Mission: Computer Science Question Input and Delivery Template Manager (C-SQID-TM)

DID: Software Development Plan (SDP)

PREPARED by: Team Two(
         Charles Varga
         Ryan Appleby
         Amrithya Balasubramanian
         Chris Devoe
         Danada Amalage Don
         Aleya Mayo
)

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REVISION LOG

REVISION	BY	DESCRIPTION	DATE
a	Team	Initial version	15-SEP-2020

1. Scope.

1.1 Identification.

This Software Development Plan pertains to the development of the Computer Science Question Input and Delivery Template Manager (C-SQID-TM) application and backend question database powering said application. The intended audience includes the engineers tasked with developing the application and its database as well as the test conductors responsible for the verification and acceptance of the application.

1.2 System overview.

The C-SQID-TM application can interface with the backed C-SQID-TM database to store, retrieve, and update the information within the database. The user can manually enter information to both store and retrieve information. The user may also submit a local document to be parsed and stored in the database. In addition, the application allows the user to input values into retrieved questions and save said questions locally without storing them in the database, and will allow the user to export this output to a separate file. The primary user for this application would be Computer Science professors and teaching assistants.
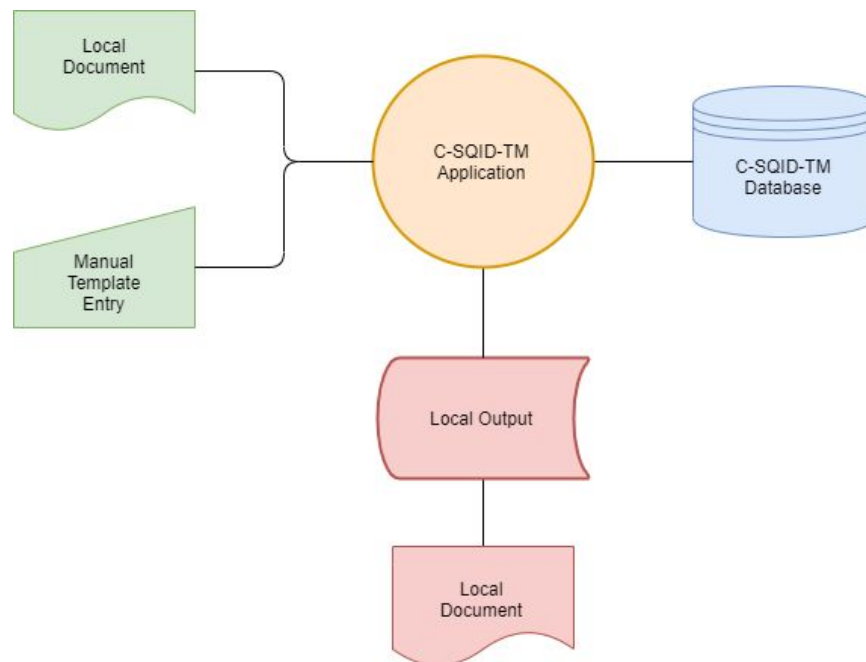
Figure 1. C-SQID-TM Interface

The software outlined in this SDP is responsible for interfacing with the user's local machine as well as the C-SQID-TM database in order to store and retrieve information. The software's overall state transition is shown in Figure 2.
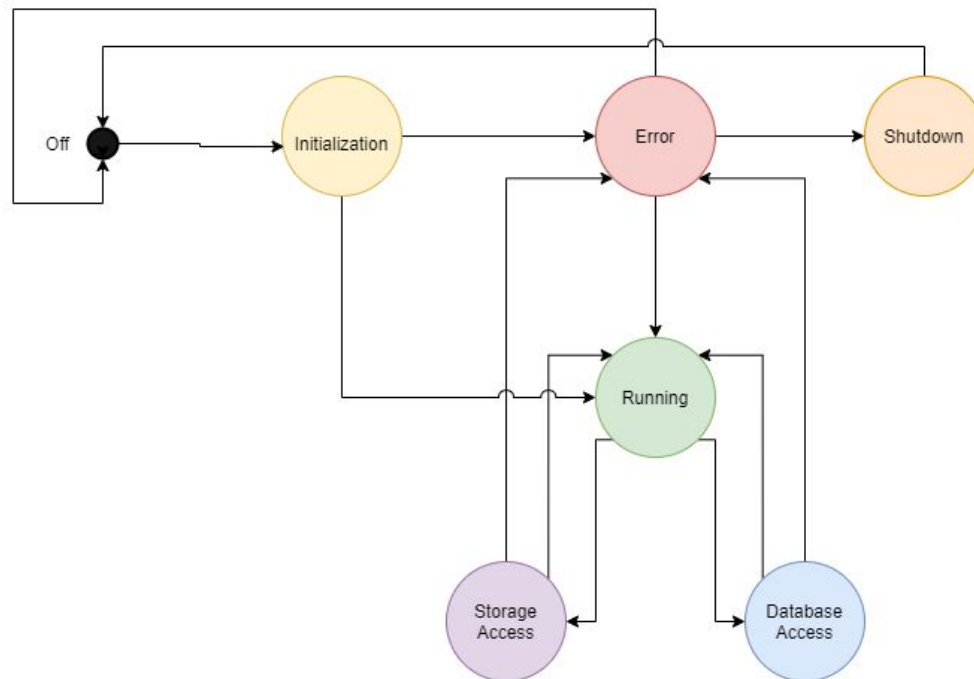
Figure 2. C-SQID-TM State Diagram

