W Booth School of Engineering Practice and Technology - McMaster University

Senior Engineer Project - SFWRTECH 4FD3

Design Document

Flashminder

(An Assistive Learning tool for building long term memory)

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1. Executive Summary

Flashminder is a unique end-to-end solution to a problem of retaining information in the long term. With its web solution accessible from anywhere, and cross platform mobile solution for Android and iOS devices, *Flashminder* will provide a highly customizable online and offline solution using proven methodologies and algorithms based on research around memory retention to cater to everyone's learning needs.

2. Business Objectives

2.1 BUSINESS OPPORTUNITY

With ever-growing student population at an estimated 739 million pupils in primary[1] , over 601 million in secondary[2] schools, as well as over 220 million[3] students in higher education, the TAM (Total addressable market) for an application to assist people in learning is extremely large. While students might be the primary target audience, this application is suitable for anyone who wants to improve their information retention and recall.

2.2 PRODUCT SOLUTION

Flashminder will allow users to utilize the spaced repetition SM-2 Algorithm which quizzes users on their knowledge at timed intervals. Users will be able to enter their own questions and answers that the application will later quiz them on. The product will then notify the user at various times to answer questions chosen based on the SM-2 Algorithm. The principle is simple, if the user remembers the information correctly, then it is shown to the user over a longer interval, and if the user cannot remember the information, then they are reminded of it again, in a shorter interval.

The software has several features, including a backend with user profiles, information that the user can add, remove, edit, and categorize their settings on the spaced repetition, and an effective UI (User Interface) for editing the collected information. It will maintain correct status of user learning

[1] https://www.statista.com/statistics/1227106/number-of-pupils-in-primary-education-worldwide/

[2] https://www.statista.com/statistics/1227098/number-of-pupils-in-secondary-education-worldwide/

[3] https://www.worldbank.org/en/topic/tertiaryeducation#1

experience such as study area of interests, level of difficulty, priority etc. thereby improving learning pace and making quality experience. A part of the software is also a cross-platform (Android / iOS) mobile application that synchronizes the database of information and allows users to practice both online and offline, even when they are not near a computer.

2.3 DELIVERABLES

- Web application
- Android application
- iOS application

3. Project Description

3.1 SCOPE

The scope of this project *includes*:

- Development, testing and deployment of the web application product
- Development, testing and deployment of the Android application compatible with android 5 (KitKat) (97% market share) and up, to the Google Play store
- Development, testing and deployment of the iOS application compatible with iOS 14+ (98% market share) to the Apple App Store

However, due to the constraints of various factors, the scope of the product *does not include:*

- The functionalities such as Print, Share quizzes in social media
- The implementation of Multiple languages and Language Translation features
- Covering hosting or deployment of app in public domain at this moment
- Ongoing technical support

3.2 SYSTEM OUTLINE

The system shall cover user verification and authentication, and processes described in product solution section.

3.3 USERS

The following are the end-users of the systems:

- Student
- QA tester
- System Administrator

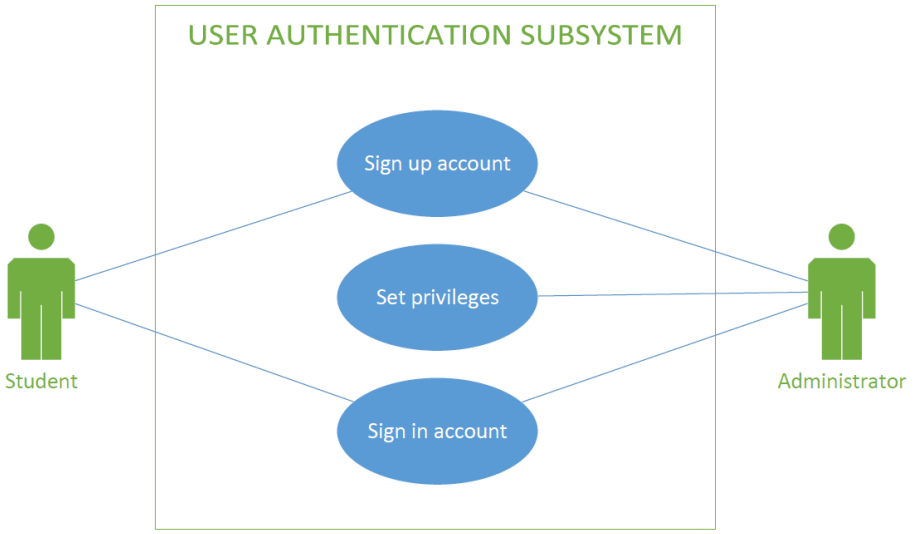
3.5 USE CASES

No.	Goal Use Case	User's role/ Actor
1.	Sign up account	Student, Administrator
2.	Sign in account	Student, Administrator
3.	Set privileges	Administrator
4.	View account	Student, Administrator
5.	Update account	Student, Administrator
6.	Delete account	Student, Administrator
7.	Create flashcard	Student, Administrator
8.	View flashcard	Student, Administrator
9.	Update flashcard	Student, Administrator
10.	Delete flashcard	Student, Administrator
11.	View quiz	Student, Administrator
12.	Rate quiz	Student, Administrator

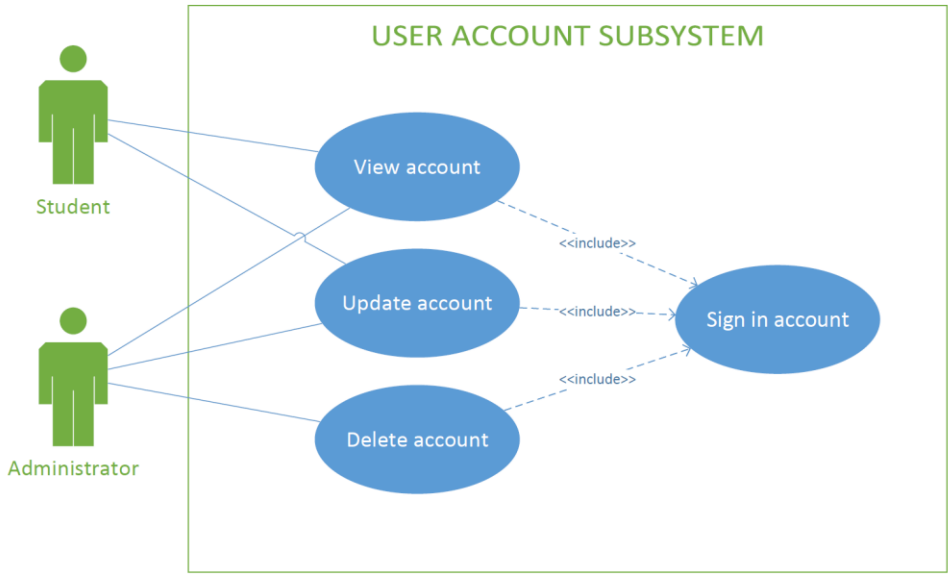
(Table 1)

3.6 USE CASE DIAGRAMS

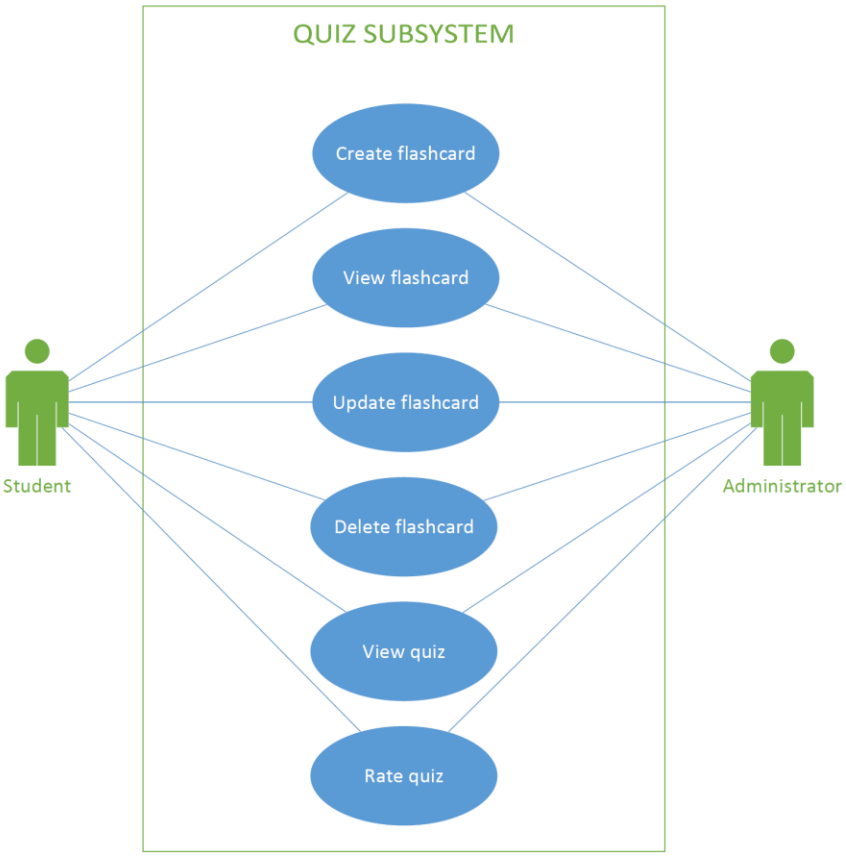
Use case Diagram
(User Access Privilege)



