

# Kollab

by

Michael Palte, Jacob Bennett, and Nicholas Pavey

Submitted to

the Faculty of the School of Information Technology

in Partial Fulfillment of the Requirements for

the Degree of Bachelor of Science

in Information Technology

© Copyright 2021 Michael Palte, Nicholas Pavey, Jacob Bennett


The author grants to the School of Information Technology permission to reproduce and distribute copies of this document in whole or in part.



\_\_\_\_\_  
Michael Palte

April 22, 2021

Date



\_\_\_\_\_  
Jacob Bennett

April 22, 2021

Date



\_\_\_\_\_  
Nicholas Pavey

April 22, 2021

Date



\_\_\_\_\_  
Bander Alyami, Faculty Advisor

April 22, 2021

Date

University of Cincinnati  
College of  
Education, Criminal Justice, and Human Services

April 2021



Prepared by

Michael Palte, Jacob Bennett, and Nicholas Pavey

Students of

University of Cincinnati

College of Education, Criminal Justice, and Human Services

School of Information Technology

April 2021

## TABLE OF CONTENTS

---

Abstract.....	i
Introduction.....	ii-iv
Introduction.....	ii
Problem.....	ii
Solution.....	iii
Project Goals.....	iv
Overview.....	iv
Discussion.....	v-21
Project Concept.....	v
Design Objectives.....	v
Methodology and Technical Approach.....	vi-viii
User Profile.....	ix-xi
Technical Architecture.....	xi-xxi
Testing.....	xxi-xxiv
Budget.....	xxiv-xxv
Problems Encountered and Analysis of Problems Solved.....	xxvi
Recommendations for Improvement.....	xxvi
Conclusion.....	xxvii-xxviii
Lessons Learned.....	xxvii
Abilities and Skills Developed Throughout Project.....	xxvii-xxviii
Plans for Continued Development.....	xviii
Back Matter.....	xxix-xxx
References.....	xxix
Appendix.....	xxx

## LIST OF FIGURES

---

Figure 1.	Final Logo Design.....	viii
Figure 2.	Use Case Diagram.....	xi
Figure 3.	Portfolio Page .....	xiii
Figure 4.	Network Page.....	xiv
Figure 5.	Todo List Boards.....	xv
Figure 6.	Messaging.....	xvi
Figure 7.	Getting Started Page.....	xvii
Figure 8.	Discover Page.....	xviii
Figure 9.	Project Details Page.....	xix
Figure 10.	Firestore Database.....	xx
Figure 11.	Firebase Rules.....	xxiii
Table 1.	Project Budget.....	xxv
Figure 12.	IT Expo Poster.....	xxx

## ABSTRACT

---

Kollab is an innovative web application solution for young professionals struggling to gain credible experience in their area of interest, for the purpose of building out a reputable online portfolio. E-Portfolios are increasingly being viewed as a tool to not only improve the learning experience of students but also to enhance the employability, career development and professional identity of business graduates. Kollab provides features for users to showcase their online portfolio displaying certifications provided by universities for extra credibility to employers, as well as features for recruiting others with common interests to work on projects that provide relevant experience to their areas of future employment pursuits. Although there are similar solutions for project collaboration in today's market, Kollab will focus on being the middle man for students on their journey into the job market.

## 1. INTRODUCTION

---

### 1.1 Introduction

The highly competitive nature of the global job market today has made it increasingly difficult for recent college graduates and young professionals to stand out among the workforce. A common strategy being used to overcome this challenge is the use of ePortfolios. According to a 2016 article by Global Focus Magazine, ePortfolios are increasingly being viewed as a tool to not only improve the learning experience of students but also to enhance the employability, career development and professional identity of business graduates. In the article they go on to state that 54% of US students and 52% of Canadian students respectively have used them in their studies.

### 1.2 Problem

Covid-19 has removed the social aspect of working with your peers and networking at colleges. Technical projects are one of the most important things that employers look at on your resume when you are applying for an internship or a full-time job. Employers are looking for people who work well in teams. At this time there are no websites that are made for students to network and collaborate with students at their colleges. According to an article published by Maury County in 2017, research has shown that students that saw a connection between what they were learning, and their interests are more likely to pursue a career and develop a better understanding of the subject.

