WarisApp: An Android Application for Islamic Inheritance Shares Calculation

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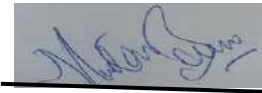**Fatima Jinnah Women University, Rawalpindi Campus**

Certification

This is to certify that **Izza Yaqoob**, **2019_BSE_013, Soma Karim, 2019_BSE_029** and **Khadija Amjad Abbasi, 2019_BSE_036** have successfully completed the final project **WarisApp: An Android Application for Islamic Inheritance Shares Calculation,** at the **Fatima Jinnah Women University Rawalpindi,** to fulfill the partial requirement of the degree **BSE.**

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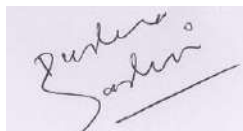
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WarisApp: An Android Application for Islamic Inheritance Shares Calculation

<u>**Sustainable Development Goals**</u>

SDG No	Description of SDG	SDG No	Description of SDG
SDG 1	No Poverty	SDG 9	Industry, Innovation, and Infrastructure
SDG 2	Zero Hunger	SDG 10	Reduced Inequalities
SDG 3	Good Health and Well Being	SDG 11	Sustainable Cities and Communities
SDG 4	Quality Education	SDG 12	Responsible Consumption and Production
SDG 5	Gender Equality	SDG 13	Climate Change
SDG 6	Clean Water and Sanitation	SDG 14	Life Below Water
SDG 7	Affordable and Clean Energy	SDG 15	Life on Land
SDG 8	Decent Work and Economic Growth	SDG 16	Peace, Justice and Strong Institutions
		SDG 17	Partnerships for the Goals

	Range of Complex Problem Solving		
	Attribute	**Complex Problem**	
1	Range of conflicting requirements	Involve wide-ranging or conflicting technical, engineering and other issues such as screen size of the mobile application, device orientation, user behavior, content hierarchy, and accessibility.	
2	Depth of analysis required	Have no obvious solution and require abstract thinking, originality in analysis to formulate suitable models.	
3	Depth of knowledge required	Requires research-based knowledge much of which is at, or informed by, the forefront of the professional discipline and which allows a fundamentals-based, first principles analytical approach.	
4	Familiarity of issues	Involve infrequently encountered issues	
5	Extent of applicable codes	Are outside problems encompassed by standards and codes of practice for professional engineering.	
6	Extent of stakeholder involvement and level of conflicting requirements	Involve diverse groups of stakeholders with widely varying needs.	
7	Consequences	Have significant consequences in a range of contexts.	
8	Interdependence	Are high level problems including many component parts or sub-problems	
	Range of Complex Problem Activities		
	Attribute	**Complex Activities**	
1	Range of resources	Involve the use of diverse resources (and for this purpose, resources include people, money, equipment, materials, information and technologies).	

2	Level of interaction	Require resolution of significant problems arising from interactions between wide ranging and conflicting technical, engineering or other issues.	
3	Innovation	Involve creative use of engineering principles and research-based knowledge in novel ways.	
4	Consequences to society and the environment	Have significant consequences in a range of contexts, characterized by difficulty of prediction and mitigation.	
5	Familiarity	Can extend beyond previous experiences by applying principles-based approaches.	

Abstract

Inheritance property calculation and distribution is the most crucial and complex part of Islamic Jurisprudence, aimed at preserving the integrity of society. Current automated systems for Islamic Inheritance Calculation often produces incomplete and fractional results; hard to be interpreted and understood by the user. In addition, the user interface of the current automated platforms is also very complicated and language specific (mostly Arabic or Malay). There is no gender inequality in Islam, while distributing the inheritance shares. But unfortunately, despite of the Islamic principles and State Laws of Pakistan, women of rural areas of Pakistan are unable to get their fair inheritance rights, due to many customary and traditional norms.

Thus, the proposed solution is in the form of an Android based application built on Flutter framework. It aims to help the Muslims (especially of Pakistan), to accurately compute the inheritance shares of the heirs in currency, with user-friendly interface and bilingual (English/Urdu) support. The proposed system also aims to help the people of Pakistan (especially women) for claiming their legacy rights, given to them by their Religion.

Using the proposed system (WarisApp), users can calculate inheritance shares of the heirs in amount, on the basis of Islamic Inheritance Rules, entered asset values and heir data. By using a complaint option incorporated in WarisApp, a person can complaint to regulatory body i.e. Admin, to claim the legacy rights. The complaint module of the application has two sections, one for Admin and one for the user. Both, the Admin and the User, need to login the system to access their distinct complaint panels. In User Complaint Panel, a user can file a new complaint to Admin or can check the previous complaints status. While in Admin Panel, an Admin can view new user complaints and can change the status of the complaints after resolution. An Admin can delete the resolved complaints automatically, through the interface of WarisApp. WarisApp produced an accurate result in terms of inheritance shares calculation. It also integrated multiple security layers in complaint module including user login verification and 2-step verification process for Admin. In future, different concerns like fetching family tree of a person from NADRA's database and inheritances shares calculation for other religions, can also be integrated in the system.

Keywords: WarisApp; SDLC; NADRA; Faraid; Rapid Application Development Model; Graphical User Interface; Object Oriented Programming and Flutter

Undertaking

I certify that the project **WarisApp: An Android Application for Islamic Inheritance Shares Calculation** is our own work. The work has not, in whole or in part, been presented elsewhere for assessment. Where material has been used from other sources it has been properly acknowledged/ referred.

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Acknowledgement

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List of Acronyms

OS   Operating System

CNIC   Computerized National Identity Card

SDLC   Software Development Lifecycle Approach

OS   Operating System

CNIC   Computerized National Identity Card

SDLC   Software Development Lifecycle Approach

LRMIS   Land Revenue Management Information System

NADRA   National Database and Registration Authority

DFD   Data Flow Diagram

PDL   Program Description Language

OOP   Object Oriented Programming

UML   Unified Modeling Language

RAD   Rapid Application Development

USM   University of Science Malaysia

GUI   Graphical User Interface

OTP   One Time Password

WarisApp   An Android Application for Islamic Inheritance Shares Calculation along

with a complaint module

Chapter 1

1.1   Introduction

When a person dies, the property of the owner is transferred to its heirs known as Mawaris [3] according to the rules defined in Surah Al-Nisa verses 7, 11, 12 and 176. For the social integrity and prosperity, Islamic Inheritance Law's understanding and knowledge is necessary and Hazrat Mohammad (P.B.U.H) himself said:

"**Learn the Inheritance Laws (Al-Faraid) and teach them to the people, for they are part of half of the knowledge of Islam, but is the most neglected part.**" (Sunan Ibn Majah, Book 18, Hadith 2618) [4]

Hazrat Mohammad (P.B.U.H) warned the Muslims, not to neglect this knowledge by saying:

"**Learn Inheritance (Faraid) knowledge and teach it to others. I will die, this knowledge will die and will have chaos. So when the two clashed for the estate, they could not find anyone who can solve their cases.**" (Hadith narrated by al-Hakim from Ibnu Mas'ud) [2]

With the advent of Internet, every aspect of life is shifting towards the automation. The technological advancements are being utilized to promote and spread the religious knowledge as well. Islamic Inheritance Calculation knowledge is not easy to understand and apply. Thus, the human error rate is quite high, while doing the manual inheritance shares calculation. So, it is better to develop an automated system using emerging technological paradigm like Flutter, with upgraded programming practices like OOP, for the calculation of inheritance shares of the heirs according to the Islamic rules.

Moreover, Pakistan is a Muslim majority country with the population ratio of male (51.5%) and of female (48.5%) according to the census of 2022 [17]. Population living in urban areas of Pakistan is 37.8% and the population living in rural areas is 62.2%, according to the updates of 2022 [17]. As per mentioned figures, it is clear that the majority of the population of Pakistan lives in the rural areas where women are almost equal in number as men. But when it comes to the inheritance property rights, women become subordinate to men.

Islamic Inheritance Law has defined distinct inheritance shares for the women in the property, to make them financially strong and confident. Despite the inheritance rights given to them by

Islam and Constitution of Pakistan, its refutation is still persistent in the rural areas of Pakistan [8]. Different researches have been conducted [8]-[13] to explore the practices followed in Pakistan while the distribution of inheritance property and the position of women inheritance rights in the rural areas of Pakistan. It has been seen that women in the rural areas of Pakistan are not that much educated and there are a lot of misconceptions about the dowry rights and the inheritance rights in those areas. Women were taught to consider dowry as their inheritance right, which is not correct [8]. It was further revealed that gender discrimination exists both in the domestic and institutional circles of Pakistan [11].

