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Student Capstones

Honours Bachelor of Computer Science (Mobile Computing)

Fall 12-10-2021

Sheridan Self

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SHERIDAN SELF

HIGHER-ED | CAPSTONE PROJECT HONOURS BACHELOR OF COMPUTER SCIENCE (MOBILE COMPUTING)

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ABSTRACT

The purpose of this mobile app is to provide the Sheridan students, the tools and the personal space to design and map their own development process. This process is essential as it is used to set goals and improve efficiency and productivity to make students more agile and resilient and enable them to reevaluate their goals based on the data collected. The ideal solution is to create that virtual space to allow them to self-asses with daily/weekly reflections, then set goals accordingly to find relevant opportunities and resources. By providing this platform, students would generate their own data to monitor their progress and drive their success. They would also be able to share their experiences with other students who are looking for guidance.

ABOUT CAPSTONE PROJECTS

TIMELINES • PROGRAM • SCHOOL

- January 2021 April 2021: <u>Capstone Project Inception</u>, 4-credit course (18 hours / week)
- **September 2021 December 2021**: Capstone Project, 4-credit course (18 hours / week)

PROGRAM • SCHOOL

- Hons. Bachelor of Computer Science (Mobile Computing)
- Applied Computing, Faculty of Applied Science and Technology





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INTRODUCTION

This document will cover two areas of computing, mobile and cloud, discussing some of the platforms, such as Visual Studio and Microsoft Azure, and the programming languages that it will be using, such as, Xamarin Forms. It will present the key functional areas of mobile computing, as well as showing its architecture, the wireframe per functional area and the implementations, such as, navigation of common U.I. The document will also discuss some of the risks associated with the mobile app and its implementation. The project plan will show the roles and responsibilities of each member in deploying and launching this project out in the real world.

PROJECT OVERVIEW

Sheridan Self-Scape is a project that presents a significant opportunity for students to contribute to a cutting edge and sought-after innovation in post-secondary learning and development. The team consists of three members i.e., Vivek Gupta, Timothy Catibog, Syed Faaiz Rehan and Magdin Stoica as the Faculty Supervisor. Our Domain experts are Dr. Cherie Werhun and Vinita Sood.

The main goals of this product are to help students with self-preparation, planning and design their own person, and to develop their own intelligence. This will be achieved by creating a virtual space for each student in which allows them to see, organize and review their experiences; provides tools for fostering self-development and prompts them to initiate self- assessments. The space will act as tool to allow student to think and evolve as they embark on their journey through Sheridan to becoming a well-rounded individual and professional who possesses the resiliency and agility to adapt to the changing landscapes within their desired career and profession. Furthermore, students will engage in this app based on three functional areas, think, where students are able to write reflections and describe how they feel about certain challenges, relate where students reflect on the opportunities they create as well as any experiences they've gained throughout the semesters and finally innovate, where students set their own goals.

DOMAIN AND INDUSTRY OVERVIEW

The industry/ domain that exhibits the identified problem is:

a). Educational services (61)/Educational Services (611)/Community colleges and C.E.G.E.P.s(6112)/Community Colleges and C.E.G.E.P.s (61121).

Overview: This industry Comprises establishments primarily engaged in providing academic or academic and technical, courses and granting associate degrees, certificates or diplomas that are below university level. For example: Community Colleges, Post-secondary, post-secondary non university.

Businesses: Establishments (638), 0-99 employees (62.3%)

Financial performance (2018): Average Revenue (608.8k), profitable (78.1%)

b) Educational services (61)/Educational Services (611)/Universities (6113)/Universities (61131)

Overview: This industry comprises establishments primarily engaged in providing academic courses and granting degrees at baccalaureate or graduate levels. The requirement for admission is at least a high school diploma or equivalent general training for baccalaureate degree.

Business: Establishments (253), 0-99 Employees (41.8%)



Financial performance (2018): Average revenue (178.1K), profitable (96.8%)

PROBLEM DESCRIPTION

The students of 21st century are totally equipped with sophisticated technical competencies and capacities to be the leaders within their industries but lack the self-awareness to uncertainty, complexity, unpredictability and the social impact they have. Students do not have the tools to bring out their true potential in their work of field. The lack of communication and development process restricts their understanding of leadership and self-awareness. The biggest problem is that they are not able express and share their experiences that would later help them in their journey of evolution, and improved technique. Due to this, the self-learning is not used in student's mindsets for them to set and achieve goals. Recent events have highlighted the need of self-development within students to work with the pace, the diversity and the unknowns they will face within their careers.

An Application of this relevance and creativity will provide benefit to Higher education Community. Sheridan Community would directly benefit from such a solution. Sheridan College has a big impact on the market as thousands of students graduate every year.

