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**Proof of Concept Document**

**ConnectedNotes**

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**December 7, 2021**

**CS100W­ – Section 4**

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# 1. Business Requirements

## 1.1. Background

Note-taking is an integral part of education. The amount of information that students are expected to learn and retain increases as they advance into higher education, which is why, “to cope with this increasing demand on their information-processing capabilities, students frequently engage in note-taking to improve how much information they remember” (Jansen, Lakens, & IJsselsteijn, 2017).

Even if they don’t understand the complex science and reasoning behind it, students know that note-taking improves their learning. In a study on “note-taking habits of 21st Century college students,” a survey of college students revealed that “96% of students reported taking notes often or always” (Morehead et al., 2019). In other words, note-taking is a key aspect to student learning and success.

Baldwin, Fanguy, & Costley describe why this is. There are two major purposes of note-taking. The first function of note-taking is to store information, which relieves the brain from having to remember and retain every single detail, “while the actual physical process of writing information down is thought to imprint such knowledge on one’s memory.” The second function of note-taking is to encode information, which is “a cognitive process [where the learner links new and old material] and therefore learning is facilitated” (Baldwin, Fanguy, & Costley, 2019). In addition to having notes to reference and reflect on later, note-taking allows the learner to make connections between new information and what they already know and understand. Through this process of listening and writing, students can learn more efficiently.

However, just as advancements in technology has changed the way that humans live their daily lives, it has also changed how students take notes in classes. In addition to the traditional pen and paper, typing on digital devices has evolved as a modern method for note-taking.

In another survey done in 2017, of the 88% of students surveyed who owned a laptop, it was found that 63% use it during their class, 82% use it for homework purposes, and 70% use it to study for exams (McGraw-Hill Education, 2017). Now in 2021, those numbers are bound to be similar, if not higher due to a greater comfortability with technology usage.

Note-taking methods continue to change in order to best fit the needs of contemporary students.

However, despite the benefits that note-taking provides students, it can also have its downsides. Baldwin, Fanguy, & Costley (2019) discuss “the underpinning principle of cognitive load theory,” which relates to how note-taking can put a strain on students. According to the American Psychological Association, cognitive overload occurs when “the demands placed on a person by mental work… are greater than the person’s mental abilities can cope with” (*Cognitive Overload*, 2020). This essentially means that when there are too many mental tasks to complete, the brain becomes overworked and is unable to function at its highest efficiency. There is too much strain on the brain.

Then, how does this concept connect with the process of note-taking in class?

This means that students who are less familiar with the topic or need more time to process the information and ask questions have a harder time taking notes. This is because having to “comprehend content, write it down, and learn simultaneously… puts great strain on working memory” (Costley, Courtney, & Fanguy, 2022). If students are struggling with comprehension of the course material, then their brain will need to dedicate more effort to that task. Consequently, students will find that they do not have enough time and energy for the other main tasks of note-taking: writing and learning. Likewise, if students are struggling with writing down their notes, for example, if a professor is moving too fast and there is too much information to write down, then they may not have the brain capacity to also focus on comprehending and learning the material.

Note-taking is designed to supplement and enhance student learning. Students should not find it a burden to take notes as a result of cognitive overload. So how can students make the best of note-taking while also learning the material at the same time?

This leads to the topic of collaborative note-taking and how working together benefits in-class learning.

We look at a study on “The Effects of Collaborative Note-taking in Flipped Learning Contexts” by Baldwin, Fanguy, & Costley, where a group of “92 graduate students” were monitored for the duration of a required writing class. Students were divided into two groups. One group consisted of smaller groups of three to four students who were asked to use Google Docs to take notes together, while the students in the control group were asked to take notes by themselves. Quiz and paper scores were measured in order to compare the results of collaborative note-taking on each group.

The findings of this study are of interest to this discussion of note-taking. While “there were no statistically significant differences between students who were placed in the collaborative note-taking condition compared to those who took notes alone,” collaboration between groups that did take notes together benefitted the participants’ writing, “with students who were members of an active group scoring 15% more than those who were not members of an active group” (Baldwin, Fanguy, & Costley, 2019). Furthermore, the study suggests that “being a member of a group that had active members gave benefits to all members regardless of whether they actively took notes or not” (Baldwin, Fanguy, & Costley, 2019).

In other words, being part of a collaborative group with classmates is beneficial to students. Not only can individuals lessen the burden on their working memory but combining and sharing their skills and understanding of the material can lead to “more meaningful engagement with the course material and more interesting and memorable educational experiences” (Baldwin, Fanguy, & Costley, 2019).