1.3 Document overview.

Section 1 describes the scope of the project. Section 2 provides the documents references. A brief overview of the required work is highlighted in Section 3, while Sections 4 and 5, respectively, go into general and detailed software development activities. A schedule can be found in Section 7. Section 7 contains the general organization of the project. Privacy and security concerns are considered to be beyond the scope of this project.

2. Referenced documents.

1. Agile Development: What Does It Mean and How Does This Methodology Work? [Retrieved from: https://www.grossum.com/blog/agile-development-how-does-it-work?id=53]

3. Overview of required work.

3.1 Requirements and constraints on the system and software to be developed

The requirements and constraints for this project will be presented and further explained within the projects Software Requirements Specification (SRS) document.

3.2 Requirements and constraints on project documentation

All DIDs (including this SDP) shall follow the MILSTD-498 template and the contents required therein.

3.3 Position of the project in the system life cycle

Development Plan Phase - Setting punctual deadlines and a path for constant progress to maintain constant software life cycle flow and leveraging team strengths and weaknesses to appropriate responsibilities and define concrete development procedures and protocols. The customer has given feedback regarding specific requirements for the product; the project is poised to enter the Requirement Analysis phase imminently.

3.4 The selected program/acquisition strategy or any requirements or constraints on it

The software will be developed as a web application as per the requirements stipulated by the client. Currently, the product is set to be developed using mostly python and/or javascript web framework technologies, including but not limited to Django, flask, and frontend javascript technologies such as React. The product has also been planned to incorporate database services for backend functionality, to which end MongoDB/MySQL will be utilized. No other dependencies have been ascertained as of the current project phase, but this may be subject to change.

Since our product is designed to be scalable and open, privacy and security are not major concerns and are out of the scope of this project.

3.5 Requirements and constraints on project schedules and resources

The project is split into seven different phases, first with Kickoff phase, next is the Development Plan phase, Requirement Analysis phase, Design phase, Implementation phase, Testing phase, and finally the Presentation phase. The project will also have different software and hardware resources such as Google Drive, Discord, GroupMe, Blackboard Collaborate, GitHub, A Python programming environment. The team will also use their own personal devices for the project's development. There will also be a time constraint on the project, as time is the project's major budget.

3.6 Other requirements and constraints, such as on project security, privacy, methods, standards, interdependencies in hardware and software development, etc.

For the project's security, the development team plans to add a system to help keep out low-quality questions and a system to keep out unauthorized users. There are no privacy concerns within the scope of this project.

4. Plans for performing general software development activities.

4.1 Software development process.

The team shall develop C-SQID-TM using the Agile software development process. By doing so, the team will build the application through an iterative approach, where the team presents new additions to the application as the development is underway, and when new additions are ready. The team has concluded that this process works well for the intended application since the customer is a professor, and it directly benefits professors. The Agile process will also allow us to set deadlines for various goals and features, while remaining flexible enough to either add or remove goals as needed and adjust our schedule accordingly.
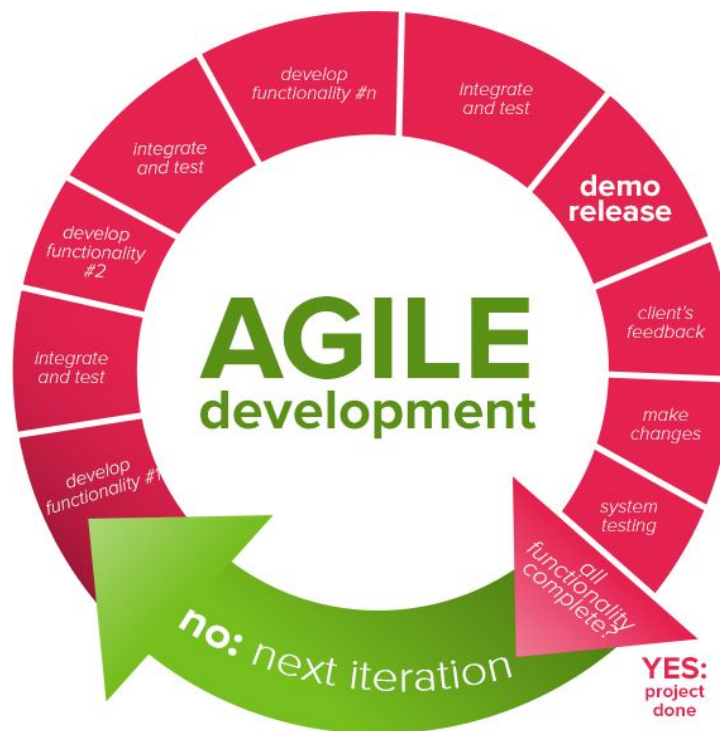