Environmental scanning in both higher education and educational technology confirms that an application of this relevance and creativity does not exist and would be game changing to a number of industry areas. Therefore, this project presents a significant opportunity for students to contribute to a cutting-edge and sought-after innovation in post-secondary learning and development—one that will not only meet industry expectations for meaningful self-capacity development in post-secondary graduates but will support student development of their whole selves, aware of their strengths, their areas of growth, and their 21st century potential.

SOLUTION DESCRIPTION

Sheridan Self will be using mobile computing to allow student to be more agile and resilient. Research indicates that students especially young people often use mobiles than desktops. Due to this, it will allow students to freely share their experiences on the dot and whenever they feel like it. Furthermore, this application will save student's time, money and will allow a primary communication tool that can be used to prepare and develop their growth mindset. Cloud computing will allow the system of this application to connect with admin in Sheridan college, providing content that will be stored and managed. Through cloud, admin will use these features for data analytics: any information relating to students that is currently available to provide a great understanding and observations of student's self-development. For advance area of research, we will be using Data Analytics as the primary area. Admin/Staff will use data analytics to provide insights on the student's self-development process.

Sheridan Self aims its students to become effective leaders in area of expertise by creating a personal space for an active mindset growth that will essentially enable them to connect and share their experiences with critical self-reflections. This will ultimately allow the students adapt to the unknowns and fast pace challenges that they will face.





Mobile Computing

As the project should be available to all users therefore, we decided to build a cross platform application using Xamarin Forms. This app is being developed using Visual Studio IDE. As said earlier this app is cross platform therefore is available for iOS, Android devices and can be accessed by a web browser as well. All of this is done by single shared codebase. The web app is also for the administrators and managing staff of the app. We are using Model-View-View Model design pattern in order to make the code more testable and easier to extend without requiring radical changes.

Cloud Computing

The Project is utilizing several Microsoft Azure services in order to accomplish the goals outlined in the solution description. The backend web API is hosted on Azure App Service connected to an Azure Cosmos DB, providing the Application with several endpoints to communicate with other users and connections to other services provided by Sheridan College. From a developer standpoint, we are using Bitbucket, Circle CI, and Azure Deployment Center to provide an environment in which we can automatically build and test the application before deploying it to the Azure stack, attempting to ensure that we consistently deploy a high-quality product and service.

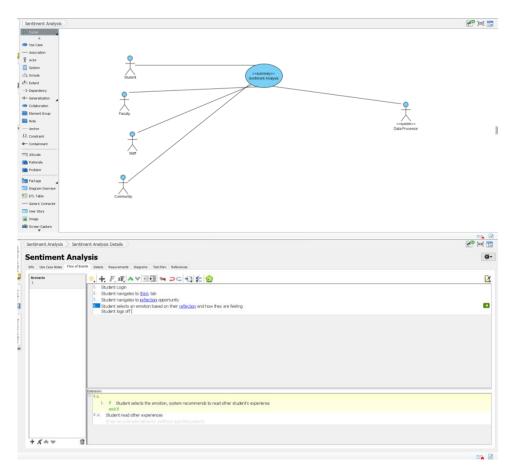
Advanced Areas of Computer Science

There are many advanced areas of computer science that can be and will be leveraged in the full implementation of the project. The most critical areas to be tackled are:

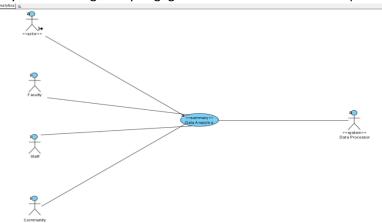
- Cognitive Computing/ Machine Learning
- 2. Data Analytics

Cognitive Computing is the use of computerized models to simulate the human thought process in complex situations where the answers may be ambiguous and uncertain. Cognitive Computing is very essential in solving this problem as to solve this type of problem requires a vast amount structured and unstructured data to be fed to machine learning algorithms. Over time cognitive system can identify certain pattern and thus becomes capable of anticipating new problem and model possible solutions. Therefore, we decided to use Sentiment analysis on student's reflections for opportunities in order to get their emotion from reflections and then recommend them to read other students experiences.

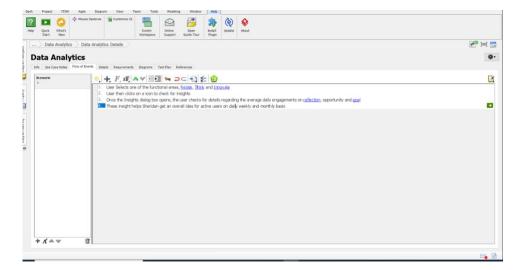




Data Analytics is one of the efficient tools in discovering the relationships, trends and other useful information existing in a body of data. Data analytics can be uses in predicting rather than traditional approaches which either focuses on historical data or a normal distribution of data thus we can use a Data analytics approach towards this solution. We are using data analytics in order to get active users on daily weekly and monthly basis as well as to analyze the average daily engagement of users in order to improve other functionality of the app as well.







