Software Requirements Specification

for

Smart Student Assistant (SSA)

Version 1.0 approved

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UCD February

2023

Table of Contents

1. Introduction

1.1 Purpose

This document shall serve as the software requirement specification (SRS) for the first version of the Smart Student Assistant (SSA) application. This SRS is compiled for the benefit of any SSA stakeholders, such as its developers, the client (University College Dublin - UCD), or its future users (UCD students). The purpose of this SRS document is to describe the scope, the functional and non-functional software requirements, and the limitations of the SSA application. The SRS will also serve as a legal contract between the SSA developers and the customer, UCD. The scope of this SRS documentation shall be limited to any matter relating to the SSA product and shall not be enforceable for any other product or purpose. The SRS will thereafter serve as a reference for the SSA product, and will be the starting point for discussions between SSA developers and the customer.

1.2 Document Conventions

The structure and format of this SRS documentation follows the format and terminologies of the IEEE 830-1998 standard. The information in this document is principally sourced from the text of the Assignment I of the Software Engineering course COMP30830 at UCD. Sample SRS files and internet sources were also consulted in the compilation of this document.

1.3 Intended Audience and Reading Suggestions

This document is principally intended for the following audience: the SSA development team, the client who commissioned the SSA project (UCD), future users of the SSA (UCD students), and any other stakeholder associated with the SSA project. Readers of this document should refer to its table of contents for specific directions.

1.4 Project Scope

The purpose of the SSA project is to develop an AI-powered digital academic assistant that helps UCD students to manage their daily tasks. This software is aimed to provide students with a comprehensive solution to streamline their academic and personal life, by offering an interactive user interface, sophisticated natural language processing capabilities, secure data storage, and seamless integration with existing UCD educational tools. The SSA will be based on large language model technologies and in particular shall make use of ChatGPT, a highly popular AI chatbot developed by OpenAI.

The scope of the project, as specified in this SRS, encompasses the entire software development cycle, including the design, development, testing, and deployment of the Smart Student Assistant. The next release of this evolving product, as well as its long-term strategic vision, will be specified in future SRS documents.

1.5 References

1. IEEE 830-1998, Standard for Software Requirements Specifications.
2. UCD Plagiarism Policy
3. Regulation (EU) 2016/679 (General Data Protection Regulation)
4. ISO/IEC 5055:2021 Software Quality Standards

2. Overall Description

2.1 Product Perspective

The SSA project is a new product aimed at helping UCD students to manage their daily tasks and academic life. The SSA shall be available on all common mobile devices, and shall take the form of a personalised interactive platform for its users.

While the SSA is a standalone product, it is designed to be integrated with existing UCD educational platforms and tools. Specifically, it makes use of UCD calendars, timetables, assignment deadlines, and course materials, which it sources from UCD's IT system (Infohub, SISWeb, Brightspace, etc). In addition, SSA makes use of ChatGPT functionalities to process the input it receives from its users and to generate adequate responses.

