

# Development of a Safer Online Relationship Platform using Kotlin Spring and Flutter

## Project Proposal

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# Chapter 1

## Problem Description

Since the advent of modern online dating in the mid-1990s, the emphasis has moved from meeting people through mutual friends, towards a less intimate approach. This change has shown significant success with online dating quickly becoming the most likely way to meet a partner, displacing meeting through friends (Rosenfeld, Thomas and Hausen, 2019).

With online dating becoming ever more prolific, and the lack of attention towards creating and maintaining a safe environment, some cracks are starting to show with regard to the personal safety of users. Recent statistics show that online dating related crime can be broken down into two main categories.

The most severe of these issues is sexual assault. In 2015, a study conducted with 666 participants from four Hong Kong universities produced some shocking revelations as to the likelihood of sexual assault stemming from use of a dating app. The study found that among users, the prevalence of sexual abuse in the prior year was 12.4%, more than double that of non-users (Choi, Wong and Fong, 2018). According to reports from Mintel (Bacon, 2015), the UK's online dating market grew by 73.5% between 2009 and 2014; in the same period, online dating initiated sexual offences increased six-fold (National Crime Agency, 2016).

The second most severe is a concept known as romance scams. The Federal Trade Commission (Federal Trade Commission, 2022) state that in romance scams "The scammers strike up a relationship with you to build up trust, sometimes talking or chatting several times a day. Then, they make up a story and ask for money." These scams accounted for \$304 million across the United States in 2020 (Fletcher, 2021), and unfortunately the situation is deteriorating, with a more than fourfold increase in total losses since 2016. This type of fraud is also one of the most brutal, with a median loss per person of \$2500, more than ten times the median loss across all other fraud types (Fletcher, 2021).

The current proposed solutions to the above mainly centre around educating individuals that are of higher risk (Scannell, 2019). Due to the prevalence of online dating in higher education institutions, another proposed solution is to educate employees such that they are sensitive to the problems and are able to address concerns.

Unfortunately, this is not enough. Many studies suggest (Choi, Wong and Fong, 2018) that the onus should be placed on the platforms themselves to provide a safer environment

and employ prevention techniques; however this is yet to be observed in practice.

## 1.1 Aims

A few months ago, I started working with a local church to design an app that enables members of the congregation to explore new connections, both friendships and dating, in a safer way. This project will aim to implement these designs and evaluate their effectiveness towards improving online dating safety.

We will build on existing online relationship platforms and leverage a partnership with a group of churches across the United Kingdom to discover and test the best mechanisms to provide a safer platform. The aims of this project are to:

- Identify the contributory factors in the dangers to personal safety that arise when using current online relationship platforms.
- Collate research with regard to dangers in online relationship platforms and corrective measures that can be applied to reduce risk.
- Produce a new online relationship platform to apply the above research, in conjunction with Christchurch Newport.

## 1.2 Objectives

There are 5 main objectives that must be met to reach the outlined aims. These are:

1. Front-End Mobile Application
2. Back-End Application Logic
3. Instant Messaging Functionality
4. Secure Application Platform
5. User Study

These will be discussed further below and addressed in-turn by the product requirements specification.

# Chapter 2

## Requirements Specification

This section defines the proposed project requirements needed to meet the above objectives and fulfill the aims of the project. The priority of each requirement falls into the following three classes:

1. **Must** - an essential requirement
2. **Should** - a preferable but not essential requirement
3. **May** - a desirable extension

### 2.1 Functional Requirements

#### 2.1.1 Front-End Mobile Application User-Interface

- The interface **must** allow users to find others, review their profiles, and communicate with them
- The application **should** allow users to decide how much of their personal data they want to be visible to other users
- The interface **should** (where applicable) provide separate interaction capabilities for distinct user types, such as pastors, administrators, etc.
- The interface **may** provide customisation options for user profiles

#### 2.1.2 Back-End Application Logic

- The back-end **must** provide a secure link between the front-end and any data stored about each user
- The back-end **must** be thoroughly tested, including unit tests, integration tests, and user acceptance tests throughout the development process
- The back-end **should** (where applicable) provide separate interaction capabilities for distinct user types, such as pastors, administrators, etc.
- The back-end **may** provide a machine-learning algorithm to identify compatible user profiles

### 2.1.3 Instant Messaging Functionality

- The application **must** provide a secure instant messaging option
- The application **should** provide an ability to report user messages for review by moderators
- The application **should** provide users with the ability to block others
- The application **may** allow users to only receive messages from friends