Islamic Law and the Constitution of Pakistan allows women to get their fair share from the property but the Laws got suppressed by the customs and traditions, followed in different provinces of Pakistan. Mostly, women do not demand their inheritance rights to maintain their relationship with the parental family. They waive off their property rights in the favor of their brothers [9]. Sometimes, the slow investigation process (when women claim the rights) by the Regulatory bodies also becomes the lead factor to hinder the women in getting their due property rights [13].

Keeping in view the above issues and the technological solution asked by the researchers of article [8], there is a dire need to develop an Application, which can automatically compute the Inheritance Shares of the heirs along with the aid of filing Complaint. The proposed system is an Android-based Application named as WarisApp. It will compute the Islamic Inheritance Shares of the heirs and integrate a Complaint module to help people in claiming their legacy rights. The proposed system will be implemented using the OOP programming paradigm with new technology such as Flutter, to address the above targeted problems.

1.2   Statement of the problem

Though Islamic inheritance calculation system is somehow automated, yet is unable to compute the inheritance shares of the heirs accurately and mostly gives the heir's share in the fractional form. User interface of the currently automated platforms for Islamic inheritance calculation, is also complicated. Moreover, while inheritance property distribution, women of Pakistan face many issues in claiming their inheritance rights, due to traditional and customary practices. Women of Pakistan mostly remain deprived off their inheritance rights.

1.3 Goals/Aims & Objectives

This study aims to aid the Muslims, in computing the inheritance shares of the heirs automatically and to help the people of Pakistan (especially women) in getting their true legacy rights. Following objectives were set to achieve the aim of the research:

- To develop an Android based application using Flutter framework, for the calculation of inheritance shares of the heirs according to Islamic Jurisprudence
- To tailor a complaint module in the application, in which a user can file a complaint to regulatory body (Admin), responsible for resolving such issues
- To develop an interface of the App, in such a way that it can be easily interpreted and used by any person

1.4 Motivation

The purpose of Islamic Inheritance Calculation System project is to provide a convenient and accessible platform for Muslims, to understand and calculate the inheritance shares of the heirs in accordance with Islamic Law. It eliminates the need for manual calculations or seeking professional assistance, making the process more accessible and convenient for users. Islamic inheritance calculations can be complex, involving various rules, shares, and relationships between heirs but the proposed system will help the users to avoid errors, miscalculations, and disputes that may arise from incorrect calculations. This will also allow users (of Pakistan) to file a formal complaint if they do not get their shares in the property. Overall, WarisApp aims to provide an accessible and comprehensive tool for Muslims to understand and calculate the inheritance shares in accordance with Islamic Law along with the aid of claiming their inheritance rights.

1.5 Assumption and Dependencies

It has been assumed that the users of the system have a basic understanding of Islamic inheritance principles and are seeking to calculate inheritances in accordance with those principles. The system depends on accurate and up-to-date information provided by the users, including details about assets and family relationships. The system assumes a stable and secure

operating environment, including a compatible Android device with an appropriate version of the Android operating system.

1.6   Methods

Our application WarisApp, is developed on Rapid Application Development (RAD) SDLC approach, as it facilitates the software developers to quickly develop and deliver quality applications along with the customer satisfaction. Characteristics like Parallel development facility, user involvement, requirements changing flexibility, high software quality and quick prototyping makes RAD, a best model to be used in the development of WarisApp.

RAD method consists of four phases [1] [16]:

1) Requirements Planning (identifying the project scope)
2) User design (designing and developing the application interface)
3) Construction (creating a workable application)
4) Implementation (optimizing and delivering the product)

1.7   Report Overview

This thesis is consisted of five sections;

- **Section 1:**
  This chapter aims to highlight the importance of inheritance calculation in Islamic Jurisprudence and the condition of inheritance rights for women in Pakistan. Basically, this section of thesis describes an overall introduction of the project including the problem statement, its solution and overall aims and objectives of the proposed solution

- **Section 2:**
  This section describes the overall review of all the studies completed for the research purpose in the project

- **Section 3:**
  This section of the thesis is about the SDLC approach used in the application development. All the phases of SDLC model chosen, i.e. requirements (functional and non-functional), design (Architectural and detailed), implementation and testing phases are thoroughly discussed in this section

- **Section 4:**

  In this section, final results of the product are discussed and communicated

- **Section 5:**

  This section covers the conclusion part of the project and the recommendations that need to be added in the system in the future

Chapter 2

2.1 REQUIREMENTS PLANNING

In this phase, all the functional and non-functional requirements of the system are gathered. System will be designed and implemented complying the requirements stated.

2.1.1 Problem Statement

Our society (Pakistan) is facing major issues regarding the fair distribution of property shares among family members, especially women. Also, the current Islamic inheritance calculation systems are unable to compute the inheritance shares of the heirs accurately and mostly gives the heir's share in the fractional form. User interface of the currently automated platforms for Islamic inheritance calculation, is also complicated.

2.1.2 Motivation

The purpose of Islamic Inheritance Calculation System project is to provide a convenient and accessible platform for Muslims, to understand and calculate the inheritance shares of the heirs in accordance with Islamic Law. It eliminates the need for manual calculations or seeking professional assistance, making the process more accessible and convenient for users. Islamic inheritance calculations can be complex, involving various rules, shares, and relationships between heirs but the proposed system will help the users to avoid errors, miscalculations, and disputes that may arise from incorrect calculations. This will also allow users (of Pakistan) to file a formal complaint if they do not get their shares in the property. Overall, WarisApp aims to provide an accessible and comprehensive tool for Muslims to understand and calculate the inheritance shares in accordance with Islamic Law along with the aid of claiming their inheritance rights.

Purpose of Software Requirement Planning and Specification section, is to give the detailed description of system's functional as well as non-functional requirements.

2.1.3 Product Scope

The Islamic Inheritance Calculation System is a software solution that aims to assist users in accurately calculating Islamic inheritance distribution according to Sharia law. The application provides a user-friendly interface for inputting relevant information and generates comprehensive report outlining the distribution of assets based on Islamic inheritance rules.

The scope of an Islamic inheritance calculation system can be defined by considering various aspects and functionalities.

The application provides comprehensive information about Islamic inheritance laws, including explanations of key concepts, rulings, and guidelines. Users are able to input their assets, debts, and liabilities, along with their respective values. The core functionality of the application involves an accurate inheritance calculation based on the entered data and the application will generate clear and detailed report showing the distribution of inheritance shares among the heirs. The application will have an intuitive and user-friendly interface, with clear instructions and prompts for entering data and understanding the calculations. Moreover, complaining module of the system will help the people of Pakistan, whose inheritance shares are not given to them by their families or relatives, to claim their legacy rights.

2.1.4   Overall Description

This section will provide a comprehensive understanding of the software product, setting the stage for a more detailed exploration of its features, benefits, and implementation considerations.

2.1.5   Product Perspective

Islamic Inheritance Calculation System eliminates the need for manual calculations or seeking professional assistance, making the process more accessible and convenient for users. Users can ensure that their distribution of wealth aligns with Islamic principles through this application.

Calculating inheritance shares accurately can be complex, as it involves various factors and relationships between heirs. This Calculation System designed specifically for Islamic inheritance would provide accurate and consistent calculations, minimizing the chances of errors or misinterpretations that can lead to disputes among family members. Moreover, Islamic Inheritance Calculation System provide ease to file complain for the people, who are not getting their proper shares in property and ensures that their complaint will be resolved as soon as possible.

1. Product Functions

The main functions of the WarisApp are listed below, which makes the system more user-friendly and more appealing:

- **User Registration and Authentication:**

  The application will provide user registration functionality. Users will be able to create an account using their credentials including email address and phone number etc. The application will authenticate users to ensure secure access to the system.

- **Asset Handling:**

  The application will allow users to input their assets for inheritance calculation. Assets will include various types such as cash, house, stocks, jeweler, vehicles and other possessions. Liabilities of the deceased will be deducted from the assets and the left amount will be distributed among the heirs.

- **Inheritance Shares Calculation:**

  The application will implement the rules of Islamic inheritance calculation based on user inputs (heirs and property assets). The application will consider the user's assets, family members, and their respective entitlements. The calculation will adhere to Sharia principles, considering factors such as the presence of male and female heirs, degree of kinship, and other relevant guidelines.

- **Shares Distribution Report:**

  The application will display a report of every heir's share, after completing the inheritance calculation. Report will include a summary of the inheritance distribution and individual shares for each heir in fix amount, not in percentage.

- **Localization:**

  The application will support multiple regions support for inheritance calculation. Users (Muslims) from every region all over the world, can easily access and calculate their shares.