SOLUTION IMPACT

This project will help student with time management, organization and planning and self-growth. It will prepare the Sheridan students with their journey out in the field by providing reflections and self-assessment that they would use throughout this application. They can look at the past reflections and improve upon that by using different techniques and approaches to solving their problems in the work field. It will also help them with self-development on different dimensions. These dimensions include personal, professional and social.

SOLUTION FEASIBILITY

The feasibility of this solution includes identifying the risks, such as, making this project as relatable to the students as possible to ensure that the system is more personal, engaging and relevant to what they study for courses. It should not feel as if the student is being assessed but more as a service tool. This system will allow personal connection with other students by the sharing of experiences.

Design and Construction

The feasibility of this solution is to help Sheridan Students better manage their progress in the courses by working with the different faculty and staff to organize the student's data/information. This project aims to meet the organization requirements by making relevant information available to student with similar programs and to help achieve their goals allowing them to share their experiences.

The risks that have been identified with this project are the following:

1. Making this project too big and broad is seen as a potential risk. The team's goal is to allow students to put as much information as they can in order to motivate them to be more agile, resilient and It should allow them to feel that personal space for that they can use in their journey. Design this application, in terms of general content could make them feel out of place and thus could lose their interest in using this application.



- 2. The personal space that is going to be implemented should not feel as an assessment or a test. Students should view the application as an opportunity tool to enhance their skills by writing on this personal space. In other words, the design aspect, UI and the terms are critical when deploying this application.
- 3. Quality and credibility of the system. As the students will be sharing their personal reflections, daily journals etc. the system should be able to provide a sense of security and privacy to user's data. In addition to it the app should be able to provide its users the ability to report anything that they feel is inappropriate.
- 4. The app should be able to integrate with the existing system used by Sheridan college such as ORBIS, Slate, Sheridan Portal and Microsoft etc.

Deployment

In terms of deployment, the team hopes to integrate this application with existing system of faculty and staff, such as, ORBIS, Slate, Sheridan Portal and Microsoft 365. The aim of this project to meet the user requirement such as, Sheridan's students by integrating the whole S-Factor into the system. Although it up to the student to design, map their own creativity in creating and meeting their goal, the project will provide qualitative analytics to connect students with other courses and other Co-ops. However, students must generate their own question to develop their own intelligence, such as, daily/weekly questions. Finally, the system will pair the students with identical or similar assessments and provide them with the opportunity to think, structure and self-assess.

Adoption

After the deployment of the app in order achieve adoption and get users to download and use it, we will use different strategies like:

- 1. Marketing efforts: The App will be marketed throughout the college with the help of various incentives like coupons, gift cards etc. as well as students will be educated about the app with the help of Sheridan's staff and applications like SLATE etc.
- 2. Value Proposition: Every time a student achieves a S factor quality by going through various activities, he/she would be awarded points. On completing different milestones achieving these points students can post it as achievement as well as can be given various incentive or opportunities accordingly.
- 3. Building App loyalty: To encourage regular use of the app the app will integrate with Sheridan apps to offer various alerts and updates thus making it more often for them to use it and hence it will become habitual.

PROJECT REQUIREMENTS

SYSTEM CONTEXT

The system will contain the following project stakeholders as primary actors: Sheridan's students. Its supporting actors include staff, faculty and community that will not only develop student's S Sense mindset but also directly interact with the system as well engage with the students to provide learning opportunities. The off-stage actors are identified as IT and administration that will require data privacy, access to necessary information and if the system





can obtain feedback from students. The main top level use cases that the system should carry are Think, Relate and Innovate.

USE-CASES

The use case "Innovate" allows the user, student, to set goals, brainstorm using a planning wall technique and use the process, such as, design thinking which would allow them to question what they are creating, why they are creating and how are they doing it. This process evaluates students over stakeholders, allows practical creativity which is to help students cultivate and generate their own sets of ideas. This process mainly focuses on the knowledge of students to help converge the decision making. Therefore, students can enter their goals in this application for whatever skills sets they want to achieve. This application will also help them plan for extracurricular activities, such as, Hackathon and coding clubs.

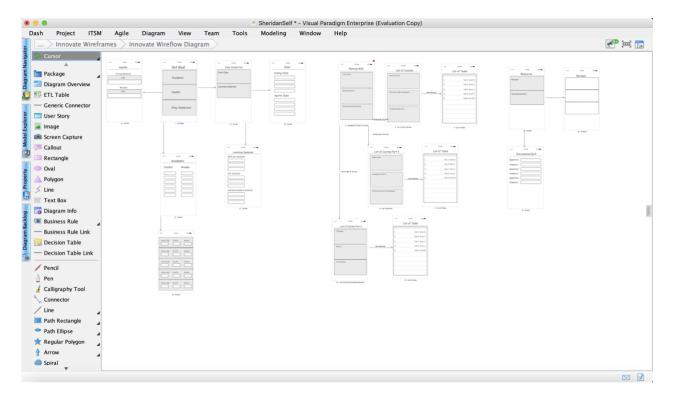
The use case "Think" focuses on motivating the user to Think. It allows the user to reflect on the opportunities provided by other users or stakeholders. It analyzes their reflections and help them by recommending experiences related to that opportunity using the same tags. It also allows user to maintain a personal Journal with customizable formats as well as preselected journal formats. Adding to it, it also gives different tips every day to motivate user with his daily activities.