Readers may refer to the below chart for an overview of the design of the SSA application:
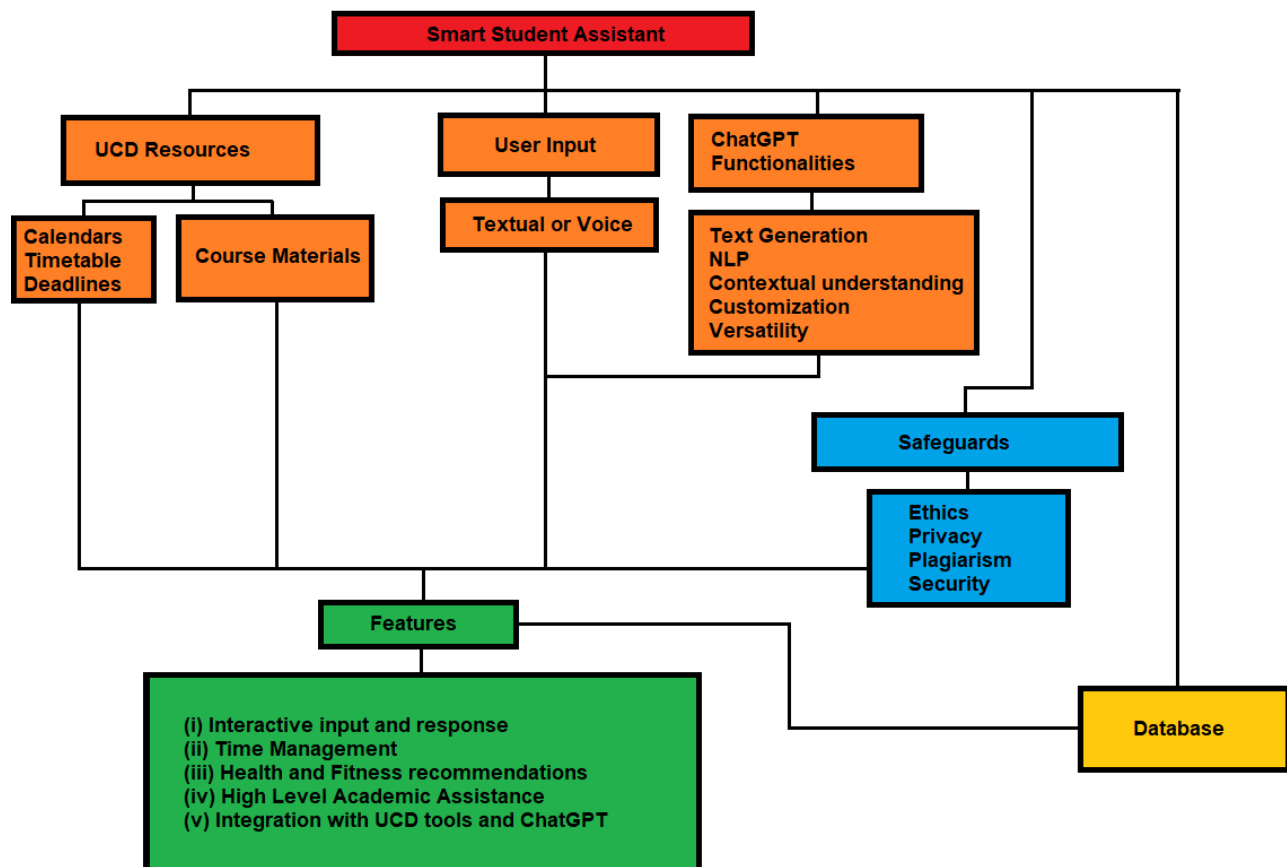
2.2 Product Features

This section will present a general overview of the features of the SSA application. These functionalities will be further elaborated upon in Section 3 of this documentation.

1. Interactive input and text generation

The SSA will have an interactive interface that allows the student to ask general queries to the application or to issue it with a command. The SSA will use NLP to process textual or voice recorded input, and will use its text generation abilities to provide a response.

2. Time management

The SSA application will provide students with time management assistance. For instance, it will be able to set reminders for important deadlines, to generate a timetable of classes and tasks, or provide the student with a personalised study plan according to their needs.

3. Health and fitness recommendations

The SSA will have the optional feature of providing the student with recommendations pertaining to their health and sport objectives. If applied, this functionality will provide the student with reminders such as suggestions for their next dental appointment, various vaccine boosters, or the incorporation of physical activities in their timetable.

4. High level assistance with academic work

The SSA will be able to provide students with high level help with regard to their academic work. This functionality is developed by closely examining the UCD Plagiarism policy and it must be ensured that safeguards are put in place to avoid ethical and plagiarism risks. In addition, this functionality will allow students to generate brief summaries of various sub-topics of their modules.

5. Integration of SSA with UCD tools, ChatGPT, the Safeguard system, and a Database

The SSA will be seamlessly integrated with UCD educational tools (calendars, timetables, deadlines, course materials) to allow it to perform the functions mentioned above. Similarly, it will have a built-in ChatGPT feature to enable its functions, and will be connected to a database to allow the users to save their data and progression.

2.3 User Classes and Characteristics

The SSA shall be designed for the student user class, both at the undergraduate and graduate level. The application is specifically designed for students enrolled at UCD.

2.4 Operating Environment

The SSA will be designed so as to be compatible with the most common mobile operating systems, namely Android and iOS. Given the functionalities of the application, SSA will also be made available on the most widely used web browsers on desktop operating systems, such as macOS, Windows, and Unix. This should allow its academic assistance functionalities to be most convenient for students, as they would be able to directly access this feature on their computers.