### 1.3 Solution

Kollab will be an innovative web application designed to foster collaboration between individuals searching to gain experience in their areas of interest and serve as a platform for their future employers to credibly validate student's accomplishments. Collaboration allows young professionals to share project workloads in order to accomplish projects in a more timely manner, helping build out their online portfolio. This application will provide features for users to showcase their online portfolio, as well as features for recruiting others with common interests to work on projects that provide relevant experience to their areas of future employment pursuits. Kollab has a target audience of young professionals and will serve as a platform to foster collaboration among young professional's hard work outside the classroom for the purpose of building a reputable portfolio online.

In the market today there exists websites such as FindCollabs which offers similar functionality in allowing users to create projects for the purpose of recruiting individuals to join their project team. However, this application does not provide the enhanced portfolio and team collaboration features that Kollab will encompass. In the future Kollab hopes to innovate on this issue by partnering with universities and professional organizations, providing them a platform to validate their students work on projects outside the classroom. Through the implementation of these unique features Kollab will provide a more encompassing and accredited platform than currently exists in the market today.

## **1.4 Project Goals**

The main goals for Kollab are to foster collaboration among young professionals for the purpose of building out a reputable online portfolio and to provide accreditation for the projects and coursework they have completed. This includes the development of a web application, building a database, and implementing industry standard security features throughout the application. When the application is complete we want it to be cost effective, and easily maintainable.

## **1.5 Overview**

Throughout this final report there will be information on how the project was completed. The report includes in-depth processes and includes the following sections: design objectives, methodology, budget, timeline, problems encountered, and future recommendations.

## 2 DISCUSSION

---

### **2.1 Project Concept**

The project concept for Kollab was created by a desire to provide a service that would fill the gaps between Education and Professional work experience that students face during their college career. Our application's entire concept revolves around creating a place student can find and create public projects that allow them to gain real world experience in their field, whether it be a software development effort, a fundraiser or creating a business. These accomplishments will be recorded on their user profile to be displayed on their portfolio for potential employers and other students looking for a high-quality group member.

### **2.2 Design Objectives**

The design objectives that the Kollab team established for the project revolve around maintaining a robust feature set to benefit our users and partnered clients with a simple to use, but powerful application. The Kollab team wants the project to be entirely its own entity, this means that the team will be developing any features they think users would desire in-house. This allows us to have zero reliance on existing e-portfolio or collaboration space web applications, which provides the user with a seamless and simple experience while traversing our site. This decision also benefits us in other ways, one being that we have full control of all of our services and how they integrate our user data.

## 2.3 Methodology and Technical Approach

### Web Application

Kollab is designed to be a modern, fast, but also feature rich web application. Kollab felt that the Angular web framework was the best choice due to its popularity among developers today. Additionally, there is an abundance of information and educational content surrounding Angular which has helped the team to learn it better and more easily accomplish some of our more complicated tasks. Kollab will provide all the following features:

“Home” - Landing page for the entire web application, provides the user with a basic understanding of the purpose of the site, as well as providing links and navigation to other key pages.

“Discover” - Page that displays current existing projects on our site, this page will allow a user to browse recommended projects and search for projects based on its name, or by searching associated project tags.

“Introduction” - This provides a user with a more detailed walkthrough of the site and the features that it has to offer. This will be very helpful to new users that need additional information on the functions of the site.

“Teams” – Page that displays all the project teams a user is apart of. Users will have the ability to go into each individual team’s page where they will be presented with a project to do list and a group chat for the team.

“Network” – Page for finding and connecting with other users of Kollab.

“Portfolio” - Provides the user a fully customizable personal portfolio, which will be used to display completed projects, badges, profile picture, resume, as well as their own entered details about themselves and their accomplishments.

### **Database**

For this project the Kollab team decided that using Google’s Firebase and Firestore was a great fit for the application, it works well with web applications built on the Angular framework. Using firebase allows Kollab to access this safe and secure firestore information on any page within the application. This information is used to populate fields, store images, and upload resumes.