This proof of concept looks at how collaboration between classmates alleviates the burden of taking notes and thus avoids cognitive overload. By collaborating on notes together, students can break down the amount of tasks they need to complete and share them with each other. This allows students more time to comprehend the information that they are being taught and learning instead of scrambling to get their notes down. Collaborating on notes eases the burden on the brain while still performing the process of storing and encoding information. Furthermore, students will have a copy of peer-edited notes at hand to refer to when studying for the class.

Collaboration seems like a good idea, but how do you ensure that every participant understands each part of the produced notes? This was an issue in the previously mentioned study, in which more than half of the collaborative groups took no notes, possibly because collaboration was suggested and not required (Baldwin, Fanguy, & Costley, 2019).

This is where discussion between classmates comes in. Students are bound to understand information differently, which is why it is equally important for students to review the information together and talk to each other about their confusion and interpretation of certain details. In addition, having the option to communicate within groups will lead to more engagement between classmates.

ConnectedNotes is a web application that addresses cognitive overload and student learning through note-taking. It allows students to create groups for their classes, where they can share a central document on the cloud. This allows everyone to add to collective notes during class. Outside of class, students are still able to connect and collaborate through the discussion feature, where they can ask any questions about a specific concept or idea and make any additional comments.

## 1.2. Business Opportunity

ConnectedNotes will enter the note-taking market and address the issue of learning equality for students. It will support quality and effective learning for all students.

During classes, students all over the world rely on note-taking habits to organize, store, and encode new content. However, when the content being taught is more than students can handle, cognitive overload occurs and hinders student’s ability to effectively listen, write, and learn. This is a problem, because students’ main priority is to learn. The burden of note-taking often creates a learning gap between students who learn more easily and students who need the time to process and connect information.

Through collaboration and discussion features, ConnectedNotes solves this problem. By allowing users to collaborate on class notes, the burden of note-taking is alleviated and shared between classmates. This gives students more time to focus on listening to and learning the material. Furthermore, collaboration between classmates leads to more complete and detailed notes. Using the discussion feature, users will address confusion and reinforce understanding of the material.

Existing products within the note-taking market include applications like GoodNotes, OneNote, and Google Docs. All these applications are effective note-taking applications that provide customization and ease of use. OneNote and Google Docs even features collaboration between users. However, while a comment function is implemented in Google Docs, discussion between users is limited and difficult to execute on all three applications. In other words, interaction between users is limited.

ConnectedNotes stands out from its competitors by not only supporting collaboration on class notes, but also providing an easy-to-use discussion feature for seamless interaction and communication. Furthermore, the application is designed for students so that class sections can be easily organized. ConnectedNotes is attractive to students enrolled in classes for its collaboration feature, discussion feature, and focus on the classroom setting.

The following table illustrates how ConnectedNotes compares to its competitors.

***Table 1.2.a****. Comparing Note-Taking Applications*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Features** | **ConnectedNotes** | **Google Docs** | **OneNote** | **GoodNotes** |
| Document/Notes Creation and Customization | ✔ | ✔ | ✔ | ✔ |
| Synchronization of Document Edits | ✔ | ✔ | ✔ |  |
| Tags for Note Organization | ✔ |  |  |  |
| Discussion Feature | ✔ | ✔ |  |  |
| Focus on Classroom Settings | ✔ |  |  |  |

***Source:*** *Author (Christina Ng), Google, Microsoft, GoodNotes*

## 1.3. Business Objectives and Success Criteria

The purpose of ConnectedNotes is to alleviate cognitive overload from note-taking and enhance learning habits by encouraging collaboration and discussion between classmates. To evaluate the application as meeting these objectives, the total amount of contribution to shared notes, active participation, and discussion frequency will be measured.

Specific measurements that will be anticipated for success include equal contribution between users within a class section, at least 4 postings in the discussion board per note, at least 2 responses for each posting, and sustained productivity throughout the duration of the class. Each of these metrics will be gathered from user data and activity on the app.

***Table 1.3.a****. Comparing the Success Criteria with Competitors*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Success Criteria** | **ConnectedNotes** | **Google Docs** | **OneNote** | **GoodNotes** |
| Even Work Distribution | ✔ | ✔ | ✔ |  |
| Active Contribution to Notes | ✔ | ✔ | ✔ | ✔ |
| Increase in Discussion Activity | ✔ |  |  |  |
| Sustained Productivity | ✔ | ✔ | ✔ | ✔ |

***Source:*** *Author (Christina Ng), Google, Microsoft, GoodNotes*

Growth and increase of these statistics will indicate that users are actively collaborating and participating. Furthermore, an increase in revenue will similarly indicate success. These metrics demonstrate that ConnectedNotes is performing successfully and having a positive impact on users’ learning experience, making the application a desirable product in the market.