### 2.1.4 Secure Application Platform

- The application **must** provide a secure user log-in/registration flow
- The application **must** store applicable data ONLY
- The application **must** store all sensitive data securely

### 2.1.5 User Study

- The user study **must** evaluate the usability of the application with comparison to competing alternatives by way of a System Usability Scale (SUS) survey
- The user study **must** evaluate whether leveraging church communities to improve safety has reduced user concerns
- The user study **should** identify areas for improvement with regard to application usability
- The user study **may** identify unexplored target demographics and features for the application

## 2.2 Non-Functional Requirements

### 2.2.1 Performance

- The application **should** perform well enough that it is not frustrating to use
- The application **should** be scalable to larger user loads without a significant drop-off in performance

### 2.2.2 Security

- The application **must** comply with General Data Protection Regulation (GDPR) legislation with regard to user data
- The application platform **should** be secured against common methods of attack such as: SQL injection, cross-site scripting (XSS), distributed denial of service attacks (DDoS), etc.

### 2.2.3 Accessibility

- The application **should** be easily accessible to users across the UK (likely through online hosting)
- The application **may** be resilient to failure in infrastructure/services

### 2.2.4 Safety

- The application **must** only allow users that are registered as a member of an on-boarded church
- The application **must** allow users to report and block other users
- The application **should** utilise processes and technologies to improve perceived and actual safety of users






*The above requirements are subject to change as the project evolves.*

# Chapter 3

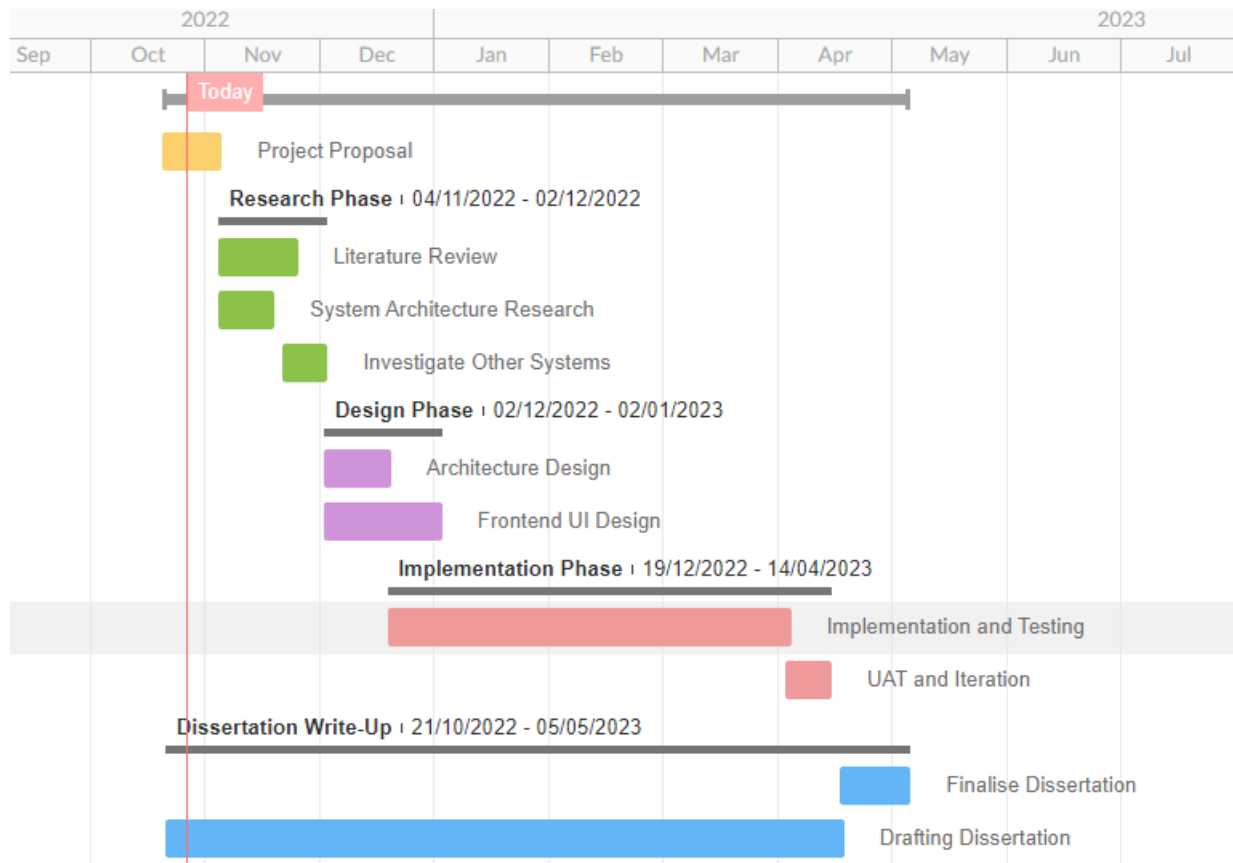
## Project Plan

This section covers the expected project milestones with planned dates to meet them. The project has been split into four phases, as depicted below.