### **Security**

The security architecture is very complex when it comes to firebase. Kollab uses web authentication tokens provided via Firebase to authenticate users while they access the app. Additionally, Kollab has created its own account creation and log in functionality through firebase authentication providing for a seamless log in and sign-up experience.

## Logo and Social Media Redesign

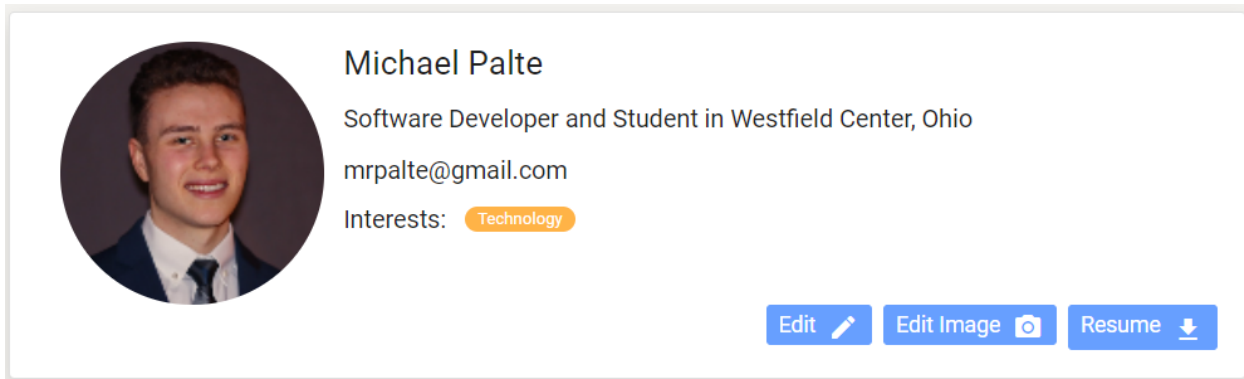
Kollab's logo design is very important to us because we want to show in our logo the idea of teamwork, collaboration, and unity being the key aspects someone sees when they look at our logo for the first time. We were able to hire a Graphic Designer and they ended up creating a great logo that demonstrated all our key aspects that we wanted. He created the logo Kollab, but used the "o", as a world to show collaboration and unity.

*Figure 1: Final Logo Design The following figure shows unity and collaboration.*



*Figure 1: Final Logo Design*

## 2.4 User Profile



A user profile card for Michael Palte. On the left is a circular profile picture of a young man with short brown hair, wearing a dark suit jacket, white shirt, and dark tie. To the right of the picture, the name "Michael Palte" is displayed in a large, bold font. Below the name, the text "Software Developer and Student in Westfield Center, Ohio" is shown in a smaller font. Underneath that is the email address "mrpalte@gmail.com". Below the email is the text "Interests:" followed by a yellow pill-shaped tag containing the word "Technology". At the bottom right of the profile card are three blue buttons: "Edit" with a pencil icon, "Edit Image" with a camera icon, and "Resume" with a download icon.

### **Project-** Kollab

#### **Potential Users**

- Young Professionals
  - College Students
  - Recent College Graduates

#### **Software, Interface, and Related Experience**

Kollab is a platform where young professionals can build out their online portfolio through collaboration on projects, and by gaining accreditation for the professional courses they have taken. The web application will provide all the tools necessary for young professionals to begin on their journey of building out their e-portfolio. The web application will include a how it works page to provide insight for new users on how the different pages of the site work, and how new users can take advantage of all the different tools Kollab provides. No prior experience is required to use Kollab, however previous use of a web browser and social media applications would be beneficial. Users are expected to have access to a web browser in order to use the web application.

## **Experience with Similar Applications**

Young professionals may have experience with social media such as LinkedIn or Facebook; web browsers such as IE or Google Chrome; communication applications such as Microsoft Teams or Discord; and collaboration applications such as Trello.

## **Task Experience**

Young professionals should have experience with tasks such as the following:

- Navigating through website pages.
- Navigating through social media to view content.
- Communicating via online chat messages.
- To-do list task management.