Use case Diagram
(User Access Privilege)



Use case Diagram
(User Access Privilege)

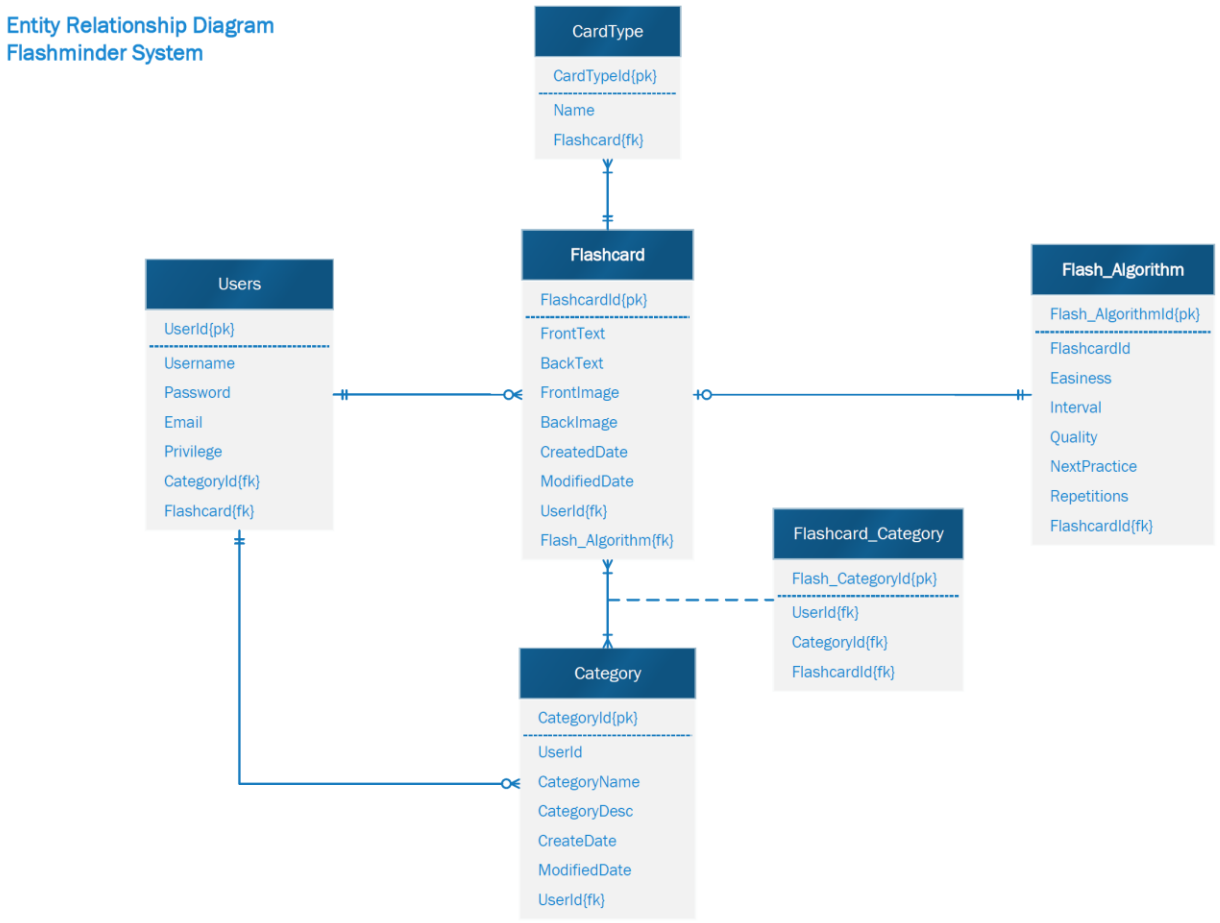


3.7 SAMPLE OF BRIEF USE CASE DESCRIPTION

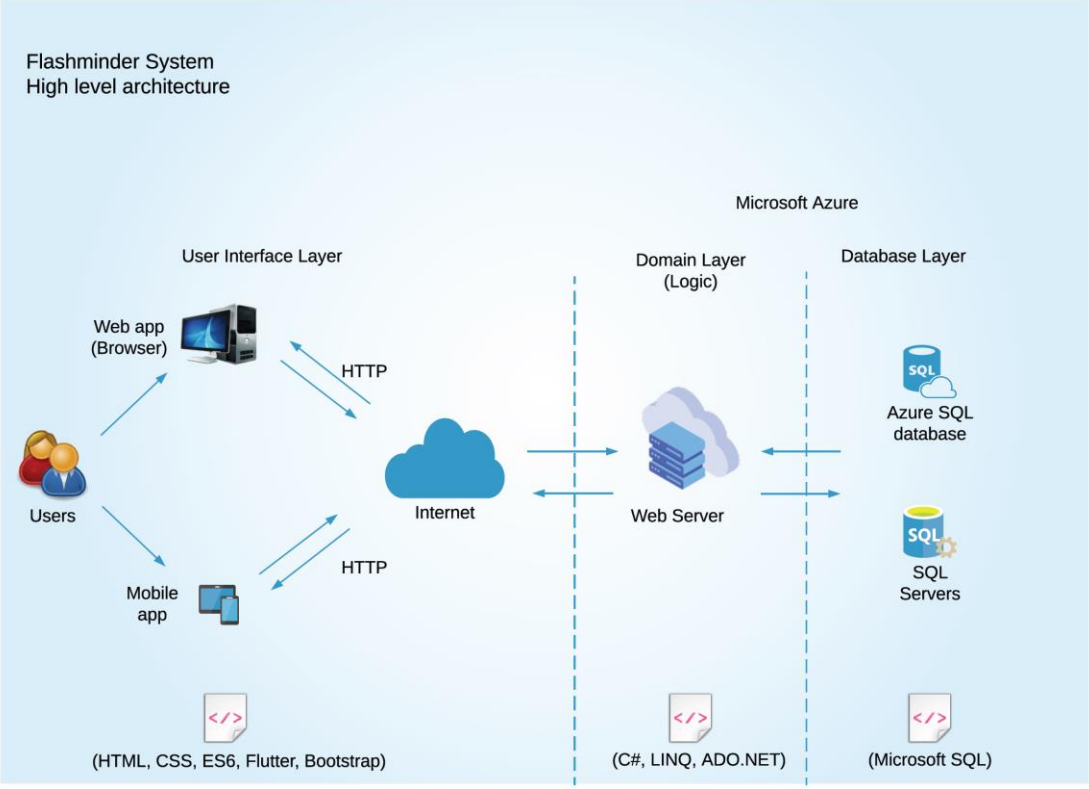
Sample of Brief use case Description

<table>
<tr><td>User case name:</td><td colspan="2">Create account</td></tr>
<tr><td>Scenario:</td><td colspan="2">Creates account by users</td></tr>
<tr><td>Triggering event:</td><td colspan="2">Student or Administrator wants to create account</td></tr>
<tr><td>Brief description:</td><td colspan="2">When student or administrator wants to create account, s/he requests to create his/ her account. Flashminder system asks her/ his user info (username, email, password etc.). student or administrator provides user info in appropriate fields and sends the request. Flashminder system then verifies the user info. If user is an existing user, Flashminder system asks him/ her to enter new user info. If user is not an existing user, Flashminder System saves user info in Flashminder DB and creates account.</td></tr>
<tr><td>Actors:</td><td colspan="2">Student, Administrator</td></tr>
<tr><td>Related use cases:</td><td colspan="2">Invokes Sign up account use case</td></tr>
<tr><td>Stakeholders:</td><td colspan="2">Student, Administrator</td></tr>
<tr><td>Preconditions:</td><td colspan="2">User Authentication Subsystem must be available.
User Account Subsystem must exist.</td></tr>
<tr><td>Post conditions:</td><td colspan="2">Username must be unique.
User info must be saved in Account subsystem.</td></tr>
<tr><td rowspan="2">Flow of activities:</td><td>Actor</td><td>Flashminder System</td></tr>
<tr><td>1. Student requests sign up account.
2. Student or Administrator inserts enters user info (username, email, password, confirm password parameters).</td><td>1.1 Flashminder System responds with Sign up form.