2.5 Design and Implementation Constraints

The development of the SSA will be subjected to the following implementation and design constraints:

1. Regulatory constraints

The SSA application's ability to store personal data and provide its users with analytical insights into their activity will be shaped in line with the General Data Protection Regulation. Privacy requirements are particularly important as university students can in some cases be identified as vulnerable persons. In addition, since the application can access medical data it is particularly important to implement privacy constraints to avoid any breaches of medical confidentiality.

2. Integration constraints

Given that the SSA application makes use of third party platforms and services, namely UCD tools (Brightspace, SISweb, etc) and ChatGPT, it is important to note that its design and functioning will be directly linked to the proper functioning of these platforms. A possible failure on the part of these third parties could result in a failure on the SSA application.

3. User interface constraints

The SSA application will be designed in a way that is accessible for as many potential users as possible. Particular attention will be devoted to creating a user interface that is compatible with users with disabilities, although it should be recognised that not all potential users will be accommodated.

These constraints will impact the options available to SSA developers and will shape the overall design and functionality of the application.

2.6 User Documentation

Given that the SSA application is a new product, there currently is no existing user documentation that can be referred to in its regard. However, SSA users can be assured that a comprehensive user documentation will be developed, including a manual and video tutorials that will cover every feature of the SSA application.

2.7 Assumptions and Dependencies

The following assumptions and dependencies may impact the requirements and functionalities of the SSA application:

1. It is assumed that SSA users have access to a stable internet connection.
2. It is assumed that SSA users possess a device that has an operating system compatible with the application.
3. The SSA application is dependent on the third party services upon which the application is reliant. It is required that these are functional at the time of its use. In the event where the third party tools are updated, it may be necessary to update the SSA application to ensure its continued compatibility therewith.

3. System Features

This section of the SRS will further detail the main features of the SSA application, including a description thereof, a ranking of its priority, the expected stimulus / response sequence, and an itemised list of the functional requirements for each feature.

3.1 Interactive interface

3.1.1 Description and Priority of the feature

The interactive interface will allow the student to ask general queries to the SSA application or to issue it with a command. The SSA will use NLP to process textual or voice recorded input, and will use its text generation abilities to provide a response.

Priority - High

3.1.2 Stimulus / Response sequence

- As a first step, the user should input their query or command in the general input box of the SSA application. It should also be possible to input via voice command.
- If the input consists of a query, it will be processed by the SSA application via NLP and its integration with ChatGPT. On the basis of the processing, the user will receive a response in the dedicated response box of the SSA application.
- If the input consists of a command, the SSA application will process it via NLP and execute it if the command relates to a possible feature of the application.

3.1.3 Functional Requirements

- Must include an input / output box for querying on the home page of the application.
- The input mechanism should include a possibility to input via voice and have the application read out its response.
- Must include a system in the SSA to allow it to process the input by the user (through the ChatGPT integration).
- The application must be able to process appropriate requests and reject any inappropriate request.

3.2 Time Management

3.2.1 Description and Priority of the feature

The SSA application will provide students with time management assistance. Specifically, it will be able to set reminders for important deadlines, to generate a timetable of classes and tasks, or provide the student with a detailed study plan according to their needs.

Priority - High

3.2.2 Stimulus / Response sequence

- As a first step, the student should be able to access their university calendar, timetable, and list of upcoming deadlines via the 'time management' page of the application.
- Secondly, the student should be able to configure the SSA application so as to set automatic reminders based on upcoming classes, assignments, exams, or any other deadline.

- Thirdly, the student should be able to add additional elements to their calendar or timetable, to enable them to include any non-university related events to the application.
- Fourthly, the application should have a feature to allow students to automatically a weekly planner based on their standard timetable, and on any other additional tasks that the student wishes to include (sports, medical appointments, study period, etc).

3.2.3 Functional Requirements

- There must be a clear interface displaying the various time management optionalities.
- There must be an input mechanism for the student to input additional events and tasks that are not directly synched from the UCD tools.
- There should be a synchronisation mechanism to allow the SSA to access and display UCD calendar, timetables, and list of deadlines directly in the application.
- The application must contain a program that allows the student to generate their weekly planner in accordance with their needs.
- There must be a mechanism to create reminders and event alerts that appropriately warn the students (in light of potential user disabilities).
- Must include an input / output box for querying on the home page of the application.
- The input mechanism should include a possibility to input via voice and have the application read out its response.