## **Frequency of Use**

Young professionals will frequently use the web application to update their portfolio and collaborate with teammates on projects. The application will be used as a way to enhance users resume and provide networking opportunities.

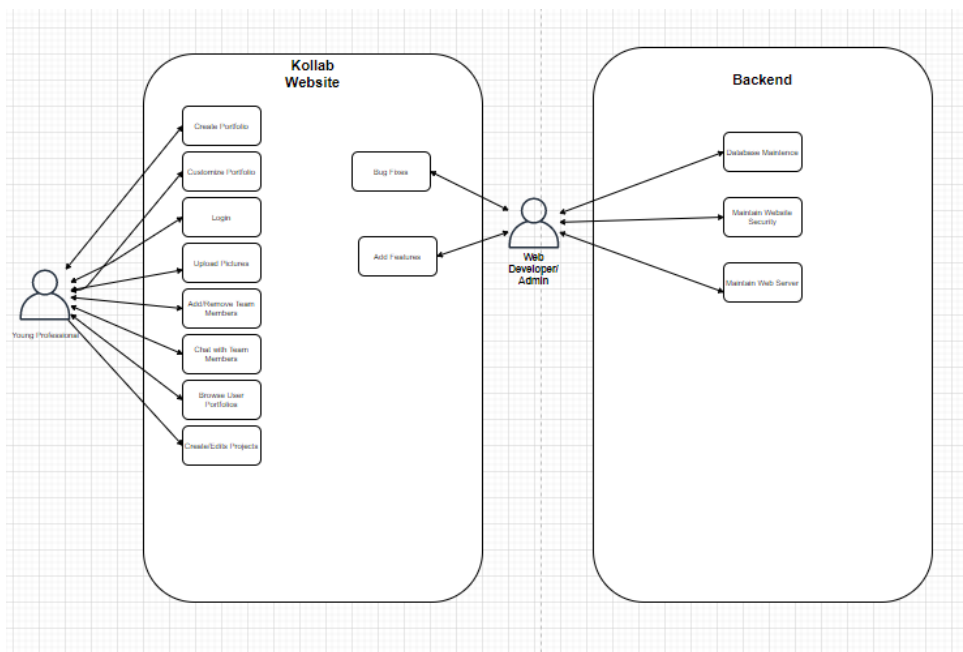
## **Key Project Design Requirements That the Profile Suggests**

- Visually appealing UI, and easily understood navigation
- Clearly defined and unique user roles
- Simple and easy to use search functionality for finding projects and users

- Security features such as user authentication, email verification and user permissions
- Ability to create a personal user portfolio
- Easily create projects and add team members to project group
- Easily create classes and add student participants

## Use Case Diagram

**Figure 2: Use Case Diagram** The following diagram Figure 1, demonstrates the use case for Kollab. The diagram shows all possible users with corresponding tasks.



**Figure 2: Use Case Diagram**

## 2.6 Technical Architecture

Our team strategically chose the technologies we would use for our project. We decided to go with the framework Angular, we felt that Angular would be the best option because it's


great for creating component-based pages. For the backend of this, we felt that Firebase was the best option, it represents a real time database that is great for storing large quantities of data, while also being great for querying data as well.


## **Website**

The architecture of the website was built with Angular Typescript, and the back end of the website was built with Firestore and Firebase Cloud Functions. We decided on these technologies because of our experience working with Angular at our jobs and we felt that our knowledge was best suited for this type of framework.

We are currently using a 3rd party platform, *Algolia* for the applications search functionality which allows users to search for projects that they are interested in. For example, if users are looking for projects about finance, *Algolia* can filter down the projects and display only the projects that pertain to finance. We also use this 3rd party search for finding users in the network section of our application. When integrating *Algolia* with our application we choose to use Firebase cloud functions for making the calls to the *Algolia* platform. We choose this technology to help with the integration because they offer a free plan that has set read/writes that are allocated to your database.