- **Complaint Module:**

  This application will provide a complain module for users to file complaints, when they face issues regarding the inheritance property distribution. Users will also be able to see their previous complaints status. But this module will only be implemented for

the residents of Pakistan. Complaint module will be further divided into Admin and User categories, enabling them to perform their tasks in a separate environment, as Admin is responsible for complaint resolution and the user is for filing a complaint.

- **Documentation:**

  The application will provide a full documented section of rules (in the side bar) about inheritance calculation according to the Islamic Jurisprudence.

- **Bilingual Support:**

  The application will incorporate the language switching option, allowing users to change the language of the application to their preferred one.

- **Ahadith related to Faraid:**

  The application will provide different Ahadith about the importance of Inheritance Shares Calculation and Division in Islam.

- **Admin Section:**

  The application will provide a separate section for Admin of the system, who can be the authorized administrators or system administrators, overseeing the management and operation of the application. Two factor verification process will be integrated for Admin login, as for the security purposes.

- **Logout:**

  Once a User or an Admin login to his/her account, he/she will logout from their account. This will ensure that the sessions are properly terminated, and unauthorized access is prevented after logging out.

2. User Classes and Characteristics

The users of an Islamic Inheritance Calculation System with a Complaint Module (WarisApp) can include individuals or organizations that require accurate calculations and distribution of assets according to Islamic Sharia, and the people seeking help from administrative authorities in getting their legacy rights. Here are some potential users of the system:

- **Individuals:**

  Muslims who want to ensure that their assets are distributed correctly among their heirs, based on Islamic Inheritance Laws. Individuals who are acting as executors of an estate and need assistance in calculating and executing the inheritance distribution. People who want to plan their estate and understand how their assets will be distributed among their family members. Users of Pakistan (especially women), who remain deprived off their inheritance rights due to any hindrance.

- **Lawyers and Legal Professionals:**

  Lawyers specializing in Islamic law who require a reliable tool to calculate and document the inheritance distribution for their clients. Legal professionals involved in probate and estate administration, who need to accurately determine the shares of heirs under Islamic inheritance rules.

- **Human Rights Commission of Pakistan's Professionals:**

  Professionals or individuals of the organization like Human Rights Commission of Pakistan, who provide help to the people of Pakistan for claiming and attaining their legal rights.

- **Islamic Scholars and Advisors:**

  Islamic scholars who provide guidance on matters related to Islamic inheritance and need a tool to support their counseling and advice.

3. *Operating Environment*

The Islamic inheritance calculation system will operate within the Android operating environment, targeting Android OS versions 5.0 Lollipop and above. It requires a compatible Android device with sufficient processing power, memory, and storage to run the application smoothly. The system relies on the Android framework, utilizing its libraries and APIs for user interface rendering, data storage, and network communication.

4. *User Documentation*

The user documentation for the Islamic inheritance calculation system provides comprehensive guidance on how to effectively utilize the application. It includes step-by-step instructions on user registration, profile creation, asset management, and calculation, filing a complaint and other application's functions. The documentation outlines the process of initiating the inheritance calculation, inputting assets, and filing complain. It aims to provide users with the

knowledge and understanding, necessary to navigate the system effortlessly and to accurately compute the inheritance shares.

5. *Assumptions and Dependencies*

It has been assumed that the users of the system have a basic understanding of Islamic inheritance principles and are seeking to calculate inheritances in accordance with those principles. The system depends on accurate and up-to-date information provided by the users, including details about assets and family relationships. The system assumes a stable and secure operating environment, including a compatible Android device with an appropriate version of the Android operating system.

2.1.6 External Interface Requirements

1. *User Interfaces*

The user interface for the Islamic Inheritance Calculation System mobile application is designed to be intuitive, user-friendly, and facilitate smooth navigation.

- The application provides a clear and accessible login and registration screen where users can enter their credentials or create a new account (when a user needs to file a complaint or to view the list of complaints in case of Admin)

- Upon application launch, present users with a visually appealing and informative dashboard or home screen. This screen will display essential information, such as different religions calculation options, complaint option, setting, documentation of Islamic Inheritance Rules, Ahadith related to Faraid and more

- The application has an intuitive interface for users to input their assets and provide options to categorize assets, such as cash, house, stocks, jewelry, vehicles etc., and allow users to enter the corresponding values

- The application has a user-friendly family management feature where users can add family members and allow users to define relationships and specify personal information for each family member

- The application has a logical and guided workflow for users to initiate the inheritance calculation process. Break down the steps into easily understandable sections, prompting users to input required data, such as assets and family members, as per the Islamic inheritance rules

- Application provide a clear and comprehensive report feature that displays the calculated inheritance distribution in fix amount. Include individual shares for each heir and present the information in a visually appealing and easily understandable format of fix amount

- The application ensures that the user interface follows mobile design principles, uses clear and concise labels, employs appropriate colors and fonts for readability, and provides intuitive navigation through menus, buttons, and gestures

2. Hardware Interfaces

The hardware interface for the Islamic Inheritance Calculation System mobile application involves the interaction between the application and the physical components of the mobile device.

The application will be designed to fully utilize the touchscreen capabilities of the android mobile device. Users will be able to interact with the application by tapping, swiping, and scrolling on the screen to navigate through menus, input data, and perform various actions. The application will support various keyboard and input methods available on android mobile devices. The application will be designed to adapt to different screen sizes, resolutions, and aspect ratios of android mobile devices. It will provide responsive design and layout, ensuring that the user interface elements are appropriately sized and positioned to fit various android device screens.

3. Software Interfaces

- Android Studio is used as development platform for Islamic Inheritance Calculation System which is the official Integrated Development Environment (IDE) for Android app development. Android Studio provides a powerful set of tools for designing, coding, and debugging Android applications

- Flutter is used as development language which provides a rich set of UI components, allowing for the creation of visually appealing interfaces that adhere to material design guidelines. It offers widgets, animations, and layouts that can be customized to match the application's branding and usability requirements

- Firebase is used as a backend platform to handle user authentication, data storage, and real-time data synchronization. Firebase Authentication can be employed to implement secure user login and registration functionalities

4. *Communications Interfaces*

Islamic Inheritance Calculation System is connected to Firebase database for live storage and data retrieval. Firebase is utilized for storing and retrieving user data, including family heir's information, and complaints data

2.1.7 SYSTEM FEATURES

System features for Islamic Inheritance Calculation System are given below:

1. *User Registration*

User registration is necessary for complaint filing.

- **Description and Priority**

User need to register first to file any complaint against his/her property share. User need to provide his/her personal information which will be store in database. Priority of user registration in this application is 5.

- **Stimulus/Response Sequences**

When user want to file a complaint, then he/she need to create account first. They need to enter some personal information such as name, CNIC, email, phone number, address, create a strong password and etc.

- **Functional Requirements**

The functional requirements for user to register are name, CNIC, phone number, email, address and strong password.

2. *Admin Login*

Admin need to login for checking user complaints and updating complaints status.

- **Description and Priority**

Admin login is for only authorize person who is already save in the applications database. Admin do not need to create any account or register first because he is already saved in applications database. Admin will be able to see complains and change complain status. Admin needs to verify himself first that the person who is claim to be admin is exactly the admin or someone else is trying to access the account, for this purpose, there will be double verification for admin. The priority of admin login is 5.

- **Stimulus/Response Sequences**

Admin will enter his/her username, phone number and the password. The identity of the Admin, needs to be verified two times, to make sure that the person who is accessing the account is actual admin or someone else trying to access the account

- **Functional Requirements**

Functional Requirements for admin are:

1. Admin login ID
2. Admin password
3. Admin phone number
4. Admin OTP verification (code)

3. *User Login*

- **Description and Priority**

Once user create account or register then it just needs to login to file complaint. This will make sure the security of their personal information so that no one can access their account without permission. User login priority in WarisApp is 5.

- **Stimulus/Response Sequences**

User needs to input the login ID and then password. After input and clicking on the login button, user can now easily file complaint and also check the previous complaints status.

- **Functional Requirements**

Functional Requirements for user are:

1. User login ID
2. User Password

4. *Assets Information*

- **Description and Priority**

The application will take input from users about the deceased's assets such as cash, house, stocks, jewelry, vehicles and etc. The application will calculate the user's total assets for further inheritance calculation after deducting the liabilities. The priority of asset handling is 5 which is basically needed for inheritance calculation, the core working of Islamic Inheritance Calculation System.

- **Stimulus/Response Sequences**

The user will input his/her worth of different assets and the application will calculate the total worth for the user.

- **Functional Requirements**

The user must enter exact worth of his/her assets in numeric.

5. *Heirs Data Collection*

- **Description and Priority**

The application requires information of heirs to calculate their corresponding shares. User need to enter all heirs and their relationship so that the application will calculate the respective share for each member. The priority of heir's data collection is 5.