3.3 Health and Fitness recommendations

3.3.1 Description and Priority of the feature

The SSA will have the optional feature of providing its users with recommendations pertaining to their health and sport objectives. Given that this functionality is not directly related to the academic success of the users, it will be implemented as an optional feature. If applied, this functionality will provide the student with features such as reminders for their next dental appointment, various vaccine boosters, the incorporation of physical activities in their timetable, and other similar suggestions.

Priority - Medium

3.3.2 Stimulus / Response sequence

- At the time of setup of the SSA application, users will be asked whether they wish to activate Health and Fitness recommendations. If they choose not to, this can still be reversed in a dedicated tab of the application.
- If the user chooses to make use of this feature, they will be asked to complete an initial questionnaire pertaining to their current health, their health objectives, their fitness objectives, relevant habits, and the timeframe of their latest specialised health consultations (dentists, vaccinations, etc).
- On the basis of the questionnaire answers, the time management section of the application will be completed with additional events relevant to the health and fitness of the user (for instance, reminders to see a dentist every 6 months, to undergo vaccination boosters, to go to the gym, etc).
- Personalised fitness recommendations, such as exercise plans or diet recommendations will be available in the dedicated section of the application. As for dietary recommendations, the application will also propose shopping lists and specific weekly menus that take account of user objectives.

3.3.3 Functional Requirements

- The initial questionnaire should be created with the help of medical professionals.

- Adequate reactions to the questionnaire response should be developed, in coordination with the help of medical professionals.
- The reaction to the questionnaire response should be adequately implemented onto the time management features of the application.
- Dietary and fitness plans as they relate to specific responses should be prepared and stored in a database of the application to be readily available to students.
- Adequate disclaimers of liability should be put in place given the medical nature of the recommendations under this feature.
- Adequate data protection features should be implemented to avoid issues with medical secrecy.
- Adequate accommodations should be made to this section of the application for students with disabilities.

3.4 High Level Academic Assistance

3.4.1 Description and Priority of the feature

The SSA will be able to provide students with high level assistance with regard to their academic work. This functionality is developed by closely examining the UCD Plagiarism policy and it must be ensured that safeguards are put in place to avoid ethical risks. The idea is that students can use this feature of the application to receive pointers and feedback on their assignments and other academic commitments.

Priority - High

3.4.2 Stimulus / Response sequence

- In the academic assistance section of the SSA application, the input section will be made available for students to ask questions relating to their academic work. This input may be either written or vocal.
- The system will initially process the input via NLP technology and will assess the request in light of constraints that will be set up to avoid ethical and plagiarism risks.
- If the request is deemed unethical or risk of resulting in plagiarism, the system will first try to help the student through a generic answer or refuse the request if this is not possible.
- If the request falls within the scope of appropriate requests, the system will make use of its integration with ChatGPT to provide the student with assistance in the form of pointers towards the correct solution or appropriate feedback. It must be noted that the design for the system's assessment of ethical and plagiarism risks will be developed in close connection with UCD personnel to avoid potentially unwanted results.
- The application will have access to all the courses and any other academic materials that are uploaded on UCD's Brightspace, so as to ensure that its replies are as relevant as possible.

3.4.3 Functional Requirements

- An input mechanism will have to be created in the relevant section of the application.
- An NLP based processing mechanism will have to be put in place to allow the application to process student requests.
- A comprehensive assessment system for ethics and plagiarism will have to be developed and implemented in the system, in coordination with UCD personnel.
- A tailored ChatGPT integration will have to be set up for this functionality.
- A response system will have to be set up, both in written and oral form.

4. External Interface Requirements

4.1 User Interfaces

The SSA application will have an elegant and minimalist graphical user interface that will be accessible through mobile devices or on most web browsers on a desktop operating system. The design will be as simplistic as possible to accommodate as many users as possible and to avoid a high-maintenance system that could create confusion for its users. Section 3 of this document also provides recommendations for the structure of the user interface of the application.