***Figure 3: Portfolio Page*** the following image displays a user's portfolio page.

**KOLLAB** Discover Getting Started Teams Network 









**Michael Palte**  
Software Developer and Student in Westfield Center, Ohio  
mrpalte@gmail.com  
Interests: Technology

Edit Edit Image Resume


### About

I currently work as a software developer in Akron OH for First Energy. In my job I work with web technologies such as Angular, and Dot Net. In addition to working as a developer I am finishing my last semester at the University of Cincinnati. I will be graduating from UC this coming May and will have a Bachelors in IT Software Developer.

### Projects

 <p>Moon Lander</p>	 <p>Amazon</p>	 <p>Grading Easy</p>
 <p>Microsoft</p>	 <p>Teacher Assist</p>	 <p>AB Construction</p>

### Certifications and Achievements

 Michael Palte

*Figure 3: Portfolio Page*

Figure 4: Network Page the following image displays the network page.

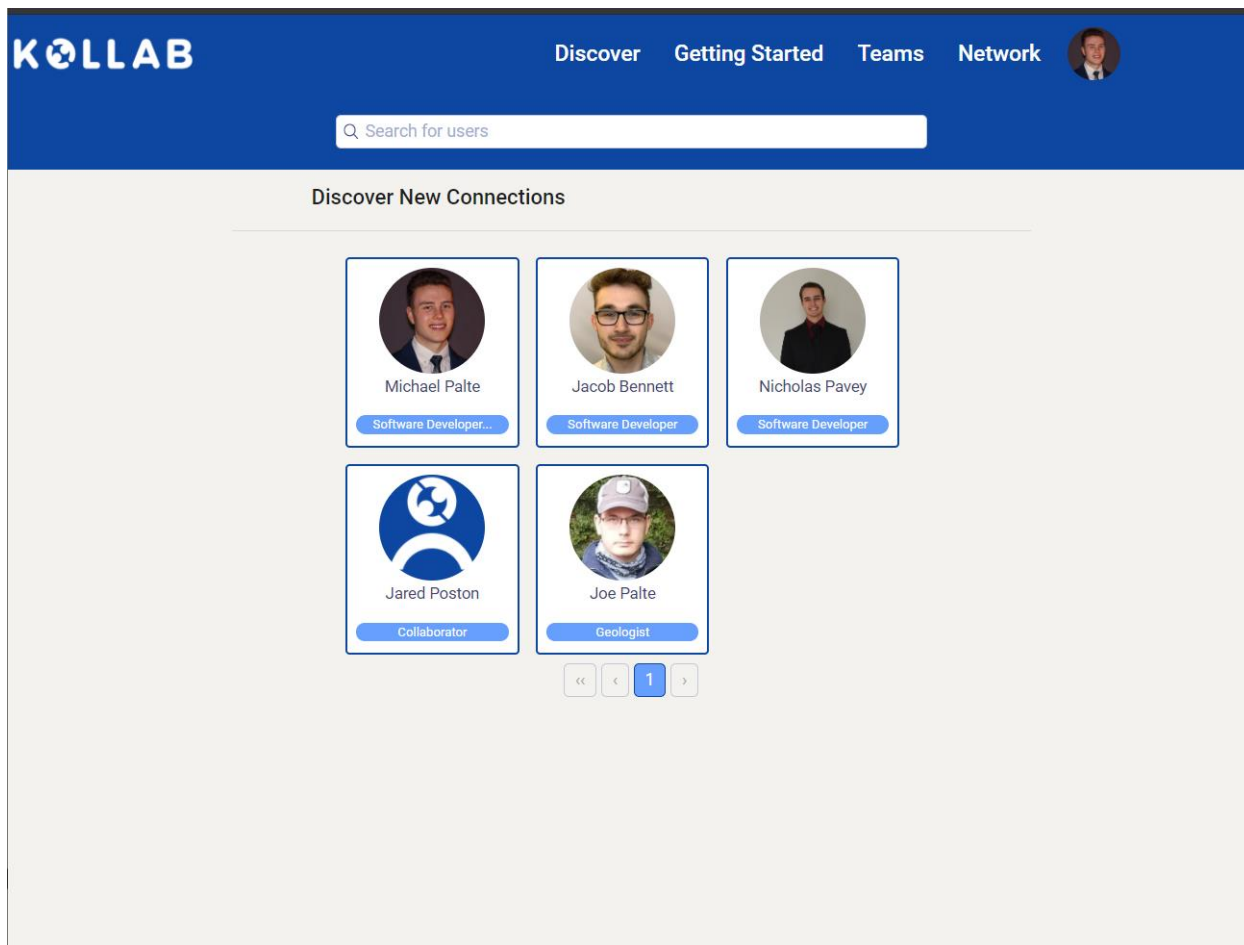
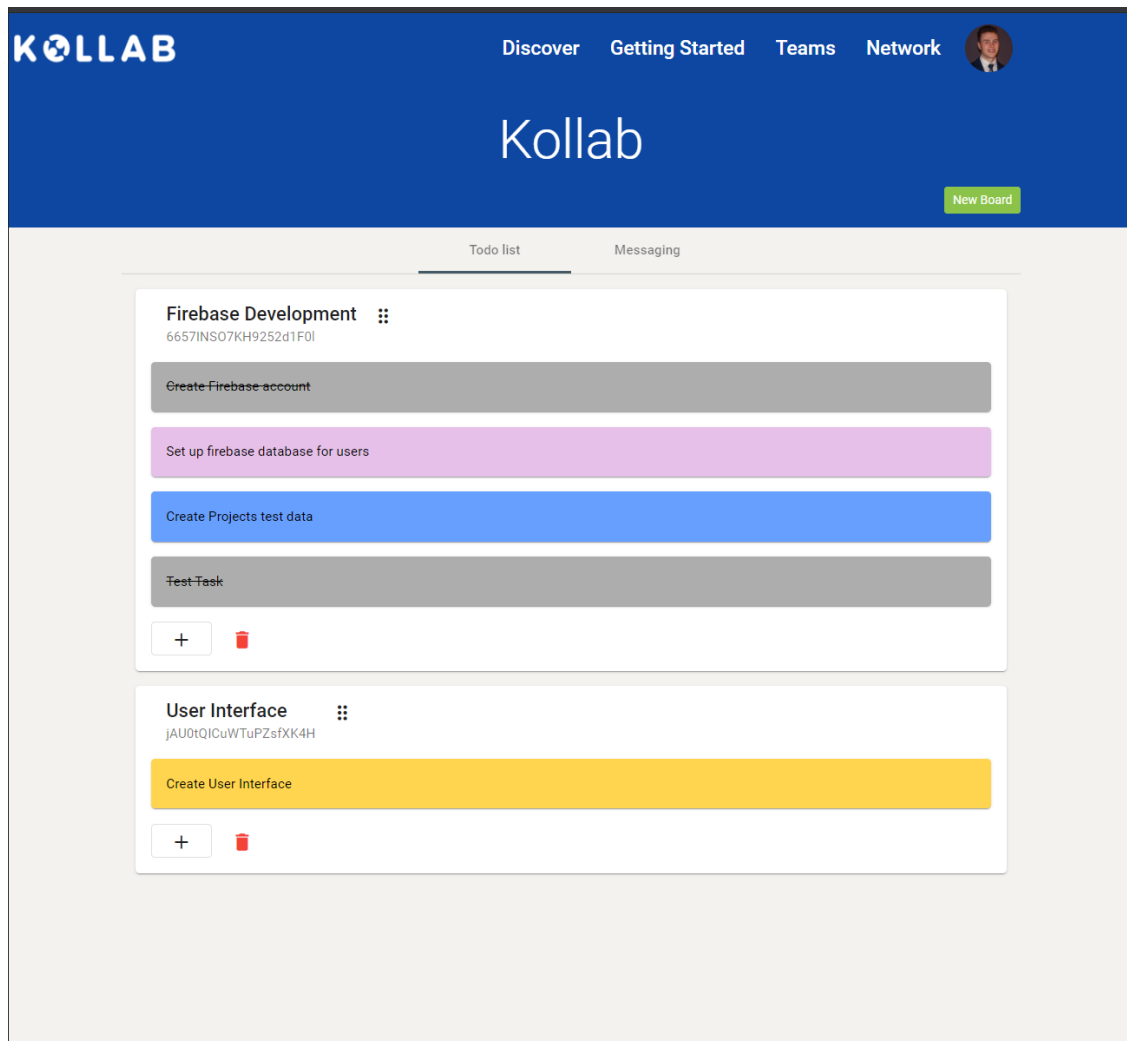