- **Stimulus/Response Sequences**

The user input his/her heirs and define their relationship. So that the application will calculate their fair share according to Islamic inheritance and then display to the user.

- **Functional Requirements**

Functional Requirements for heir's data are:

1. Number of heirs
2. Relationship of each heir with the deceased

6. *Inheritance Calculation*

- **Description and Priority**

The application takes input from user about the heirs, total assets and the liabilities of the deceased. Then according to the Islamic inheritance rules, it will calculate share of each heir. This is one of the most important features of Islamic Inheritance Calculation System. It also has priority of 5 in WarisApp.

- **Stimulus/Response Sequences**

User needs to input the deceased's total assets, liabilities and number of heirs with the relationship. After that, the application will calculate the appropriate share for each heir according to Islamic Inheritance laws.

- **Functional Requirements**

Functional Requirements for inheritance calculation are:

1. Total assets and liabilities

2. Number of heirs and their relationship with the deceased

3. Islamic Inheritance Rules to calculate appropriate share of each heir

7. *Inheritance Shares of the Heirs Report*

- **Description and Priority**

The application will display a detailed report summarizing the calculated inheritance shares. The report will clearly outline the distribution of assets and provide information on individual shares for each heir in exact amounts. Inheritance report has a priority of 5 in the application.

- **Stimulus/Response Sequences**

After taking input of assets and heirs, the application calculates share of each heir according to the Islamic inheritance rules and then display a report where it has the total amount for each heir as their share in assets.

- **Functional Requirements**

Functional Requirements for generating inheritance shares report are:

1. Number of heirs and their relationship

2. Worth of assets and liabilities

3. Islamic inheritance rules for shares distribution

8. *Complaint Module*

Our application also has a complaint module that allow users to report their issues to the administrative authorities.

- **Description and Priority**

The application provides separate complaint module for users, to file complaint when they do not get their inheritance shares according to Islamic Inheritance Rules. The application also facilitates a transparent and efficient process for reviewing and resolving complaints, received from users (Admin's responsibility). The priority of Complain module in this application is 5.

- **Stimulus/Response Sequences**
  1. When the user clicks on complain button, it will display a popup where he/she will be asked if it is admin or user. If it is user, then they need to login. In case they do not have

any account, they have another option for registration. After this, they need to fill a form and submit it and their complaint will be send to authorized persons.

2. If the user is admin, then they also have login option with 2 factor authentication process. The admin will able to check complaints and change complaints status as well.

- **Functional Requirements**

Functional requirements necessary for complaint module are:

1. Login and registration as user
2. Login and OTP verification as admin

2.1.8 OTHER NONFUNCTIONAL REQUIREMENTS

Non-Functional requirements for WarisApp are as follow:

1. *Performance Requirements*

Performance requirements for Islamic Inheritance Calculation System includes:

1. The system will perform inheritance calculations promptly, providing results within an acceptable timeframe
2. The system will be able to handle calculations for a large number of users simultaneously, without significant degradation in performance
3. The system will produce accurate and precise inheritance calculations, adhering to the principles and rules of Islamic law. Calculation algorithms and formulas will be implemented correctly, minimizing any errors or discrepancies in the results
4. The system will provide real-time responses to user interactions, such as inputting data or making adjustments to inheritance scenarios
5. The system will incorporate appropriate security measures to protect user data and ensure the confidentiality and integrity of sensitive information
6. The system will be designed in a modular and maintainable manner, allowing for easy updates, bug fixes, and enhancements. Code quality, documentation, and version control practices will be in place to facilitate ongoing maintenance and support
7. The system will have an intuitive user interface and provide clear instructions and feedback to users. It will be user-friendly, allowing users to navigate the application, input data, and interpret the results with ease

8. The complaint module's functionality will be separately implemented for both User and the Admin. Authentication components will be added before heading towards the intended complaint panels

2. Safety Requirements

The safety requirements for an Islamic inheritance calculation system involve measures to ensure the security, privacy, and integrity of user data. The system will implement data privacy measures to protect the personal and financial information of users. It will adhere to relevant data protection laws and regulations, ensuring that user data is collected, stored, and processed securely and confidentially. The system will employ secure authentication methods, such as strong passwords or two-factor authentication, to verify the identity of users. It will also implement proper authorization mechanisms to control access to sensitive data and functionalities, allowing only authorized users to perform inheritance calculations or access relevant information. The system will be continuously monitored for security threats and anomalies.

3. Software Quality Attributes

Islamic Inheritance Calculation System consider several software quality attributes to ensure a high-quality and reliable application. Here are some key software quality attributes:

1. **Accuracy:**

    The application will provide precise and accurate calculations of inheritance shares based on Islamic rules and guidelines. The calculations will be error-free and reliable to instill confidence in users.

2. **Performance:**

    The application will be responsive and perform calculations efficiently, even with large and complex inheritance scenarios as it has been tested on different scenarios.

3. **Usability:**

    The application will have a user-friendly interface, making it intuitive and easy to navigate. Users will be able to input the required information effortlessly and understand the results without confusion. By designing an attractive and easy-to-use

user interface for our mobile application, we ensure that users can input information and navigate through the interface with ease.

4. **Reliability:**

The application will be dependable and operate consistently without unexpected crashes or errors. It will handle varying scenarios and user inputs gracefully, providing reliable results consistently. As there are different dart files for interface designing and input handling and calculations.

5. **Security:**

As security is a critical attribute. The application will employ high security measures to protect user data, ensure confidentiality, and prevent unauthorized access or data breaches. For user's data security we add login/signup functionality in our application.

6. **Portability:**

The application will be designed to work seamlessly across different mobile platforms (e.g., iOS, Android) and devices with varying screen sizes and resolutions. It will adapt to different devices without compromising functionality and usability. Flutter is a great framework for building mobile applications that are responsive and can adapt to different screen sizes. With Flutter, we can use widgets that automatically adjust to different screen sizes, which makes it easier to develop a responsive user interface.

7. **Maintainability:**

The application is built with a clean and modular code structure, allowing for easy maintenance, updates, and bug fixes. Well-documented code (interface design and logic of the application are in separated dart files) and efficient development practices (object-oriented programming) contribute to its maintainability.

8. **Compatibility:**

The application will be compatible with various mobile devices, operating systems, and versions. Regular testing across different platforms can help identify and address compatibility issues. As Flutter is a cross platform development framework so we can switch between two platforms by sharing same code for Android and iOS.

Chapter 3

3.1 USER DESIGN

This stage comprises of user-interface design of the application. The app contains splash screen, home screen, side-bar drawer and further sub-screens for the inheritance calculation and complaint filing modules. Logo of the WarisApp, animation on splash screen and the background image used in the home screen and the sub-screens are designed with the help of Canva tool. Canva provides a range of flexible and easily accessible templates for the designing purposes that is why it is chosen to show the conceptual interface of the WarisApp.
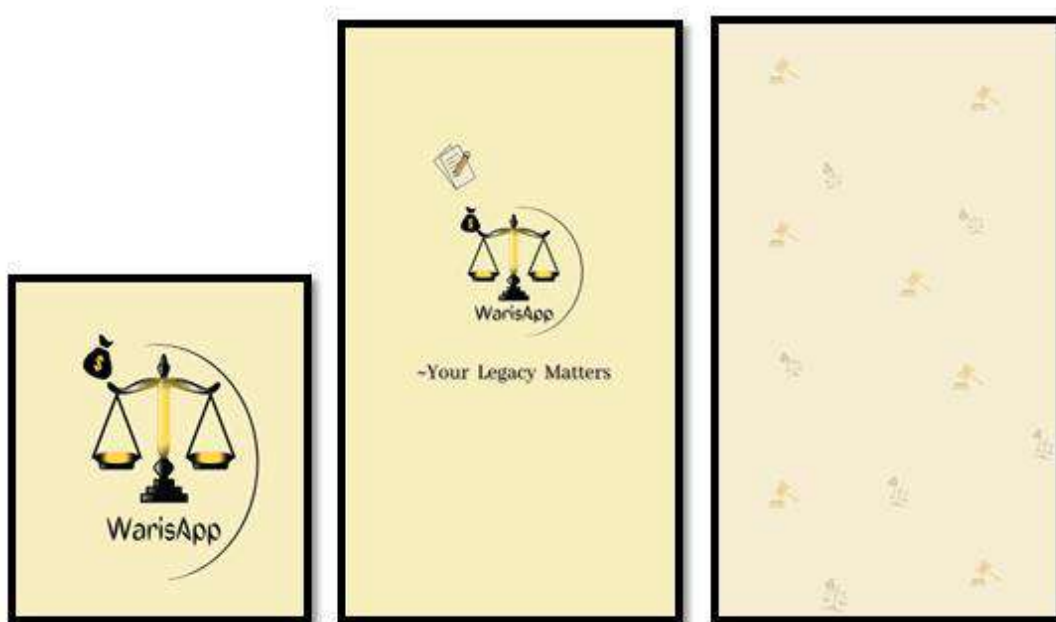
Logo, Splash Screen and Background Image:

*Figure **Error! No text of specified style in document.**:1: Logo, Splash Screen and Background Image*

3.2   SOFTWARE DESIGN

1.   *Purpose*

Software design section aims to provide a brief overview of the functionalities of the system being developed. In this section of the document, complete design details and modules of the WarisApp will be discussed. Detailed Design of the software application will be shown with the help of UML Diagrams like class diagram, use-case diagram, sequence diagram, activity and package diagrams, to give the structural as well as behavioral insights of the proposed system's components.