In order to meet these metrics, functionality of the collaboration and discussion features will be crucial. When these features are working properly, users will have an easier time actively participating in their class sections.

An external factor that will affect the success of the application is the structure of classes that users are enrolled in. If classes initiate collaboration between classmates through an external channel, users may be less inclined to use this application.

## 1.4. Customer or Market Needs

ConnectedNotes targets students studying at the university level. These students take courses in order to expand their knowledge breadth in the field they are pursuing so that they are successful once they enter the workforce.

One integral part of their learning is note-taking, in which they copy down key ideas of course material during lectures. However, students may find it difficult to take notes when there is too much material being covered or when they are struggling to understand the concepts being taught. This struggle in learning leads to cognitive overload, where either their notes or their comprehension is compromised. This is not ideal when they are in school to make the most of their learning. University students need a method to take quality notes and learn efficiently without the burden of note-taking.

ConnectedNotes will meet this need by allowing students to collaborate on notes with their classmates through a web application, so that they can spend more time listening and learning and less time fretting over a load of writing. It will also provide students with the opportunity to interact and communicate, ultimately adding to their learning experience. The following list describes the major performance requirements that the application will meet:

1. Users will access and collaborate on shared notes in the corresponding class section along with their classmates.
2. Users will communicate and create messaging threads through the discussion feature to ask questions and discuss key ideas.

Users will need a computer or tablet in order to access the web application.

## 1.5. Business Risks

During the development of ConnectedNotes, encountering business risks are inevitable due to a lack of control over what the future holds. While ConnectedNotes seeks to address student struggles with in-class learning with its collaboration and discussion features, the targeted audience may not recognize or accept the purpose of the application. Furthermore, other existing note-taking applications may prevent the targeted audience from choosing to use this application. When users use the application, they may also be deterred by the complexity of the application’s content and features. These potential high-risk hazards pose a threat to the relevance of the application. ConnectedNotes seeks to address these issues by marketing the functionality and usability of the application.

Potential high-risk hazards for ConnectedNotes are discussed in the following chart.

***Table 1.5.a****. Risk Analysis Chart for ConnectedNotes (High-Risk)*

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **High-Risk Hazards** | **Is the hazard present? Y/N** | **What is the risk?** | **Controls**  **(When all controls are in place risk will be reduced).** | **Is this control in place?** | **Action/to do list/outstanding controls**  **\*Risk rating applies to outstanding controls outlined in this column** | **Person responsible** |
| End User Acceptance | N | Users do not recognize the need to use the application. | Benefits of app to learning will be advertised to demonstrate why users should use the app. | N | Market collaboration and discussion and its effects on class learning and interaction. | Marketing Manager |
| Competing Products | Y | Users will choose other collaboration applications. | Discussion feature and target setting of the application will be marketed to distinguish from competitors. | N | Market desirable features that competitors lack to distinguish itself among other note-taking apps. | Marketing Manager |
| Content Overload | N | Users will choose not to use the app due to there being too much content and text. | Collapse feature to close content and sections of the application not in use. | Y | Implement feature to close class or notes sidebar and switch between the notes and discussion pages. | Full-Stack Developer |

***Source:*** *Completed by Author (Christina Ng) on November 2, 2021*

Medium-risk hazards that may appear during the development of this application involve user attitudes and actions. One potential risk is that users create duplicate class sections when one already exists, leading to the cost of cloud storage. Another potential risk is that users fail to collaborate with each other, with some students in a section riding the coattails of other students. To mitigate these risks, additional features to consolidate data and encourage participation are planned.

Potential medium-risk hazards for ConnectedNotes are discussed in the following chart.

***Table 1.5.b****. Risk Analysis Chart for ConnectedNotes (Medium-Risk)*

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Medium -Risk Hazards** | **Is the hazard present? Y/N** | **What is the risk?** | **Controls**  **(When all controls are in place risk will be reduced).** | **Is this control in place?** | **Action/to do list/outstanding controls** | **Person responsible** |
| Duplicate Class Sections | Y | Users create multiple sections for a class which increases cost of cloud storage | Consolidation feature will allow for the data from two class sections to be combined. | N | Implement consolidation feature to sync data. | Full-Stack Developer |
| Lack of collaboration between users | Y | Some users in a class section do not contribute to shared notes or discussion. | Research methods to encourage user participation using additional features. | N | Research ways to motivate students to learn and collaborate with classmates. | Program Manager |

***Source:*** *Completed by Author (Christina Ng) on November 2, 2021*

Some more hazards that are ranked low include additional features and schedule delays. In the development stage, the team may find that extra features need to be implemented in order to support the success of the application. Features may also take longer to develop than scheduled in the timeline. These hazards cannot be avoided, but a better plan of the development timeline can be created to allow for flexibility and changes to the schedule so that progress will not stagnate.