4.2 Hardware Interfaces

The SSA application will be compatible with most devices, such as smartphones, desktops, laptops, and will not require additional hardware installations.

4.3 Software Interfaces

The SSA application will be integrated with the following software components:

1. ChatGPT (version 3.18 or higher) for natural language processing and text generation capabilities.
2. UCD tools and educational platforms (Brightspace, SISweb, etc).
3. A relational database for storing and retrieving user data (e.g. MySQL, version 8.0 or higher)

In terms of data flow, the SSA application will receive user inputs in the form of text or voice commands, processed by ChatGPT and in light of information provided by UCD tools to generate appropriate responses. The user data (such as user preferences and history of interactions) will be stored in the database for future use, but adequate privacy and security measures will be implemented to ensure the safety and integrity of said database.

Information sharing protocols will be developed and included in a revised version of these SRS to detail the mechanisms by which the SSA application and the above mentioned software components.

5. Other Nonfunctional Requirements

5.1 Performance Requirements

This section outlines the performance requirements for the SSA application.

1. Response Time: An optimal response time for the SSA application would be within 5 seconds of user input. Critically, it should be noted that the SSA response time should be a factor of both the complexity of the user's query or command and of the availability of its underlying systems (i.e. ChatGPT, etc).
2. Data Transfer Rate: The SSA application must transfer data between the user and the system at a rate that allows an optimal deployment of its features. A standard data transfer rate should be determined during the test phase of the SSA.
3. User Concurrent Access: The SSA application must be able to support at least 85% of the student body of UCD at any given time.

Please note that these performance requirements are subject to change based on user needs and that they will be reevaluated during the development and testing process.

5.2 Safety Requirements

This section of the SRS will outline the safety requirements that should be met during the development phase of the SSA. These requirements are designed to ensure that the product is designed and used in a way that prevents any harm to its users or other parties.

The proposed safety measures are:

1. A mechanism to avoid loss of data or unintended damage in case of system failure.
2. A thorough testing phase to ensure that the SSA application is as safe for its users as possible.
3. Handling of personal and medical data by the system administrator should require adequate authentication and authorization. Throughout the testing process, other events that should require authentication protocols should be identified.
4. Adequate regard should be paid to the legal and regulatory risks associated with the application. To do so, a specialised legal team should be contracted to review the features of the application in detail.
5. The final design of the SSA application should comply with ISO/IEC 5055:2021 Software Quality Standards.

5.3 Security Requirements

This section will outline the security requirements that must be satisfied during the development phase of the SSA. These requirements are designed to ensure that the product is designed and used in a way that protects the privacy and data of its users or other parties.

The proposed security measures are:

1. User identification authentication: A password and identification system should be implemented to ensure that only authorised users have access to their data and the features of the SSA.
2. Data Protection: Encryption of sensitive data, both in terms of storage and transmission, should be implemented. A back-up and restoration system should also be put in place.
3. A Legal team should review the privacy implications of the SSA in light of the GDPR and other standards.
4. A system should be implemented to allow for the deletion of the personal data of users that have left the system.

5.4 Software Quality Attributes

The SSA software should be built so as to be: user friendly, simple to use, reliable, maintainable, scalable, updatable, reusable, and testable. Specific metrics will be created to assess these attributes and will be implemented in future SRS versions.

6. Database Requirements

This section will go over the database requirements of the SSA application. The database should present the following elements:

1. Database Management: An appropriate data management system should be set up to allow the storage of all relevant data associated with the SSA application. The data should be stored and organised in a secure manner that ensures confidentiality and privacy. An efficient system for data retrieval should be set up, along with a search and filtering system. The database should also be scalable, in case the system is suggested to other universities.
2. Data integrity: The database should allow for its data to be accurate and consistent, thus minimising the risk of errors and inconsistencies. Data input constraints would, in this respect, help implement data integrity. Backups and recovery systems should be set up in case of system failures.
3. Data access: robust security measures should be put in place (user authentication at the very least). Role access controls should be considered, with the creation of a hierarchy system to protect personal data. Encryption techniques should be implemented in the handling of particularly sensitive data, and adequate regard should be paid to GDPR requirements.

Appendix A: Glossary

NLP   *Natural Language Processing*

SSA   *Smart Student Assistant*

SRS   *Software Requirements Specifications*

Appendix B: Analysis Models