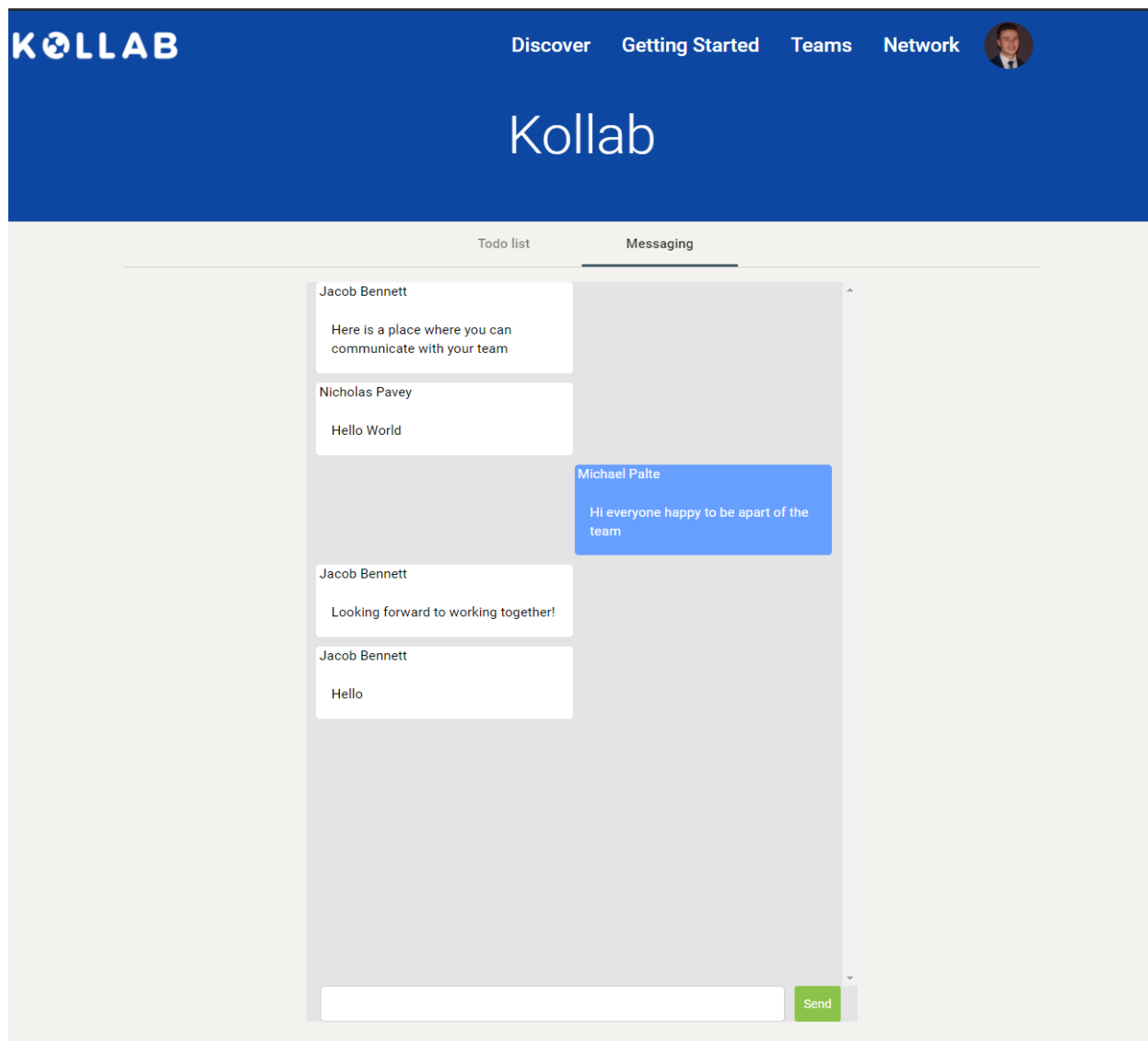
Figure 4: Network Page

*Figure 5: Todo List Boards* The following image displays the Todo list section of the Teams page.