Potential low-risk hazards for ConnectedNotes are discussed in the following chart.

***Table 1.5.c****. Risk Analysis Chart for ConnectedNotes (Low-Risk)*

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Medium -Risk Hazards** | **Is the hazard present? Y/N** | **What is the risk?** | **Controls**  **(When all controls are in place risk will be reduced).** | **Is this control in place?** | **Action/to do list/outstanding controls** | **Person responsible** |
| Additional Features | N | Extra features are needed to make the application a success. | Agile methodology used throughout the project development to allow for flexibility for new changes. | Y | Make timeline for future sprints vague to allow for flexibility and changes. | Program Manager |
| Schedule Delays | Y | Features take longer to develop than planned. | Daily review of task completion status and progress | Y | Track progress of ongoing tasks and prioritize tasks to be completed sooner. Reallocate work to support struggling members. | Program Manager |

***Source:*** *Completed by Author (Christina Ng) on November 2, 2021*

# 2. Vision of the Solution

## 2.1. Vision Statement

ConnectedNotes will solve the issue of the learning gap by providing users with a collaboration feature that lessens the burden of writing notes.

Through ConnectedNotes, struggling students in higher education will be able to share the task of getting notes down. They will be able to rely on each other to get important information down and identify what main points the lecture contains. Instead of struggling with cognitive overload due to a wave of new information and a need to copy down the material, they will be able to spend more time on listening and asking questions in class. They will not have to scramble to write down information they do not understand but will have the opportunity to note down key ideas at a slower pace, allowing their brains to process and make connections.

Through ConnectedNotes, otherwise isolated university students will foster interaction and engagement through the discussion feature of the web application. They will create stimulating conversations that will address gaps in understanding and lead to a more complete foundation in the course topic. By interacting with fellow classmates, they will finish the course with a more memorable experience.

Despite the benefits of ConnectedNotes, it will not completely solve the learning gap. Students will still have to put in their own effort to find a method of studying and learning that works for them. However, ConnectedNotes will be a viable solution for them to address the strain of cognitive overload and participate in an interactive experience with classmates.

## 2.2. Major Features

ConnectedNotes is a note-taking web application that combines collaboration and discussion to create an engaging learning experience for users. To cope with large amounts of content and avoid overloading the brain, users will take advantage of the ability to share notes with classmates in order to distribute the workload. They will also communicate and interact through discussion threads. Six major features of the app that support these functions are described below.

* + 1. **User Authentication**: Users will need to create an account with their email in order to sign into the app and access their notes. In this way, their associated data will be protected.
    2. **Class Section:** Since the targeted audience is a group of students in the same class, users will create and join class sections in order to share information.
    3. **Document Editor:** Through the document editor, users will be able to create and add to their class notes. This will be a simple text editor with options to format text, insert files, and annotate added material.
    4. **Syncing Edits:** Users will be able to share their notes with users in the same class section so that edits can be performed at the same time. Syncing of these edits will be performed through the cloud.
    5. **Organization Note Tags:** Due to the large number of shared notes between users, tags will be used to differentiate different types of notes. These tags are customizable in order to fit the class setting.
    6. **Discussion Thread:** Users will post their queries, remarks, and comments as a discussion topic, under which other users can post their responses. These discussion threads are limited to each class section.

The following table compares the major features that distinguish ConnectedNotes from its competitors.

***Table 2.2.a****. Comparing Major Features with Competitors*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Success Criteria** | **ConnectedNotes** | **Google Docs** | **OneNote** | **GoodNotes** |
| User Authentication | ✔ | ✔ | ✔ | ✔ |
| Class Section | ✔ |  |  |  |
| Document Editor | ✔ | ✔ | ✔ | ✔ |
| Syncing Edits | ✔ | ✔ | ✔ |  |
| Tags for Organization | ✔ |  |  |  |
| Discussion Thread | ✔ |  |  |  |

***Source:*** *Author (Christina Ng), Google, Microsoft, GoodNotes*

## 2.3. Assumptions and Dependencies

ConnectedNotes is a note-taking application that seeks to provide students with an alternative to existing note-taking methods that increases their learning efficiency. In developing this application, some assumptions were made about the current environment that students learn and study in: all students use some form of note-taking methods and most students communicate with their classmates.