2.   *Scope*

The proposed Islamic Inheritance Calculation System, will help the Muslims of the world, to compute the inheritance shares (in amount) of the heirs; accurately, efficiently, quickly and easily. It is an Android application that is why it can be easily accessed and used. Additional complaint component will aid the user (from Pakistan), to ask the regulatory bodies (Admin in this case) for help, when he/she is unable to get his/her fair shares from the property.

3.   *Context*

The advancements in the Mobile Application Development field (Flutter Framework for cross-platform applications), Programming Practices (Object-Oriented Programming, incorporated in Dart language) and the hardware computing power, have enabled us to develop a user-friendly and sophisticated android application like WarisApp. The product aims to compute the inheritance shares of the Muslim heirs (in amount) with guaranteed authenticity. The product also has a complaining module, to help the public of Pakistan, especially women community, by file an application against the ones who are standing in their way, for claiming their legacy rights.

4.   *Identified Stakeholders and Design Constraints*

Stakeholder is any entity like person, organization, system and group that has some stake in the project or product. The identified stakeholders for Islamic Inheritance Calculation System are requirement engineers, designers, developers, testers, consultants and users.

Design constraints are those, which are imposed on the system being developed. The constraints can be applied on software or hardware components, user interfaces, operational procedures or on any other system component. The constraints imposing body can the system user/customer, development organization or an external authority.

Following are some of the system's design constraints:

1. Authentication process must be sophisticated specially for Admin
2. Passwords shall never be in viewable form
3. The application must be user-friendly and everything embedded in it must be self-explanatory

5. *Design Viewpoints*

Design viewpoints of the system are described by:

1. Use Case Diagram
2. Entity-Relationship Diagram
3. Class Diagram
4. Activity Diagram
5. System Sequence Diagrams
6. Package Diagram

1) **USE CASE DIAGRAM**

Use Case diagram is used to show how or in what order, the user will interact with the system or application. It combines both user and the related use cases (functions).

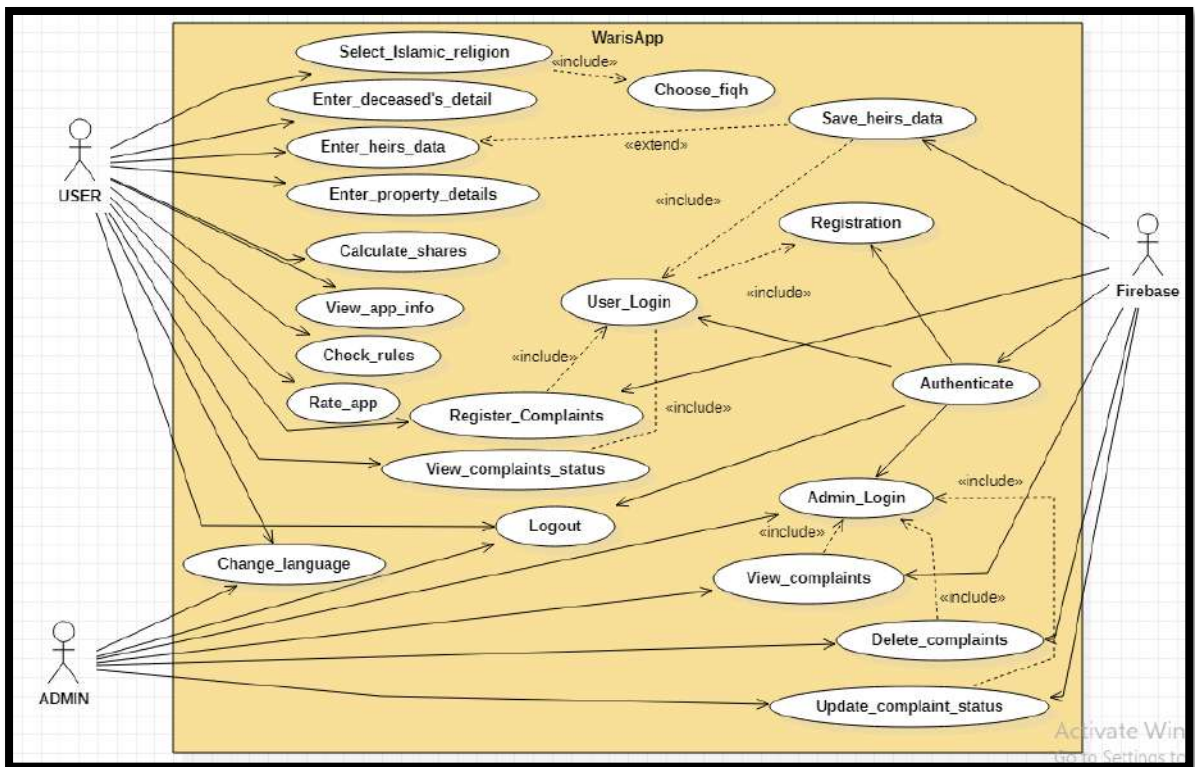Use Case Diagram of WarisApp is given by:

*Figure **Error! No text of specified style in document.**:2: UML Use-Case Diagram of WarisApp*

2) ENTITY RELATIONSHIP DIAGRAM

An Entity-Relationship diagram is used to represent the database schema in the visual form. It gives the graphical illustration of the structure of the database. The entities are represented as the tables in the database. The attributes of the entity are represented as the columns of that entity. To establish the relationship between entities, primary and foreign keys are used. The relationship between the entities in the database makes the transaction and manipulation of data, easier.

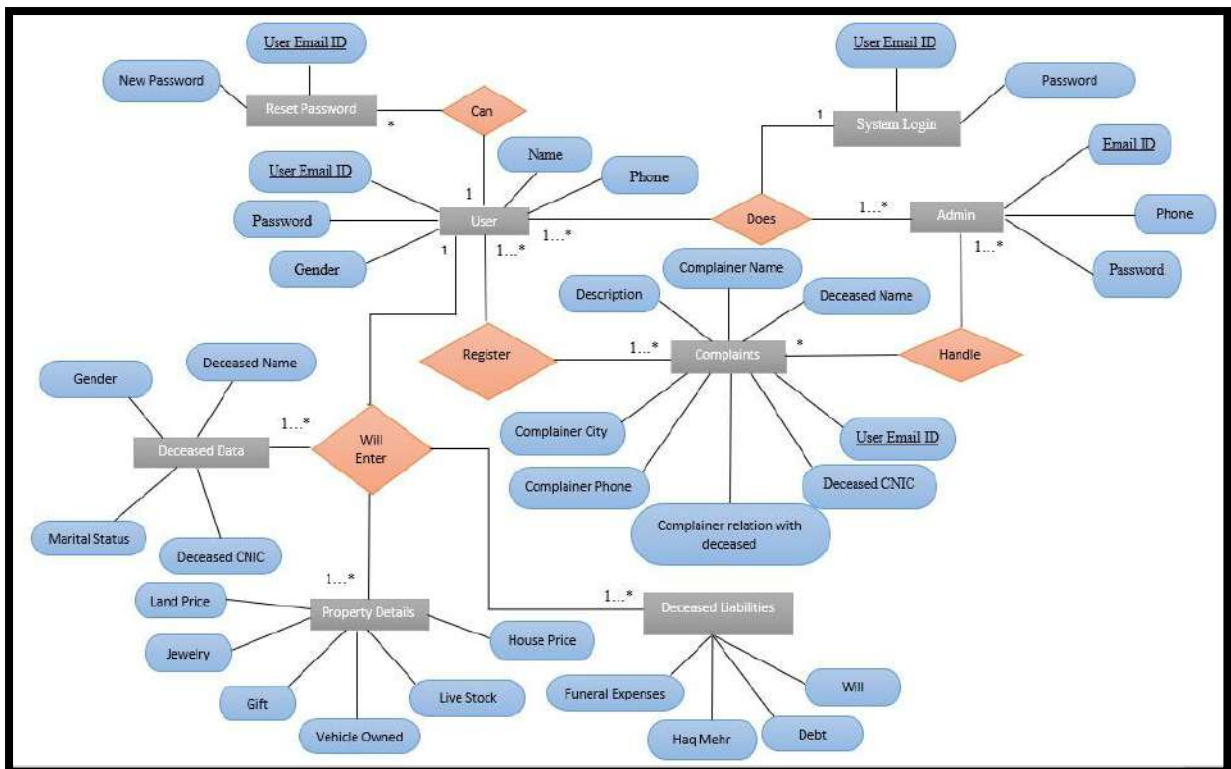The Entity-Relationship Diagram of the WarisApp is given by:

*Figure **Error! No text of specified style in document.**:3: ERD of WarisApp*

3) CLASS DIAGRAM

Class diagram is a representation to show the structural view of the system, described using classes' and its attributes and operations. It is used to show the main modules (or classes) that a system possesses and its relative connection and dependence on other modules (or classes).