USER INTERFACE

For Innovate, the user will be provided with two tabs, goal and experience. The user will first navigate to goal where they will be presented with a list of goals that are created or to be created. There will also be add button where the student will be navigated to a form from which they are required to enter a title and description of the goal. The student will then click on the save button to save that information. Depending on what they have inputted, that information will be then saved and displayed back the goal page from which list of Goals is created. The user can also delete a goal by clicking on the selected item and then click delete to permanently delete that information. The second tab is for student experience. Once the user clicks on the engage button in the Opportunities tab under relate, they will automatically be navigated to experience under innovate. The same information that was in opportunity will displayed in experiences. The information will also be saved in a different table from the opportunity table. In addition, the student can also add a plan for each experience created. This is achieved by clicking on the selected experience which will lead to a new form where five questions are presented. The user is encouraged to answer these five questions and then click on the save button at the top right corner. These five answers will then be saved in the database and so the user will automatically be navigated back to the Experience homepage. Those five answers will be presented along with experience previously created.

Innovate Wireflow Diagram:

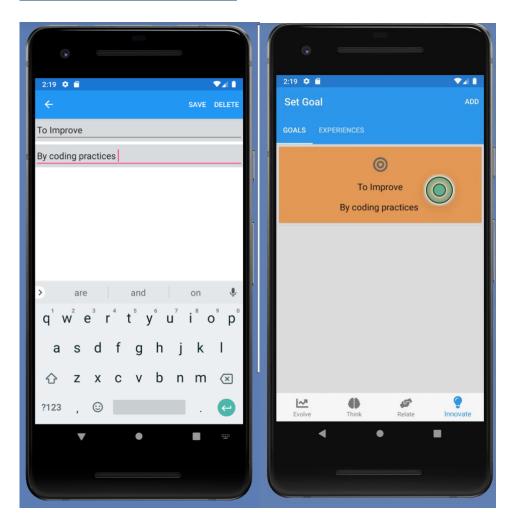




Implementation Screenshots:

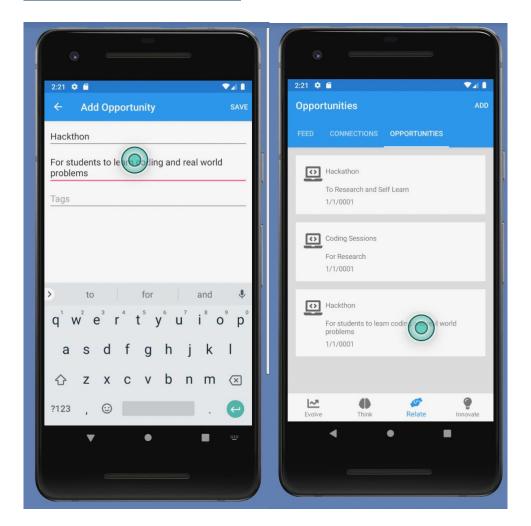






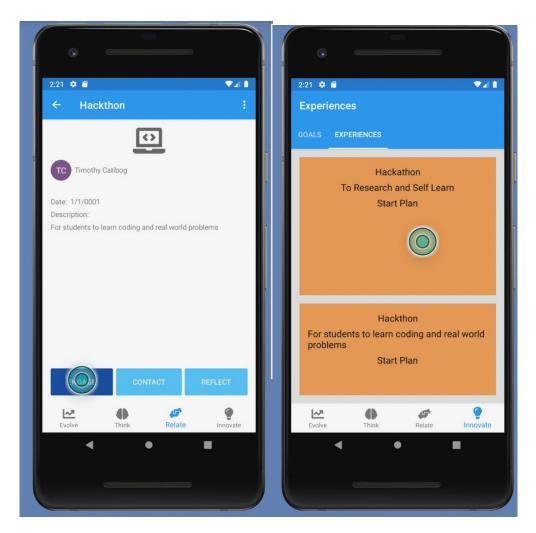




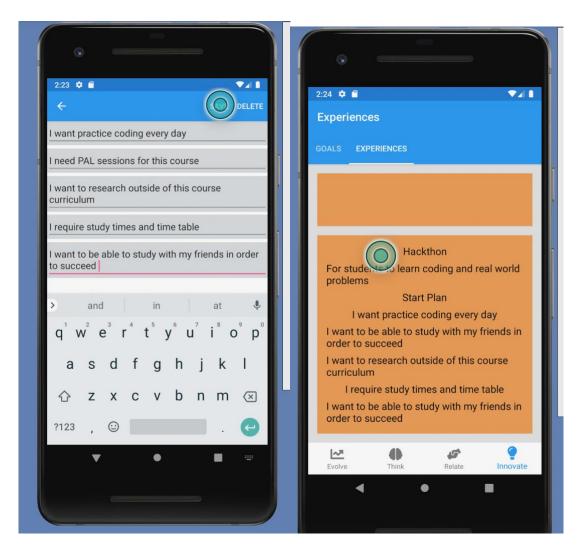












For think The UI is as follows:

For the think functional area, the UI was initially designed in a button formed which was later changed to tabbed form to go from one functional area to another. The opportunities tab of think functional area is connected to list of

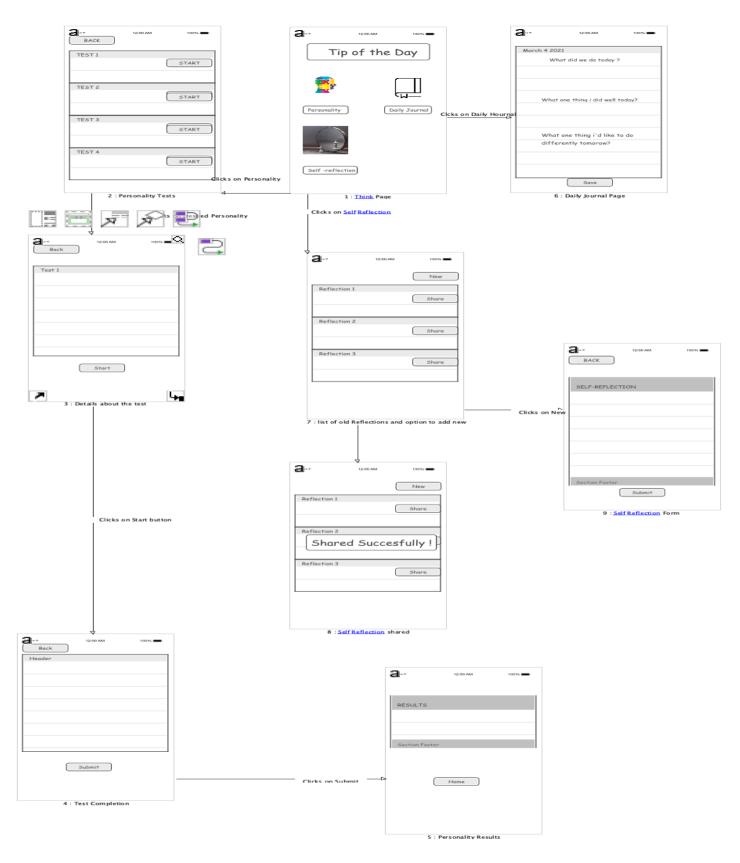


Sheridan Self CAPSTONE PROJECT 2021

opportunities in relate. When a user wants to reflect on an opportunity, he will be clicking on reflect button and will reflect on it. The list of reflection he has already done will be shown in the reflections tab. The user can also edit their reflections from there. These reflections will then analyze and deduct some tags from there in order to deduct how the user is feeling about the opportunity and based on that the system will recommend reading some experiences with the same tags. In addition to it there is a daily journal tab where user is able to maintain a personal journal. Also, the user has an option to either follow the already set format of the journal or they can create their own format. The initial Wireframes Wire flow Diagram of the system,









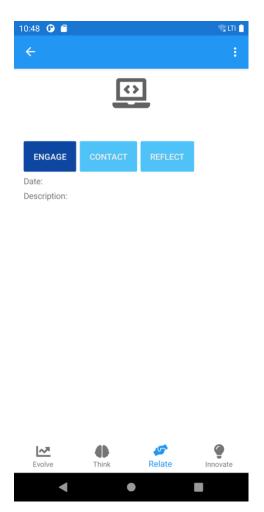


While the concrete Application screenshots are as follows:

Reflection button shown on the details page of opportunity. When user clicks on reflect goes to the reflection details page where he/she can reflect on the opportunity and then clicks save. The saved reflection will be shown on the list of reflections.