The first assumption is that students take notes and study for their classes using a variety of tools. These tools range from Google Docs, traditional pen and paper, lecture slides, OneNote, and Bear. As seen from Figure 2.3.1., 35% of users surveyed reported that they handwrite their notes, 29% of users use Google Docs, and 24% of users use lecture slides to study. Smaller percentages reported the use of other note-taking applications like Bear and OneNote. From this survey, it can be assumed that all students use some form of note-taking in their classes.

***Chart, pie chart

Description automatically generated***

***Figure 2.3.1****. “What tools do you use to take notes and study for classes?” Question from*

*ConnectedNotes User Research Survey*

***Source:*** *Author (Christina Ng), made with Qualtrics*

The second assumption that most students find discussing course material with classmates beneficial is supported by Figure 2.3.2. Of the 16 users surveyed, only 4 reported that they rarely or never discuss with classmates, with 2 users reporting a maximum of 30 minutes per week of discussion, 4 users reporting a range of 30 to 60 minutes per week of discussion, and 6 users reporting more than 60 minutes per week of discussion. From this survey, it can be assumed that most students actively discuss with their classmates.

Chart, bar chart

Description automatically generated

***Figure 2.3.2****. “How much time do you typically spend discussing course material with classmates?”*

*Question from ConnectedNotes User Research Survey*

***Source:*** *Author (Christina Ng), made with Qualtrics*

ConnectedNotes relies upon a few major dependencies for a successful launch of the app.

1. Users must have access to the internet through a computer. ConnectedNotes will be launched as a web application, so online access is a must.
2. The Google Cloud platform effectively synchronizes user edits in real time. Since one of the main aspects of the application is in-class collaboration between users, the syncing performance of the cloud platform will greatly impact the functionality of the app.

# 3. Scope and Limitations

## 3.1. Scope of Initial Release

The goal of ConnectedNotes is to address the issue of the learning gap as a result of cognitive overload. By providing users with the ability to collaborate on notes with classmates, they will be able to dedicate more time to comprehending the material. ConnectedNotes also seeks to encourage interaction between classmates through discussion.

In order to support these actions, the initial release of the product will include five major features with the focus on a document editor that can be shared with other users in the cloud and a chatting interface that promotes communication.

In order to save and access their data, user authentication is crucial. This will require users to create an account and sign into the app using an email and password. Users will create and join corresponding class sections, where they can interact and communicate with other users in the same class.

As a note-taking application, a document editor is the most important feature. Through this editor, users can write down, organize, and annotate their notes for later use. These notes will be shared across the cloud, so that users can edit documents at the same time and view changes made by other users in real time. This feature will allow users to take notes and collaborate easily.

The second most important feature, discussion threads will let users to start conversations on concepts and key ideas that require more discussion and analysis. Users can post their questions for classmates to answer, share interesting perspectives, and interact over the web.

The major features that will be included in the initial release of the product are listed.

1. **User Authentication**: Users will need to create an account with their email in order to sign into the app and access their notes. In this way, their associated data will be protected.
2. **Class Section:** Since the targeted audience is a group of students in the same class, users will create and join class sections in order to share information.
3. **Document Editor:** Through the document editor, users will be able to create and add to their class notes. This will be a simple text editor with options to format text, insert files, and annotate added material.
4. **Syncing Edits:** Users will be able to share their notes with users in the same class section so that edits can be performed at the same time. Syncing of these edits will be performed through the cloud.
5. **Organization Note Tags:** Due to the large number of shared notes between users, tags will be used to differentiate different types of notes. These tags are customizable in order to fit the class setting.
6. **Discussion Thread:** Users will post their queries, remarks, and comments as a discussion topic, under which other users can post their responses. These discussion threads are limited to each class section.

## 3.2. Scope of Subsequent Releases

The first release of ConnectedNotes will focus on the major features of synchronization of document edits and discussion threads. These features will have the most impact on the success of the application. Although not included in the initial release, other major features will be considered and deferred to later releases. These include a discussion thread filter and a record of past course sections and notes.