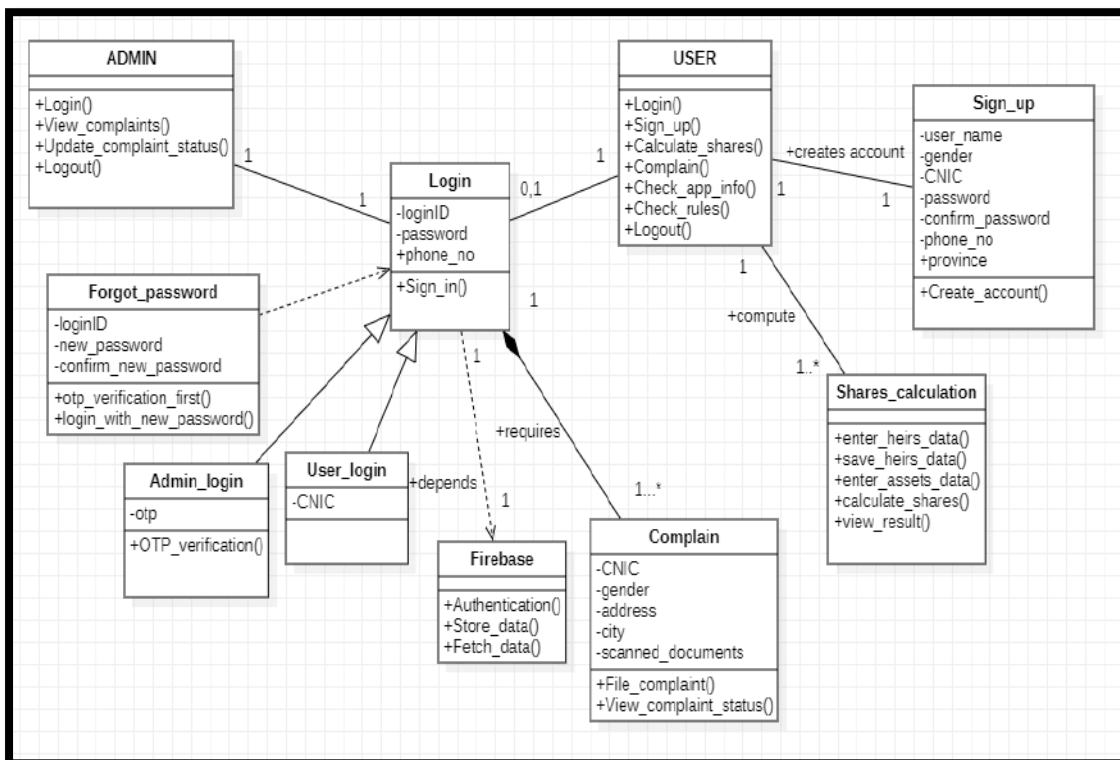Class Diagram of WarisApp is given by:

*Figure **Error! No text of specified style in document.***:*4: UML Class Diagram of WarisApp*

4) ACTIVITY DIAGRAM

Activity diagram is like a control flow diagram or a flowchart, and it aims to show the control or flow of operations from starting to the ending point of the system.

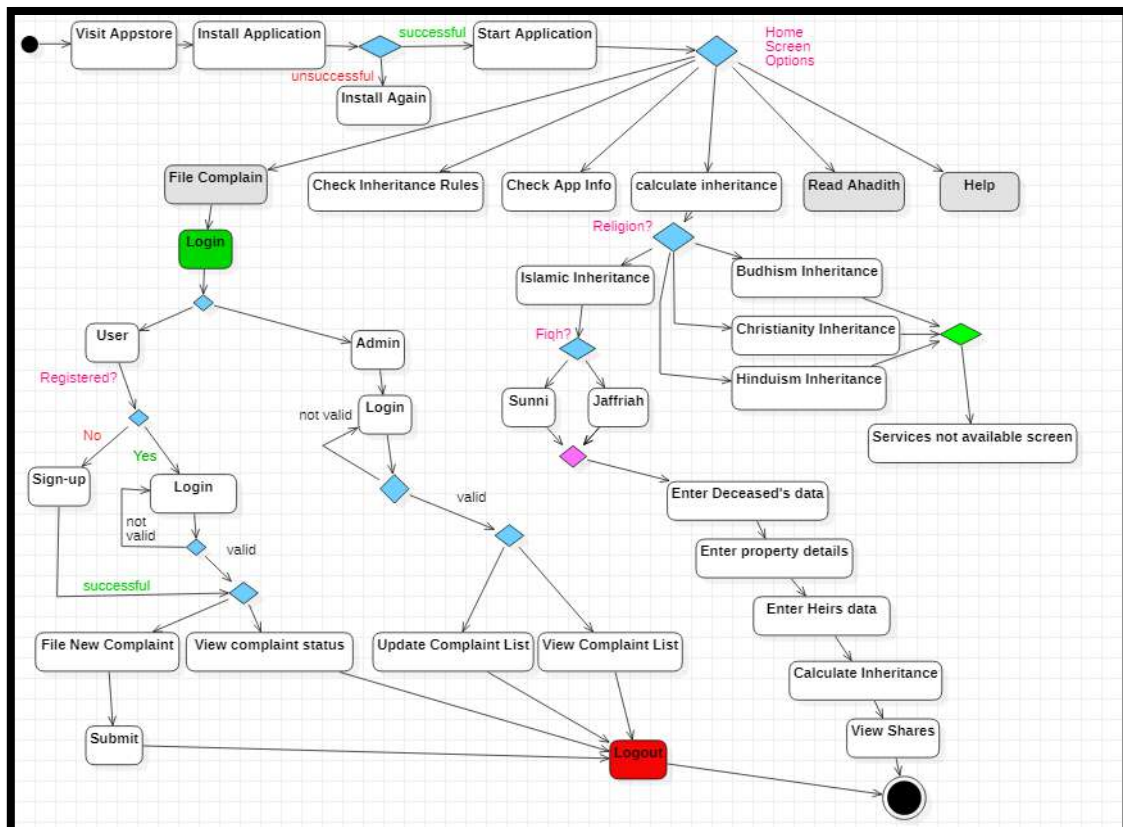Activity Diagram of WarisApp is given by:

*Figure **Error! No text of specified style in document.**:5: UML Activity Diagram of WarisApp*

5) **SEQUENCE DIAGRAM**

Sequence diagram represents the user as an object and used to show the interactions between objects over time sequence. Basically, sequence diagram is a behavioral diagram which uses the entity of the system as an object and the identified objects exchange messages with each other to carry out a certain function.