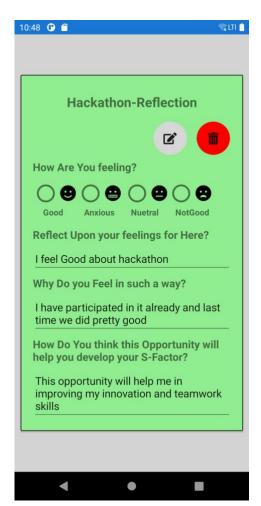






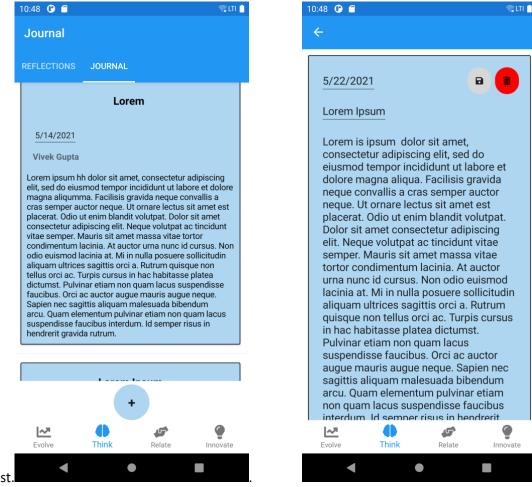








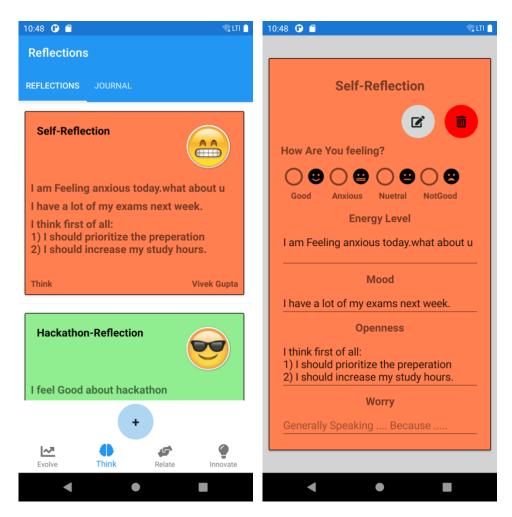
Journal Page with the list of already done pages and one new page with the default format. These pages are being saved in local database using realm database. The user can also delete them by just sliding them to left side from the



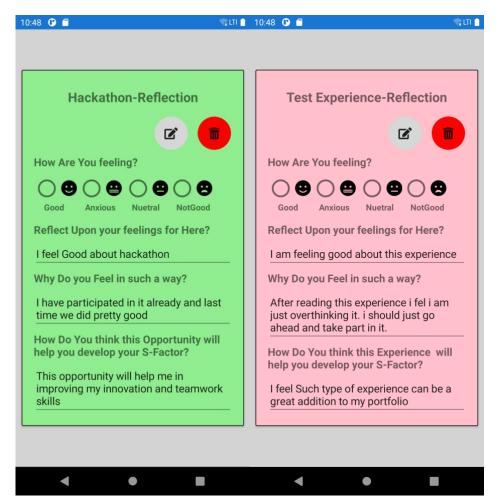
Reflections list Page containing all type of reflections created by user. Different type of UI for different type of reflection.











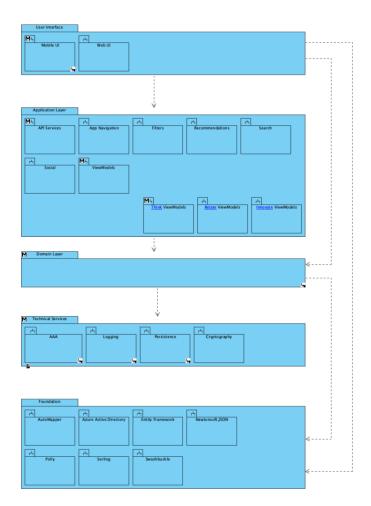
PROJECT ARCHITECTURE

Visual Paradigm Link: https://online.visual-paradigm.com/w/ezzefsjv

ARCHITECTURE OVERVIEW

The project will use layered architecture, such as MVVM.





SYSTEM COMPONENTS

The first component of the system is the User Interface which contains mobile and web U.I. This component is responsible for directly interacting with user and displaying the output of what user inputs. The second component is the Application Layer which contain the view model of different uses cases, such as, Think, Relate and Innovate.

DEPLOYMENT MODEL

The system will be deployed on Cloud Server with execution environment as ASP.NET Core which will be generating a DLL. This DLL (Dynamic Link library) will be providing a Web API that will enable the software to interact with other software programs such as SLATE, ORBIS etc. Also, we will be using a database management system in our cloud server in order to generate a Database API. This will enable us to interact with the engine directly. As part of



our Data Analytics system, we will generate a Machine Learning model that will be deployed on the web server for it to consume in order to make better decisions with which data it serves to specific users.

As the software being built is for different type of devices which includes iOS smartphones, Android smartphones, Wearables, tablets, Web browsers etc. Android APK is generated for the Android smart devices that are executing under Android 10 environment, Android Smartwatch devices that are executing under WearOS environment, Android Tablet Devices that are executing under Android 10 environment while iOS IPA files are generated for iOS Smartphone device that are executing under iOS 14 environment, iOS smartwatch devices that are executing under Watch-OS 7 environment and iOS tablet devices that are executing under iPadOS environment. In addition to it an additional web app will be deployed that can be used by administrators to manage information or the students themselves can use it as well. This web that is generated will be using web assembly that will be running the code on web at a near native speed and will be using a web storage as well for storing client-side data.