1. **Discussion Thread Filter**: Users are expected to create numerous discussion threads over the course of the semester. To keep these threads organized and allow for easy navigation, a filter will be applied in order to distinguish between topics. These topics will range from questions, analyses, interesting comments, and anything else the user needs for effective discussion.
2. **Archive of Past Courses and Notes**: Once users have completed a course, the need to go back to that course section decreases. To allow users to store course notes away but still refer to them, an archive page will be created to record the past course sections that users joined, and the notes created within.

These major features do not directly impact user collaboration, discussion, and learning and require more resources, so they will be added to subsequent releases to enhance user experience in note-taking and communication.

A screenshot of a computer

Description automatically generated with low confidence

***Figure 3.2.1****. Anticipated Release Schedule for ConnectedNotes*

***Source:*** *Author (Christina Ng)*

## 3.3. Limitations and Exclusions

Providing users with a collaborative and interactive environment for learning, ConnectedNotes will include a system for synchronizing edits made by multiple users and a discussion feature. However, in order to simplify the note-taking process and avoid overwhelming users, some features that may be anticipated by stakeholders will not be included in the final product.

One feature that might be anticipated by users is the function to make comments on certain sections of the shared notes, similar to how Google Docs allows comments for highlighted text. This feature will not be part of ConnectedNotes.

Due to the collaboration of multiple users on a single document, having this feature will overcrowd the notes content and instead be ineffective for student learning. Instead of including this feature, users are encouraged to start topic threads in the discussion window. This makes the conversations between users more focused and organized without being overwhelming.

Another feature that will not be included in the application is the function to privately chat with users in the same class section. Private chats discourage collective collaboration and does not match the objective of this application.

Instead, users are encouraged to communicate with all their fellow classmates through the discussion feature. Ensuring that communication is visible to all makes sure that users are not left in the dark on shared knowledge.

# 4. Business Context

## 4.1. Stakeholder Profiles

* + 1. Customers (End Users)
  1. University Students: These users are enrolled in some sort of course at a university/college and endeavor to learn through various methods of note-taking and studying. At the university level, courses tend to be less personal, and students often sit and listen while the professor lectures. By using this product, university students will be able to share the burden of note-taking with classmates, obtain more complete notes, and participate in engaging discussion. They will be interested in this application because it focuses on collaboration in a course setting and prevents their brain from being overloaded with information.
  2. High School Students: These users are enrolled in smaller class settings, where interactions between teacher and classmates are more frequent and where content is delivered at a slower pace. Though not the target audience of this product, they may choose to use this product to collaborate and communicate with classmates outside of class time.
     1. Investors
        + 1. Shareholders: These are individuals or legal entities that own shares of ConnectedNotes’ stock. They will have an influence on major decisions made in the project and are interested in the success and profits of the application. When the note-taking application earns revenue, these investors will receive dividends.
     2. Project Team
        + 1. Project Manager: The project manager is responsible for planning and overseeing the development of the application. They will define the scope of tasks and resources, schedule realistic timelines, and identify potential risks. They will need to communicate clearly and have excellent organization skills in order to lead the team efficiently. They will be interested in the success of the application and will make sure that the use cases are met. The expected salary of this team member will be $73k according to Indeed.
          2. Marketing Manager: This individual is responsible for the reaching out to potential customers and clients and advertising the product’s features and benefits. They will develop the application’s brand to align with the project’s vision and scout market trends to increase the application’s market value. The expected salary of this team member will be $63k according to Indeed.
          3. Full Stack Developers: These team members develop the interactive features of the product on both the front end and back end. They will be responsible for transforming the prototype designs into executable code, developing the necessary features, testing the product, and modifying the software. They will need to be knowledgeable about both web development and the server-side of software. The expected salary of this team member will be $106k according to Indeed.

## 4.2. Project Priorities

Understanding the priorities of this project is important to ensure that development of the application does not get sidetracked and that the project objectives are followed. In this project, there are four project requirements that needs to be prioritized.

1. **Document Editor:** As a note-taking application, ConnectedNotes needs to have the basic document editing capabilities for users to produce class notes. This editor will allow users to type key ideas from lectures, format the document, and customize it for personal use.
2. **Synchronization of Edits:** Collaboration is the main idea of the application, which is why it is important that edits made by different users on a document be updated in real time. Users will be able to make edits to their notes while also seeing what their classmates are adding to the document.
3. **Discussion Threads:** To create a unique and interactive experience for users, the discussion feature is crucial. By posting queries and comments on course material in the discussion threads, users will participate in engaging discussion and collaboration.
4. **Class Sections:** With university students as the target audience, the app needs to be customized to cater to class settings. Users will create and join corresponding class groups, where they will share the responsibility of note-taking and communicate with each other.