### 3.1 Gantt Chart

| Task name |  | Start date | End date   |
|-----------|--|------------|------------|
| 1         | Project Proposal   | 20/10/2022 | 05/05/2023 |
| 2         |  Research Phase             | 04/11/2022 | 02/12/2022 |
| 2.1       | Literature Review  | 04/11/2022 | 24/11/2022 |
| 2.2       | System Architecture Research   | 04/11/2022 | 18/11/2022 |
| 2.3       | Investigate Other Systems  | 21/11/2022 | 02/12/2022 |
| 3         |  Design Phase               | 02/12/2022 | 02/01/2023 |
| 3.1       | Architecture Design  | 02/12/2022 | 19/12/2022 |
| 3.2       | Frontend UI Design   | 02/12/2022 | 02/01/2023 |
| 4         |  Implementation Phase       | 19/12/2022 | 14/04/2023 |
| 4.1       | Implementation and Test...  | 19/12/2022 | 03/04/2023 |
| 4.2       | UAT and Iteration  | 03/04/2023 | 14/04/2023 |
| 5         |  Dissertation Write-Up      | 21/10/2022 | 05/05/2023 |
| 5.1       | Finalise Dissertation  | 17/04/2023 | 05/05/2023 |
| 5.2       | Drafting Dissertation  | 21/10/2022 | 17/04/2023 |





# Chapter 4

## Resources

### 4.1 System Development

#### 4.1.1 Hardware

I will use my personal desktop PC to create the application and write the project report. I believe it is capable of development of both the front-end and back-end, as well as emulation for sanity-testing the application.

#### 4.1.2 Software

I will be using Kotlin for the back-end development and Flutter for the mobile application. I will be using the IntelliJ Idea IDE as both of these are supported and I have used it extensively.

I plan to use Postman to sanity test the back-end via HTTP requests, I will also look into more automated testing opportunities to reduce excess time spent sanity testing.

#### 4.1.3 Cloud Computing

For source code control, I will make use of Github. This is the industry standard for source control, and will allow me to leverage Github Actions to interface with my cloud application host.

With regard to data storage, I will be using Azure Cosmos document databases. This technology is new to me but will provide the greatest performance with little overhead for the use-case. As this is a cloud storage mechanism, I will benefit from Azure's in-house security, scalability, and data-redundancy.

As for hosting the application, I will use Azure once again. This will provide a simpler interface with the database, and will allow me to set up an automated build and deploy script which will run every time I push to GitHub.

Finally, for user authentication I will be using Azure Active Directory B2C in tandem with Spring Security. This will allow me to set up individual users and roles within a B2C tenant, and provide users with the option to sign-in with accounts from different platforms (Google, Apple, etc.) through federated identity.

The above will be funded using my Azure for Students subscription initially with funding from the partner organisation if necessary.

#### **4.1.4 Human**

I plan to have regular (fortnightly) meetings with my supervisor, Dr. Alan Hayes, to discuss my progress and ensure that targets are met.

I will also leverage my connections within the church to find prospective end-users to test the functionality of the application. Ideally, these users would be familiar with other offerings currently available, as I believe this would improve the quality of their feedback.

### **4.2 User Study**

#### **4.2.1 Human**

For the user study, I will once again leverage prospective end-users within the partner church to test the functionality. These users will acceptance test the product multiple times and will carry out a system usability test towards the end of the project.

#### **4.2.2 Hardware**

My intention is to make the application available to be downloaded to an iPhone or Android device. If this is not possible, I will provide an emulated version of the application on my personal laptop for them to test.

#### **4.2.3 Tests and Surveys**

I will source a System Usability Scale survey. This will be completed by prospective end-users to get an idea of the comparative usability of the produced system, and areas for improvement.

I will also provide users with extended tests to allow them to explore the full functionality of the application, and provide feedback on its operation and the perceived safety implications.

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