PROJECT PLAN

The plan for this project is to analyze the first iteration process: Database Design, Mobile and Cloud technologies and continues integration and delivery. Then to identify the risks, such as, poor application performance, app unresponsive service etc. Then we will look at the strategies to reduce these risks.

Task Breakdown and Iteration Plan:

https://sheridanself.atlassian.net/browse/SELF

Project Responsibility	Vivek Gupta	Timothy Catibog	Syed Faaiz Rehan				
Project Management							
	,						
Project Owner			✓				
SCRUM Master		✓					
Risk Analyst	✓						
Requirements Engineering							
Requirement / Business Analyst			~				
Stakeholder Champion (by	Faculty	 Students 	Staff				
Stakeholder)	CommunityBroaderEducationalLandscape	• IT	Senior Leaders				
Functional Area Champion	Self-reflect	Self-author	Core content				
(by Functional Area)	 Experiences 	 Self-assessment 	 Authoring process 				



	 Content administration 	 External systems connections 	Data analytics	
User Experience Design Lead			<u> </u>	
	Software A	rchitecture		
Software Architect		✓		
Requirements Lead			✓	
Domain Model Lead			>	
Design Model Lead	✓			
Deployment Model Lead		✓		
Interaction Model Lead	✓			
	Consti	ruction		
Full Stack Developer (UI,	✓	✓	✓	
Code and Unit Testing)				
Integration / DevOps Lead		✓		
Testing				
QA Lead		✓		
Verification and Validation	 Self-reflect 	 Self-author 	Core content	
Champion (by Functional	 Experiences 	 Self-assessment 	 Authoring process 	
Area)	Content administration	External systems connections	Data analytics	
	aariii ii saaci	Connections		
Test Model Lead			✓	
Support				
Tool and Devices Support		✓		
Communication Support			✓	

ITERATION PLAN

Inception Release

This release is to lay the foundation for the project which will include the design and creation of the cloud infrastructure, the base mobile and backend skeleton projects created, the tools for Continuous Integration and Continuous Delivery have been properly setup and implemented, and the rules for access management with the application have been applied. These tasks are required to lay the groundwork for future releases.

Elaboration Release

The elaboration release is when many of the core features have been developed and implemented into a more cohesive product, along with establishing a common design language for any of the interactions that will happen





within the application. The collection of anonymous usage of the application will have been setup to allow for future data analytics processes to derive any potential valuable insights.

Alpha Release

This release will contain all of the core features that we initially set out to develop and allow us to begin to focus on improving the quality of the application with regards to features and user experience by optimizing the build of the mobile application using Microsoft production build tools (e.g. Linker, fast renderer, layout compression, asset optimization). We may begin to explore the prospects of having an exclusive student body test the application at this stage for feedback on the state of the product.

Beta Release

This release will aim to further improve the user experience, fix any outstanding bugs in the application, and solidify the workflows throughout the application. We aim to have a preliminary data analysis pipeline leveraging Microsoft Azure ML service to further understand which features are proving to be useful for Sheridan Students and how to expand our offerings. We may again consider expanding the availability of the application to more users for testing and insight.

Final Release

The final release will have all the features we set out to develop at a stable version and have implemented all the necessary logging and uptime monitoring to ensure the application services remain available. The services will also have an automated recovery procedure to promote high availability for the application.

RISK MANAGEMENT PLAN

Risk Management Plan:

https://sheridanself.atlassian.net/browse/RMP

Major/High-Impact Risks

Project feels like "another course" for students.

The system should provide a clean presentation of how the System is developed to help the user in numerous ways and by not making the system officious to its user. Also, the system should work in such a way that usage of system should be felt like a benefit to the user instead of a work/task assigned by the college. This can be done by providing a sense of ease in the usage of app and not making the app working/recommendations dependent on user's academic records only.

Product doesn't promote motivation for regular use.

The user can be motivated to use the app regularly/ often with the help of following strategies:





- 1.) Making user's Life easier i.e., making the most important features easy to access.
- 2.) By providing clear instructions of using the app.
- 3). Making the Design Appealing and aesthetic.
- 4). Consistent experience on multiple devices.
- 5). Regularly providing new content like various events, notifications and alerts happening in the college.

Poor application performance

There are many facets which can manifest poor application performance, whether actual or perceptual. From a client-side perspective, it could manifest as high memory usage, unresponsive user interface, little/no feedback on user interface actions, or long load times over a fast/stable network. From a server-side perspective, it could manifest as slow database interactions slow time to respond to requests.