Developing ConnectedNotes with these priorities as the foundation will keep goals clear and contribute to the production of a reliable note-taking application.

With both investors and end users as the key drivers of this project, it is important to meet their expectations in terms of schedule and budget. Releasing the product by the promised deadline is crucial to fostering trust with both user and investor. In addition, forming paid partnerships as a source of funding is necessary in order to demonstrate product value to investors.

Top project priorities and the key drivers of each is listed in the following table.

***Table 4.2.a****. Project Priorities for ConnectedNotes*

|  |  |  |
| --- | --- | --- |
| **Order** | **Priority** | **Key Driver** |
| 1 | Initial Release Date | End Users and Investors |
| 2 | Partnership Payments | Investors |
| 3 | Document Editing Feature | End Users |
| 4 | Synchronization Feature | End Users |
| 5 | Discussion Feature | End Users |
| 6 | Class Sections Feature | End Users |

***Source:*** *Author (Christina Ng)*

## 4.3. Operating Environment

Since ConnectedNotes is a web application that targets university students wherever they are, users can be widely distributed geographically. However, for the first iteration of the app, only users within the United States will be able to use the application. This is so that the attitudes and habits of users can be narrowed down and considered for analysis before developing for a more widespread audience. This means that there are six different time zones being considered.

Users across these various locations are expected to access the system throughout the day during classes and study times, with 8am to 2pm expecting the heaviest traffic for users.

Data will be generated anonymously through user data and through user surveys. While users are using the application, data such as how many words they contributed to the notes, how many postings they made to the discussion, and how many members of a class section actively participated will be tracked, unless users request that their data not be tracked. Surveys will also be conducted for random users across the country to measure user satisfaction. Since users will be spread around the United States, collected data will need to be combined from these six time zones.

Google Cloud Platform will be used. Specific maximum response times are unknown, however, depending on how long the request timeout setting is set, the timeout can range to up to 60 minutes with a recommended 15-minute cap (Google Cloud, n.d.).

Service interruptions cannot be tolerated by users; a continuous access to the system is critical while different users in the same class section are collaborating. If one user is unable to see the changes to the document created by another user, then the functionality of the product will be significantly compromised.

In order to produce user data, access security controls are necessary. Users will be required to provide usernames and passwords before logging in to their accounts. Furthermore, accounts will be connected to a provided email so that users can recover their accounts when necessary.

***Table 4.3.a****. Operating Environment Summary for ConnectedNotes*

|  |  |
| --- | --- |
| **Environmental Factor** | **System Architecture Details** |
| Geographical Distribution of Users | * End users will be limited to the United States |
| Typical User Traffic | * Heaviest traffic for users will be between 8am to 2pm |
| Data Generation, Storage, and Usage | * User activity and data will be collected by users * Survey responses will be generated by users |
| Server Response Times | * Maximum response times are unknown |
| Anticipated Service Interruptions | * Continuous access to the system will be needed for user collaboration and interaction |
| Access Security Controls and Data Protection | * User authentication using login credentials implemented to protect accounts |

***Source:*** *Author (Christina Ng)*

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# Appendices

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## Appendix A: Proof of Concept Wireframes

***Graphical user interface, application

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***Figure A.1****. Log-in Page for ConnectedNotes Prototype*

***Source:*** *Author (Christina Ng), made with Adobe XD*

Graphical user interface, application

Description automatically generated

***Figure A.2****. Home Page for ConnectedNotes Prototype*

***Source:*** *Author (Christina Ng), made with Adobe XD*

Graphical user interface, text, application

Description automatically generated

***Figure A.3****. Course Page for ConnectedNotes Prototype*

***Source:*** *Author (Christina Ng), made with Adobe XD*

Graphical user interface, text, application, email

Description automatically generated

***Figure A.4****. Example Notes Page for ConnectedNotes Prototype*

***Source:*** *Author (Christina Ng), made with Adobe XD*

Graphical user interface, text, application, email

Description automatically generated

***Figure A.5****. Discussion Page for ConnectedNotes Prototype*

***Source:*** *Author (Christina Ng), made with Adobe XD*

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## Appendix C: Résumé

**Christina Ng**

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**linkedin.com/in/christina-ng-software-development/** • **github.com/christinang3030**

Objective: **Software Engineer Intern**

**Education**

San José State University**,** San José, CA Expected December 2022

* **Bachelor of Science in Computer Science**
* GPA: 3.9 / 4.0 **(President’s Scholar)**
* **Relevant Coursework**: Data Structures and Algorithms, Database Management Systems, Object Oriented Design, Linear Algebra, Linear Nonlinear Optimization, Computer Architecture, Operating Systems, Computer Networks, **Anticipated**: NoSQL Database Systems, Mobile Device Development, Information Security