2.1 Flashminder System verifies user info.
2.1.1 If user info already exists, it returns to step 1.
2.1.2 If user info is correct and does not exist in Flashminder DB, it saves the user info.
3. Then, it returns message “Account successfully created” and redirects user to login page.</td></tr>
<tr><td>Exception conditions:</td><td colspan="2">2.1 User account info data is duplicate.
3. User account info is not valid.</td></tr>
</table>

3.8 DATABSE SCHEMA DESIGN



3.9 HIGH LEVEL ARCHITECTURAL OVERVIEW



4. Completion Criteria

The following are the task specific completion criteria.

Activity List			
Task No.	Task Name	Dependency	Completion Criteria
101	User Stories/ requirements gathering	-	User requirements document is complete, reviewed and signed off by each team member, and is ready for Project Specification

102	Prepare Project Specification Document	101	Project specification document is complete, reviewed and signed off by each team member, and is ready for designing System architecture
103	Design System Overview	102	System architecture is complete, reviewed and signed off by each team member and ready for building prototypes
104	Prepare Test Plan	103	Test Plan document with detailed strategy is complete, reviewed and signed off by each team member
105	Build Prototypes – Web/Android/iOS	101, 102, 103	All products are ready for testing
106	Validation	104, 105	100% Test coverage is achieved, Not known serious defect

(Table 2)

The project is considered done upon successful delivery of the products - Web, Android, and iOS applications.

5. Validation Strategy