Sequence Diagrams of WarisApp are given by:

1. Sequence Diagram-1:

This Sequence Diagram is showing the user interaction with the System or Application for the Inheritance Shares Calculation, according to Islamic Jurisprudence:
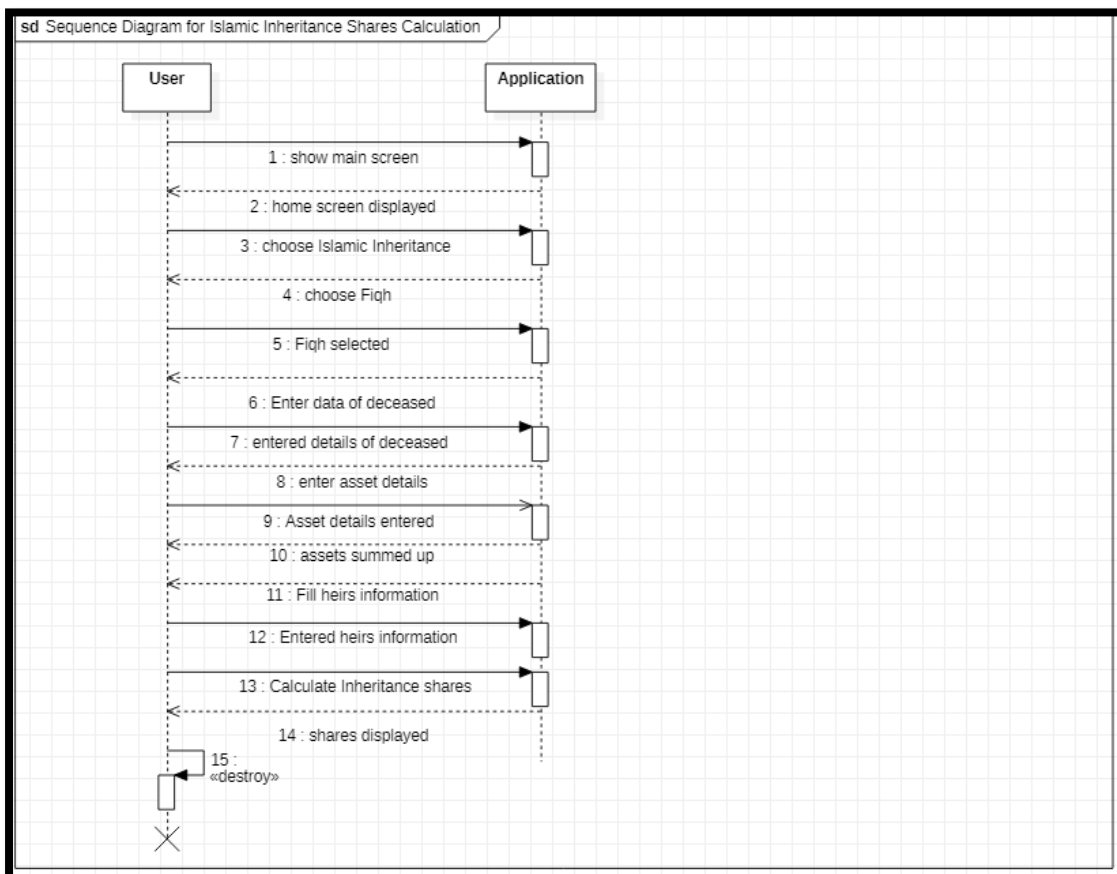

*Figure **Error! No text of specified style in document.**:6: UML Sequence Diagram-1 (Islamic Inheritance Shares Calculation)*

2. Sequence Diagram-2:

This Sequence Diagram is showing the user interaction with the System or Application to file a complaint:
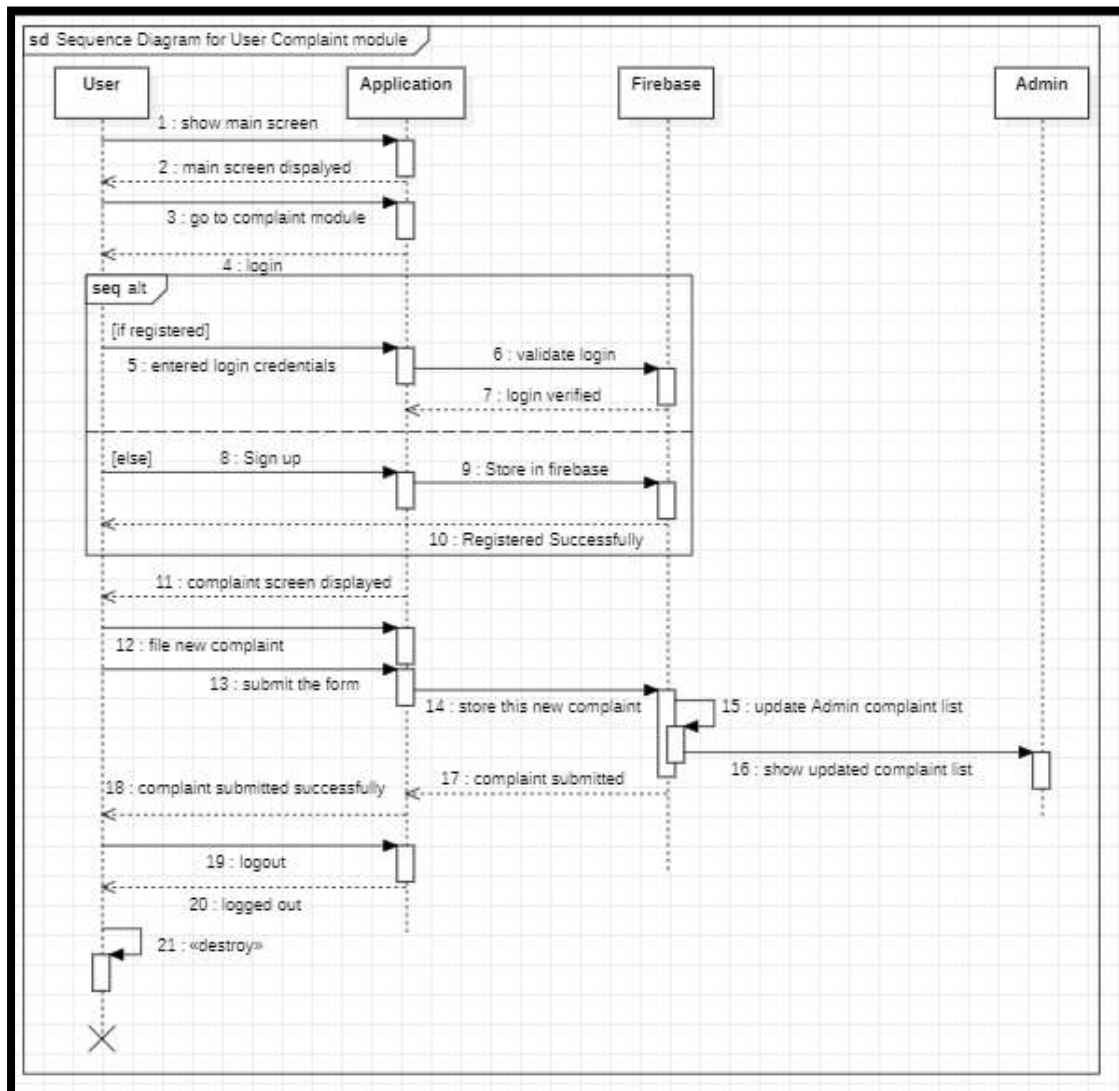

*Figure **Error! No text of specified style in document.**:7 UML Sequence Diagram-2 (User-side Complaint Module)*

3. Sequence Diagram-3:

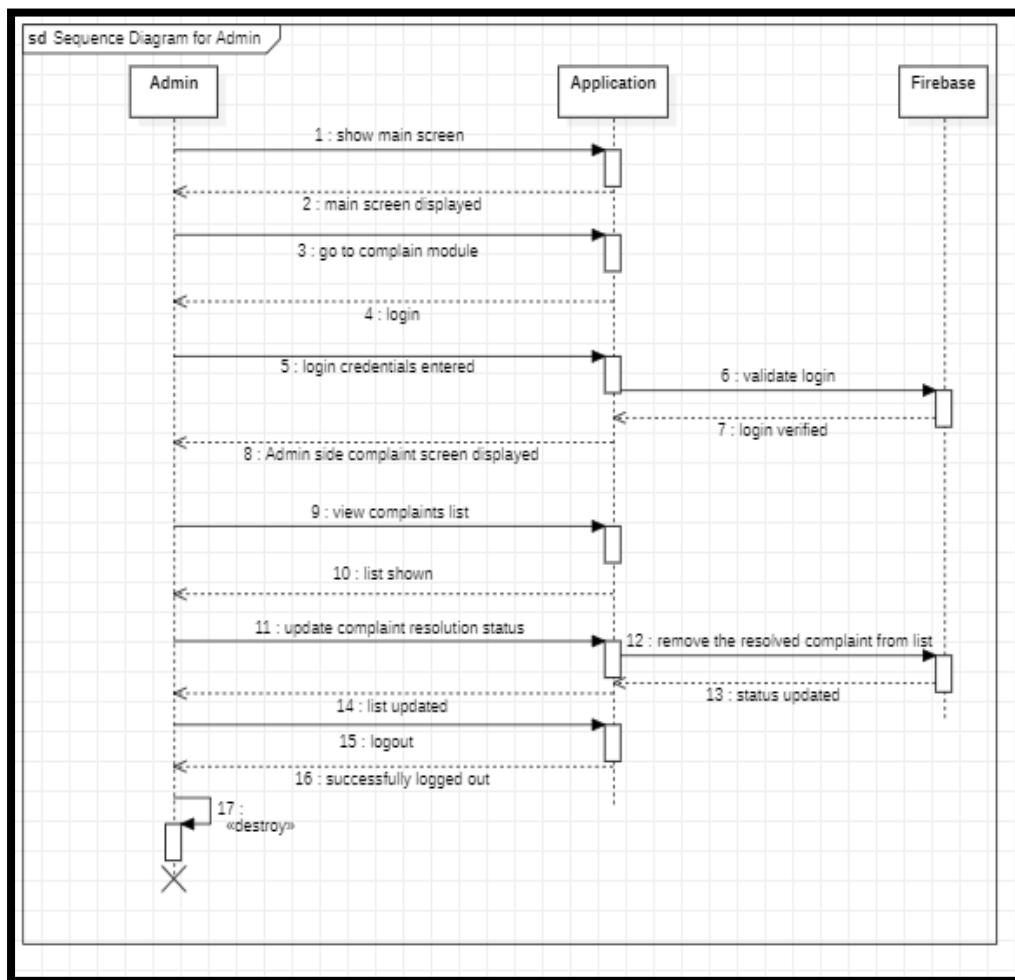This sequence diagram is showing the Admin interaction with WarisApp:

*Figure **Error! No text of specified style in document.**:8: UML Sequence Diagram-3 (Admin-side Complaint Module)*

6) PACKAGE DIAGRAM

Package diagram represents the structural arrangements of the system, in the form of packages.
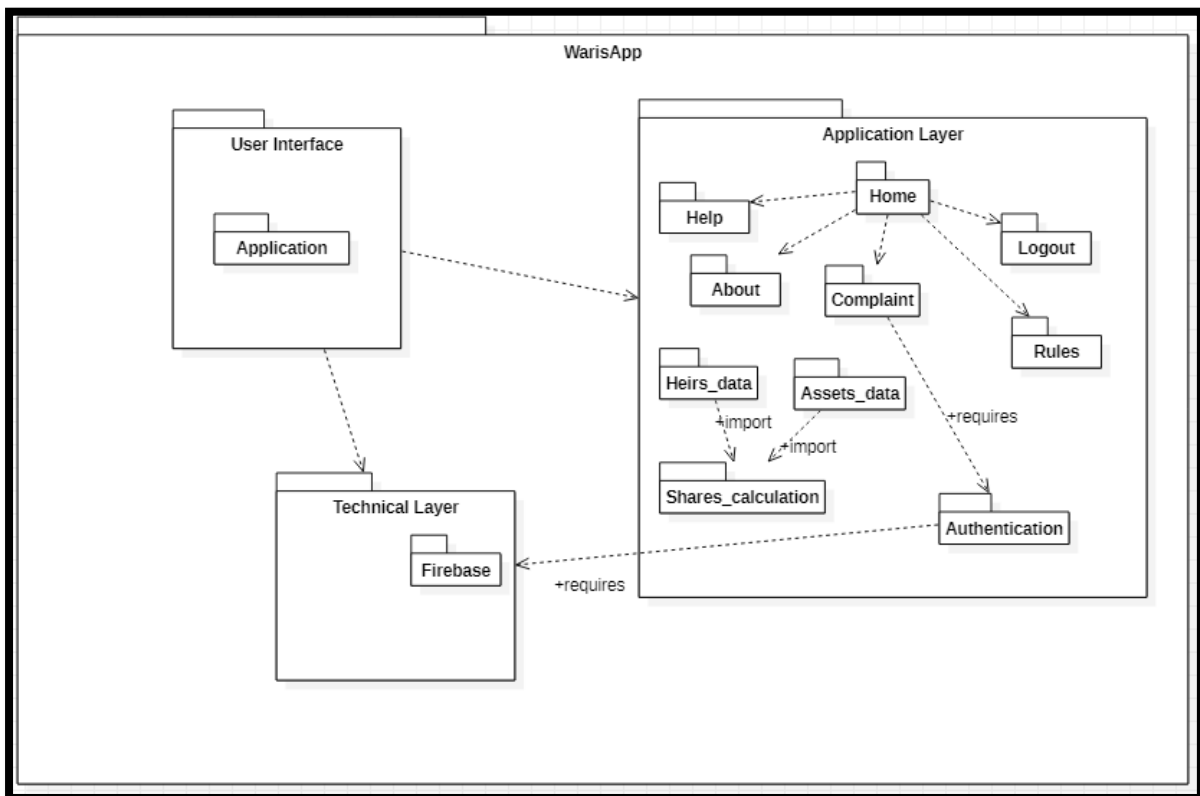
Package Diagram of WarisApp is given by:

*Figure **Error! No text of specified style in document.**:9: UML Package Diagram of WarisApp*

Chapter 4

4.1   Proposed Solution/Results & Discussion

TABULAR COMPARISON OF EXISTING SYSTEMS AND PROPOSED SYSTEM

Existing Systems	Proposed System
Computes the shares of the heirs in fractional form	Computes the shares of the heirs in amount
Language Specific (Malay/ Arabic/ English)	Bilingual (English and Urdu)
Deals with the specific School of thought (Jafari or Sunni)	Designed for both Sunni and Jafari School of thought
Non-user-friendly interface	Interface is user-friendly and easy to understand
Mostly, the systems are developed using structured programming practices	WarisApp is designed and developed using new technological and programming paradigms (Flutter and OOP)
Intensive page routing to enter the details of the heirs	Do not require intensive page routing
Slow Response and Performance issues	Fast and reliable
Platform specific (Android/Web/iOS)	WarisApp is a cross-platform application

No module to help the people, in getting their legacy rights from the regulatory bodies	Separate Complaint Module for Pakistani users (specifically women) to file a complaint, when they are facing issues in claiming the inheritance rights

Table 1: Comparison of Existing Systems and the Proposed System

Chapter 5

5.1   Summary and Future work

This chapter shows and discusses the results, obtained after the completion of implementation of the application. It represents the interfaces of mobile application interfaces with their working and purpose. Following are the interfaces of the application:

- Splash Screen
- Home Page Interface
- Side-Bar Interface
- About Screen
- Ahadith related to Faraid Interface
- Islamic Inheritance Calculation Rules Interface
- Help Screen
- Rating Screen
- Deceased's Information Interface
- Asset Details Interface
- Heir's Information Interface
- Share's Distribution Interface
- User Login Interface
- User Sign-up Interface
- Admin Login Interface
- User-Side Complaint Interface
- Admin-Side Complaint Interface
- Bilingual Feature
- Forgot Password (user-side)
- Logout Screen Interface

In future, the application's functionality can be expanded in the following manner:

- It can incorporate the inheritance calculation for other religions like Christianity, Hinduism, Jews and Buddhism

- It can be connected with NADRA's database to enhance the credibility of the information provided by the user, regarding the heirs
- It can be connected with the original Regulatory Bodies of the Pakistan Government to resolve the inheritance distribution issues of the residents of Pakistan (mainly women)

Chapter 6

6.1   Conclusion & Recommendation

The purpose of this project is to design and develop an automated solution in the form of an Android Application for the Islamic Inheritance calculation and to facilitate the people of Pakistan (especially women) to claim their estate rights. The application is developed using the Flutter framework inside Android Studio IDE. Dart programming language and Firebase (database) is used for interface designing, record handling and authentication.

Currently automated Islamic Inheritance Calculation Systems produce results inaccurately and in fractional form. Furthermore, while the inheritance property distribution in Pakistan, mostly, women remain deprived off their legacy rights due to many customary and traditional sanctions and patriarchal cultural norms.

The proposed system is capable of computing the individual shares of the heirs, in amount, on the basis of liabilities, asset details and heir's information entered. The interface of the application is appealing and user-friendly. There is also a bilingual feature in the proposed system, so that national (Pakistan) as well as international users can use it easily. According to the information (asset details and heirs) entered by the user, the inheritance shares of each heir are computed and displayed. Side bar on the home screen of the application has different options like Reading Inheritance Rules, Reading Hadith related to the importance of Islamic Inheritance knowledge, Help section, Rating and About of the Application. Complaint module of the Application is also added in the Side bar of the home screen, which will ask the user to login the system first, whether as a user or an Admin. User login will direct the user to User Complaint Section. In User Complaint Section, a user can file a complaint or view previous complaints status. While, the Admin login will direct it to an Admin Section. In Admin Section, an admin can view the list of user complaints to be resolved and can update the status of complaint after resolution. Thus, the proposed system is integrating two solutions at a time, i.e. reducing the hectic of manual inheritance shares calculation with user-friendly interface and helping the residents of Pakistan (especially women) to stand up for their inheritance rights.

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