**Technical Skills**

* Languages: **Java**, **Python**, **MySQL**, SQLite
* Tools: macOS, Linux, Eclipse, **IntelliJ**, **Visual Studio Code**, **Git**, G Suite, **Slack**, Zoom

**Projects**

**Software Developer**, Chat Application September 2021

* Link: github.com/christinang3030/ChatApp
* Implemented simple chat application in Java to allow clients to communicate through server
* Established connection between server and client using **UDP sockets**, defined message format in **json** to handle multiple requests, and utilized **multi-threading** to broadcast messages
* **Accomplishments**: Built chatting interface for messaging between clients

**Software Developer**, Simulation Station April 2021

* Link: github.com/christinang3030/SimStation
* Collaborated with **2 team members** to develop Java framework for running simulations
* Employed **model-view-controller architecture** and **agent-based architecture** to create simulations of agent interaction within different environments
* **Accomplishments**: Generated **4** interactive customizations of simulation station framework

**Work Experience**

**Barista**, *Living Room Coffee Craft*, Campbell, CA July 2021 – Present

* Provided customers with enjoyable, relaxing environment to work and socialize
* Worked with coworkers to deliver satisfactory drinks and pastries, communicated orders with customers, and maintained shop cleanliness
* **Accomplishments**: Learned to **communicate clearly** with coworkers and to **prioritize tasks**

**Private Tutoring**, San José, CA February 2020 – May 2021

* Provided extra assistance to middle and high school students in mathematics
* Clarified math concepts and guided students in **solving problems critically** on Zoom
* **Accomplishments**: Furthered students’ understanding and confidence in course material

**STEM CREW Intern**, *Girlstart*, Milpitas, CA January 2020 – March 2020

* Cooperated with **2 coworkers** to create exploratory experiences in science for elementary girls
* Encouraged creativity in thinking and bravery in pursuing passions and interests
* Prepared and led hands-on experiments to teach students about science
* **Accomplishments**: Produced **supportive STEM environment** and acted as role model for girls

## Appendix D: SMART Goals Worksheet

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***Table D.a****. SMART Goals Worksheet for ConnectedNotes - Action Plan*

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***Source:*** *Author (Christina Ng)*

***Table D.b****. SMART Goals Worksheet for ConnectedNotes – Obstacles/Challenges*

**Table

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***Source:*** *Author (Christina Ng)*

## Appendix E: Qualtrics Survey (Raw Data)

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***Figure E.1****. “What are some of the apps and websites you use the most?” Question from*

*ConnectedNotes User Research Survey*

***Source:*** *Author (Christina Ng), made with Qualtrics*

***Chart, pie chart

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***Figure E.2****. “What tools do you use to take notes and study for classes?” Question from ConnectedNotes*

*User Research Survey*

***Source:*** *Author (Christina Ng), made with Qualtrics*

Chart, bar chart

Description automatically generated

***Figure E.3****. “How much time do you typically spend discussing course material with classmates?”*

*Question from ConnectedNotes User Research Survey*

***Source:*** *Author (Christina Ng), made with Qualtrics*

Chart, bar chart

Description automatically generated

***Figure E.4****. “What is most appealing about this product?” Question from ConnectedNotes User Research*

*Survey*

***Source:*** *Author (Christina Ng), made with Qualtrics*

Chart, pie chart

Description automatically generated

***Figure E.6****. “Can you see yourself ever using ConnectedNotes?” Question from ConnectedNotes User*

*Research Survey*

***Source:*** *Author (Christina Ng), made with Qualtrics*

## Appendix F: Gantt Chart (Timeline August 30, 2021, through December 7, 2021)

***Table F.a****. Gantt Chart for Proof of Concept for ConnectedNotes (Phases 1-2)*

Chart

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***Source:*** *Author (Christina Ng)*

***Table F.b****. Gantt Chart for Proof of Concept for ConnectedNotes (Phases 3-4)*

A screenshot of a computer

Description automatically generated with medium confidence

***Source:*** *Author (Christina Ng)*

***Table F.c****. Gantt Chart for Proof of Concept for ConnectedNotes (Phase 5)*

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***Source:*** *Author (Christina Ng)*

## Appendix G: Full Backlog

***Table G.a****. Backlog for the Initial and Subsequent Releases for ConnectedNotes*

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***Source:*** *Author (Christina Ng)*