Poor/missing connectivity to external Sheridan services

The system needs to merge all the student's files and data with Sheridan's database. Administrative access of Sheridan's database is required for their terms and policy. Updates and notification should be frequent to ensure that the system is using Sheridan's database with the students notes and writing if they choose to do so. The connectivity of the system and Sheridan services should be secure so that there are no interference or interruption to the paths between the two.

Slow/unresponsive application services

The system should have multiple servers connected seamlessly to prevent server overloads and app crashes. System should also the app life cycles integrated so that the data is saved per screen orientation or app crashes. The system should be secure with data-privacy and secured connection to filter out all the bugs that may have come from malicious hacks. The system should also support app responsiveness by using constraint layout for different android devices so that the web pages (HTML) fit the size of their screens.

VALIDATION AND TESTING

Testing and validation are conducted for every use case in such a way that software can meet the use case needs. All the business requirement logic or scenarios are tested in detail to make sure. Our test plan can be accessed through the following link: https://sheridanself.atlassian.net/jira/software/projects/SSTP/boards/3

TESTING STRATEGY

These are various testing strategies that have been used in order to validate system's functional areas. In order to verify the main success scenario, extensions use-case based testing is followed. The system functions that are accessible through UI and elements are tested first and the functionality is tested with both correct and incorrect



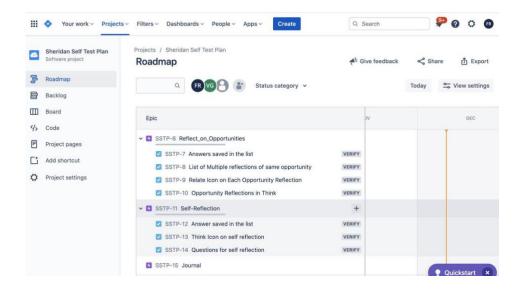
input. It is made sure that on completion of each use case for a functional area different types of test cases are being designed and Acceptance Testing Process is being followed. The framework that is used for testing is Xamarin.UITest which is a C# testing framework that uses NUnit. The tests interact with the user interface as a user would: entering text, tapping buttons and gesture- such as swipes.

These steps are followed as a feature is being developed:

- 1) Develop the feature in Android or iOS application
- 2) write the test and run them locally to verify functionality.
- 3) Create a new test run in App Center Test, or use an existing test Run
- 4) Compile the IPA and APK and then upload it along with the tests to app center test
- 5) Fix any issues or bugs that are exposed by app Center Test
- 6) Repeat the process by moving on to the next feature of the application.

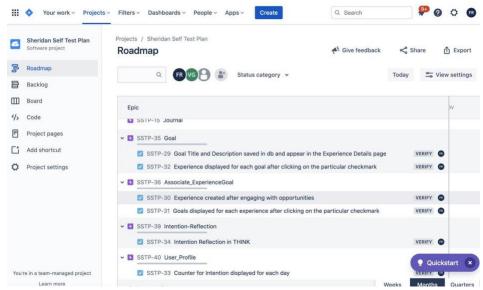
VALIDATION RESULTS

The test results will be recorded in Our Jira Project Sheridan Self-Test Plans. We will be saving all the test results when completing test.



Description: Test cases have been created for Functional Area THINK: Reflect on Opportunities, Self-Reflection, and Intention-Reflection.





Description: Test cases have been created for Functional Area INNOVATE and USER: Goal, Experience Opportunity, Experience Goal, Goal Experience and User Profile.

CONCLUSION

SheridanSelf solves a difficult problem that many of Sheridan's students face throughout their programs. This app allows students to track the progress they've made for each course and explore as to why they are in interested in their program. This can be achieved by setting goals, creating opportunities for which students have the option of creating experiences. Each experience can then be added as list for which students then have the option of creating a plan as to what type of path they would like to take. Additionally, student can write their own journal and self-reflect based on how they felt each day.

Sheridan Students now have tools to set goals, creating various opportunities within the community and the environment as well as making plans for whichever path they would like to go in. The app provides the functionality for creating experiences for each opportunity that the students create. They can also write journal to express how they feel about a certain course or goal that they have in mind. Furthermore, the app provides a dashboard from which students can monitor and observe the progress they made for setting goals, creating opportunities and reflections.

DOMAIN EXPERT EVALUATION

The SheridanSelf app aims to meet the outcomes of Domain expert through the following requirements:

- The app provides students with activities to put, such as, self-reflect and self-author.
- Students require the space and pause where they can manage their reflection to build their own signatures.





- The integration process of self-reflect and self-author is essential for students to become a whole person.
- Students require core content that should be seamless, simple and developmental. They need to see their experiences and organize the self-development accordingly.
- They need to be able to reflect on S-Factor and self-assess. To draft, to express and share.
- Students need to generate their own data to develop their own intelligence. For example, the journey let me
 to new goals.

USER TESTIMONIALS

User testing has not yet been performed and the results are not yet available.

FUTURE WORK

The team aims to integrate its services with the rest of colleagues and communities to allow student to become more agile around the globe.