Figure 3. The Agile Development Process [Available:
https://www.grossum.com/blog/agile-development-how-does-it-work?id=53]

4.2 General plans for software development.

The team will make use of GitHub for version control of the software development. The repository shall be private to limit access to the developers only. Upon release of the application, the team shall make the application accessible to professors.

The team expects the majority of this application to be programmed in Python, so the team shall abide by the Python Enhancement Proposal 8 (PEP8) standard for coding. Tools to enforce PEP8 compliance are listed below.

Pylint: https://www.pylint.org

Autopep8: https://pypi.org/project/autopep8/

Flake8: https://pypi.org/project/flake8/

Currently, the product has been poised to take a python heavy path of development. Django and Flask are currently the two main frameworks being considered. Depending on forthcoming needs, the tram may opt to base the application off of Django rather than the lightweight Flask framework, as Django offers a wider full stack range of development tools and capabilities. Javascript is also another relevant but smaller consideration at the moment. Javascript technologies may prove viable if a need for it arises further down the software development life cycle.

4.2.2 Standards for software products.

The codeset will be built on the foundations set forth by the IEEE Software Engineering Body of Knowledge. All code shall be developed with defensive coding principles to ensure the best performance and quality, as well as reduce the time required to debug issues.

4.2.3 Reusable software products.

The only reusable software product currently identified is the C-SQID-TM question bank database.

4.2.3.1   Incorporating reusable software products.

At this time, there is no plan to incorporate a reusable software product.

4.2.3.2   Developing reusable software products.

While our front-end application is designed to be specific to computer science, our back-end database will be versatile and adaptable to other courses that need access to similar question bank features.

4.2.4 Handling of critical requirements.

4.2.4.1   Safety assurance.

There are no safety assurances provided by this application.

4.2.4.2   Security assurance.

In order to prevent the database from being overrun with low-quality questions, there will be some sort of moderation feature that will flag potential poor questions for removal. In addition, there will be a log-in feature that prevents unauthorized access to our application and from our database.

4.2.4.3   Privacy assurance.

There are no privacy assurances provided by this application.

4.2.5 Computer hardware resource utilization.

Since our software is a web application, computer hardware resources will be managed by a user's web browser.

5. Plans for performing detailed software development activities

5.1 Project Planning and Oversight

The development team made up of six members are assigned to various roles essential to the development of the software application. Roles such as software developer, software designer, and testing the software is assigned to members of the group. Development phase is broken down into phases of development plan, analyzing requirements for the application, creating a design plan for the application, implementing or development of application, testing or verifying the use of the application, and finally presenting the application to the consumer. Once the application requirements are satisfied, the designers are tasked with creating the architectural design and in the implement phase the developers can use coding language to develop the physical application. Individuals tasked with testing out the application shall implement test scripts to test the potential constraints of the application.

5.2 Establishing a software development environment.

We will use the Python programming language mainly to construct the software application. We shall utilize a common development environment such as PyCharm or IDE to construct the application.

5.3 Software requirements analysis.

Other than requirements that are needed to build the application, there are also requirements demanded by the customer. Such requirements can be functional, meaning on what platform to

construct our application, or implementing methods to interact with our database of choosing. Performance testing is also a key requirement that is essential to make sure application works efficiently and effectively. Security and error handling is also essential in a web application such as ours. The application should be accessible to authorized personnel only and should not pose errors.

5.4 Software Design

The design of the application will be broken down into separate modules that will come together to create the software application. In the design phase we will start with low level modules such as interacting with the C-SQID-TM database, and creation of template files. Then we will work our way to high level modules such as user interface, and application security. Then at the end all modules would come together to create the software application.

5.5 Software implementation and Unit testing

Before presentation of the application, there should be various stages of testing that need to be conducted in order to make sure application design and requirements are satisfied. Software requirement specifications should be analyzed one by one to make sure the application passes all requirements. Then there needs to be testing upon the application itself, and make sure it performs in the manner specified by the design plan. Testing should be done on how the application runs and performs tasks such as retrieving template files. Testing needs to be done to make sure the application is interacting with the database correctly and obtain appropriate template documents requested by the user. Application should also be tested on unexpected circumstances, such as trying to retrieve a template document that does not exist within the database we are using, and also apply constraints in a way so templated files are not altered wrongfully by the user.

