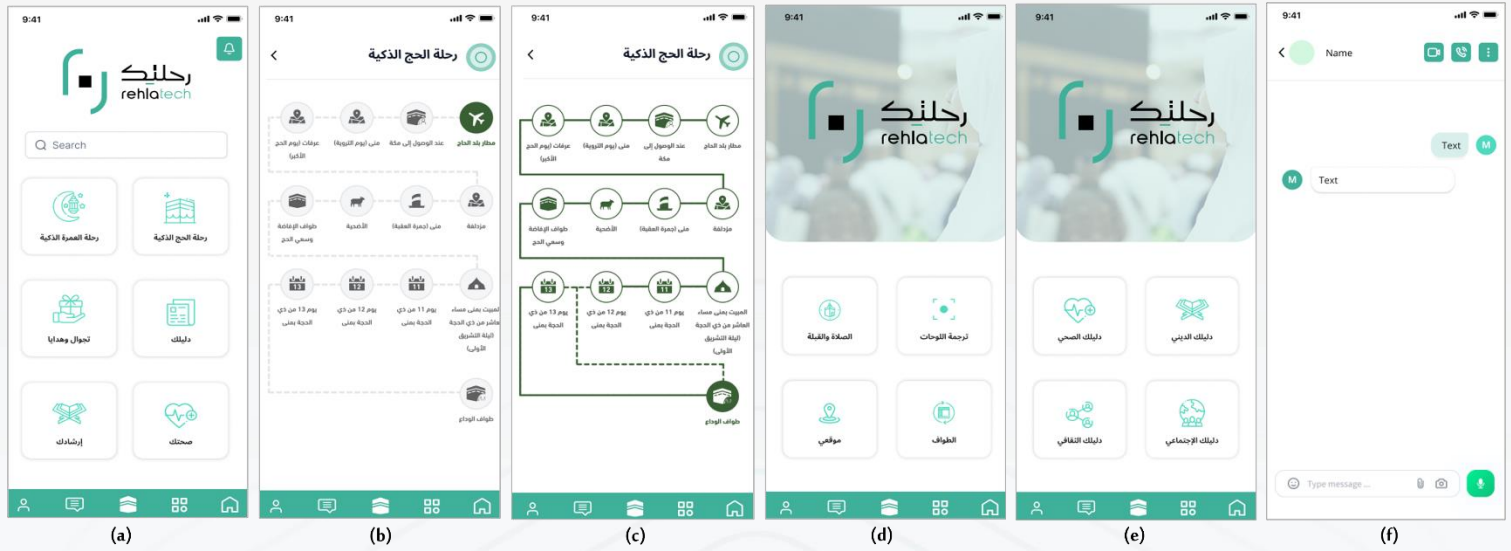
The RehlaTech application consists of effective and easy-to-use user interfaces to make the users' experience easy and intuitive. The interfaces are designed using the Figma platform. As shown in Figure 4, the app starts by displaying the splash screen, allowing the user to select a language and view screens that describe app features. Then, all users will be required to input their username and phone number to create an account and receive an OTP to validate. All users must input their phone numbers to log in. On the profile page, the users can update their personal information.



**Figure 4.** Registration/Login/ Profile Interfaces (Arabic Language Version).

Figure 5 shows different interfaces where the user can navigate between all types of content, including interactive content with widgets, general content, and direct communication. For more details about the types of content, see Table 2.





**Figure 5.** Contents Interface (Arabic Language Version).

### 3.3 Application Implementation

The RehlaTech app supports iOS and Android devices, and the first version is available in English. The app was developed using the PHP programming language through the Laravel framework, and Flutter was used for both the iOS and Android mobile apps. Additionally, Firebase was used for OTP to verify users. In the test phase, the application was validated to ensure that each feature functions correctly using an APK emulator for the Android version and TestFlight for the iOS version. The application will be ready for deployment once the final feedback is received. Then the application will be published in the Apple store and Google Play store. As for the maintenance phase, which is a never-ending process, feedback will be collected periodically from users, and necessary changes will be implemented in the form of bug fixes or enhancements.

## 4. Conclusions

This paper proposed the RehlaTech app, a mobile application designed primarily for women to meet their needs during Hajj and Umrah and their visitation to the Sacred Mosque and Sacred sites. Through the research and literature review, we could not find any application explicitly designed for women to fulfill their special needs and assist them in Hajj and Umrah. The features and services considered to develop the RehlaTech application were selected based on the previous study entitled "A Map of Women's Needs in the Hajj and Umrah System". The primary services were divided into five categories: public, religious, health, social, and cultural services. This study also aims to contribute to the research community by providing the results of using the proposed application. These results reflect the viewpoint of the women who use the application and define the proposed solutions to the problems encountered by women during the Hajj, Umrah, and visitation.

### 4.1. Future Work

- Conduct a study to survey women's opinions in the prototype version of the application to determine whether there are emerging needs or requirements for women in these religious seasons through a usability study.
- Utilize Augmented Reality (AR) services to make it easier for women to track people and locations as they can see buildings and the streets from their point of view in real-time using a mobile camera.
- Utilize Virtual Reality (VR) to help educate the pilgrim about the religious rituals and allow them to experience the entire pilgrimage virtually.



- Utilize VR to introduce the historical religious sites and the civilized projects in Mecca and Highlight the Kingdom's efforts in serving the guests of the Sacred Mosque.
- Support new languages.

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