The project will be done in Agile management model. There will be enough communication and individual interactions to understand user requirements and meet their needs. The project tasks will be divided into reasonable sprints and completed iteratively. The project team will perform unit tests, integration tests, and system tests at various points of development. Documentation will be looked over by each member of the group and signed off by each member over communication channel. The Beta version will be tested by peers and other individuals in our targeted demographic collaboratively to

validate it to meet user requirements, standards, and needs. The project team will gather user feedback timely and will improve the user experience based on those relevant feedbacks.

6. Ethics and sustainability considerations

The project is oriented around everyone's user's learning pathway, focusing on information they do not readily remember or understand. The project will:

- not exclude any user group of age, gender, race, and community.
- not require and be storing any private and critical information of its users (i.e., date of birth, license no. etc.) in order to avoid invasion of privacy.
- not allow any unauthorized access to the system for security.
- provide software accuracy developing appropriate test conditions, performing thorough system validation and verification, and documenting assumptions (if team is aware of them).
- follow best engineering and technological practices to minimize carbon footprints and support for ethical and environmental sustainability.

7. Proposed Timeline

The following is the project execution plan including validation strategies and the allotment of time.

No.	Activity	Week
1.	User Stories/ requirements gathering	2
2.	Project Specification Document	3
3.	System Overview and Design	4
4.	Test Plan	5
5.	Build Prototypes – Web/Android/iOS	6, 7, 8, 9
6.	Product Testing	10, 11
7.	Final Product	12

(Table 3)

Project Approval

_____ _____

Signature Date