5.6 Software Configuration and Management

We will primarily use Github as a platform to manage source code or other important files needed for our software application. All the members of the team will have access to Github, where each member can manage and track any development done to the software application. Using Github is beneficial since sharing and management of important files can be done easily.Other important documents such as the SDP would be managed using the google drive which offers an easy to access file sharing platform.

5.7 Corrective Action

Bug fixes and error handling will mostly be done through unit testing, and software testing in general.

6. Schedule and Activity Network.

Semester Timeline

01-SEP-20	08-SEP-20	22-SEP-20	06-OCT-20	20-OCT-20	10-NOV-20	01-DEC-20
Kickoff	SDP	SRS	SDD	STD	STR	SUM
Assign Groups	Development Plan	Requirement Analysis	Design	Implementation	Testing	Presentation
Brainstorm topic/idea to be implemented.	Create the development plan. Creating a general plan.	Analyzing requirements for the software development plan.	Planning or design phase of the software application.	Creating the software application.	Testing Application/ Verification of the use of application	Present the application to the customer.

Activity Network

7. Project organization and resources.

The project is separated into different sections or phases; the first of these phases will be the kickoff phase and will end with the final phase which is the presentation. The kickoff phase is where the will team brainstorm an idea for this project. The Development Plan phase is where the team will be creating and developing a general plan for the project. The software development plan (SDP) documents will be completed at the end of this phase. The Requirements Analysis phase is where the team will be analyzing the requirements for the software development plan. The Software Requirements Specifications (SRS) documents will be completed at the end of this phase. The Design phase is where the team will be planning or designing the software application. The Software Design Description (SDD) documents will be completed at the end of this phase. The Implementation phase is where the team will be creating the software application. The Software Test Documentation (STD) documents will be completed at the end of this phase. The Testing phase is where the team will be testing the application and verifying the use of the application. The Software Test Report (STR) documents will be completed at the end of this phase. The team will aim to remove any lingering issues and to confirm the software runs as intended. Finally the Presentation phase is where the team will present the final project to the customer. The resources and the planned organization that will be involved with this project are shown in the paragraphs below.

7.1 Project organization.

With the schedule that is shown in section 6 and the above paragraph, the project is separated into seven different sections. The team will be assigned into different roles, these roles are shown here:
- **Project Manager** - The manager of the organization. Responsible for keeping track of each team's progress and consolidating information to keep up to date. Work with teams to develop an effective plan to keep project development on track.
- **Software Developers** - the team responsible for writing and developing the majority of the code within the project.
- **Software Testers**- the team responsible for developing test documentation and scripts to test the functionality of the project.
- **Software Quality Assurance** - the team responsible for detecting and solving problems, with the goal to deliver the intended product.

The roles shown above will work together to complete the project, and all with the same goal of delivering a finished project by the end of the Testing phase for the Presentation Phase. The Project Manager will help to keep the rest of the team on track for deadlines as well as to ensure that the project is keeping to the requirements that are determined. This role will also help any of the other roles if needed. Software Testers and Software Quality Assurance will work with the Software Developers to ensure that the product is functional and is the intended product. The entire team will help with software development and when needed they will move to a different role to work on either testing or quality assurance. The entire team will also work together on the documentations and the presentation.

7.2 Project resources.

The resources allocated for this project are split into two major categories, one being the budget of time and the other being the hardware and software that are being used. First to look into the resource category of time, as this project does not have a real monetary budget, time becomes the real constraint that will affect this project. With putting a major focus on time being a resource that is being budgeted it allows for the team to budget their own time wisely to make sure that there is enough time for each and every phase of the project to meet its deadline.

The second category is the hardware and software resources that are being used in this project. Due to COVID-19, the project team will be working remotely using software resources such as Google Drive, Discord, GroupMe, BlackBoard Collaborate and GitHub. The project also will have software resources for a Python programming

environment and a database that will be used for this project. The resource Google Drive is being used to collaborate on and to share documents between the team. Discord and GroupMe is being used for the development team to communicate through messages and giving the possibility for the team to hold online meetings. BlackBoard Collaborate has been used for video meetings between the team. GitHub is where the team will be able to collaborate on their code and allows for keeping the entire team's code together. For the software, the programming environment the team will use will be a Python environment, this will mean that the team will be developing this project with Python as the programming language. The only software resource that the team needs to still decide on is the database for the software to be developed with; this resource will be decided by the end of the SDD phase. The hardware resource that is being used, due to working remotely, will be left to the teams personal equipment. All of these resources are currently available to the project team.