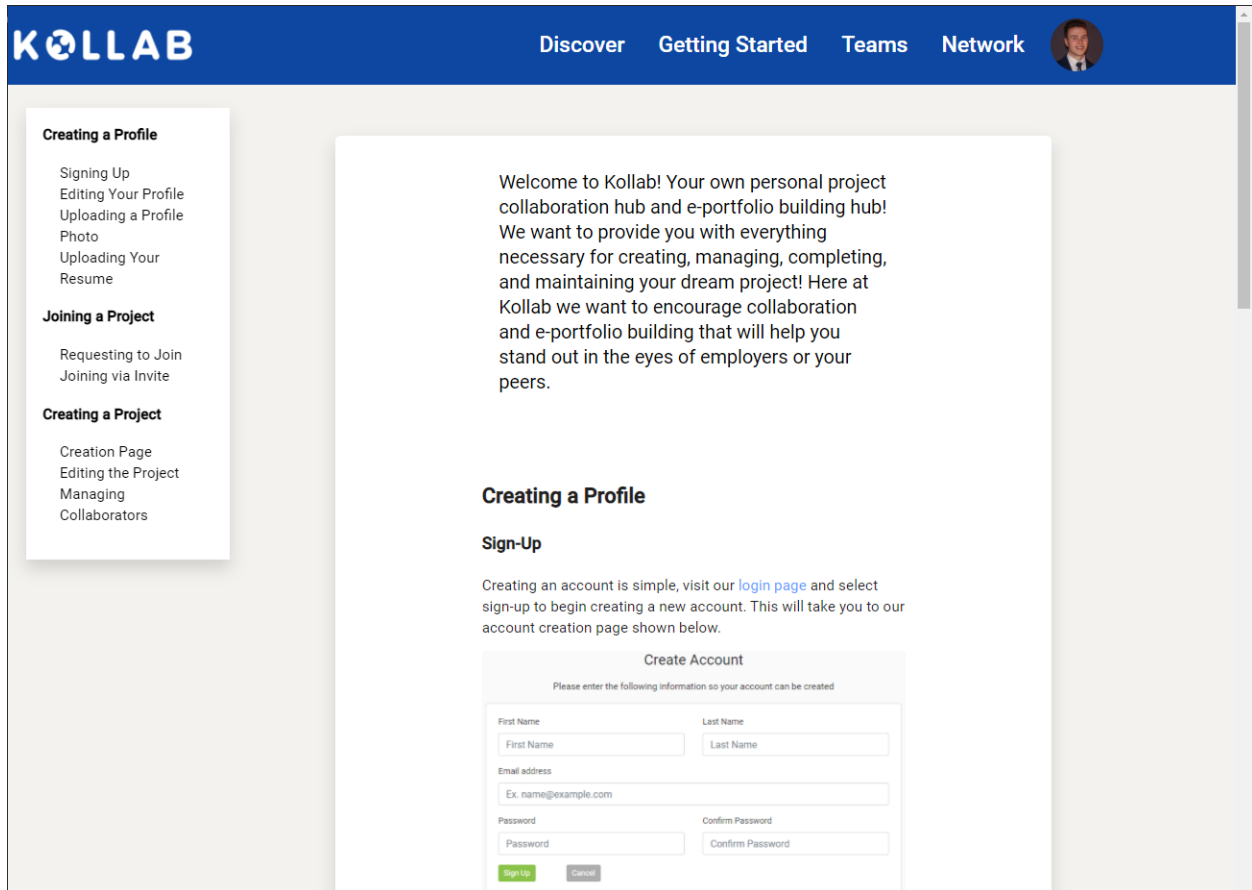
*Figure 5: Todo List Boards*

**Figure 6: Messaging** The following image displays the messaging section of the Teams page



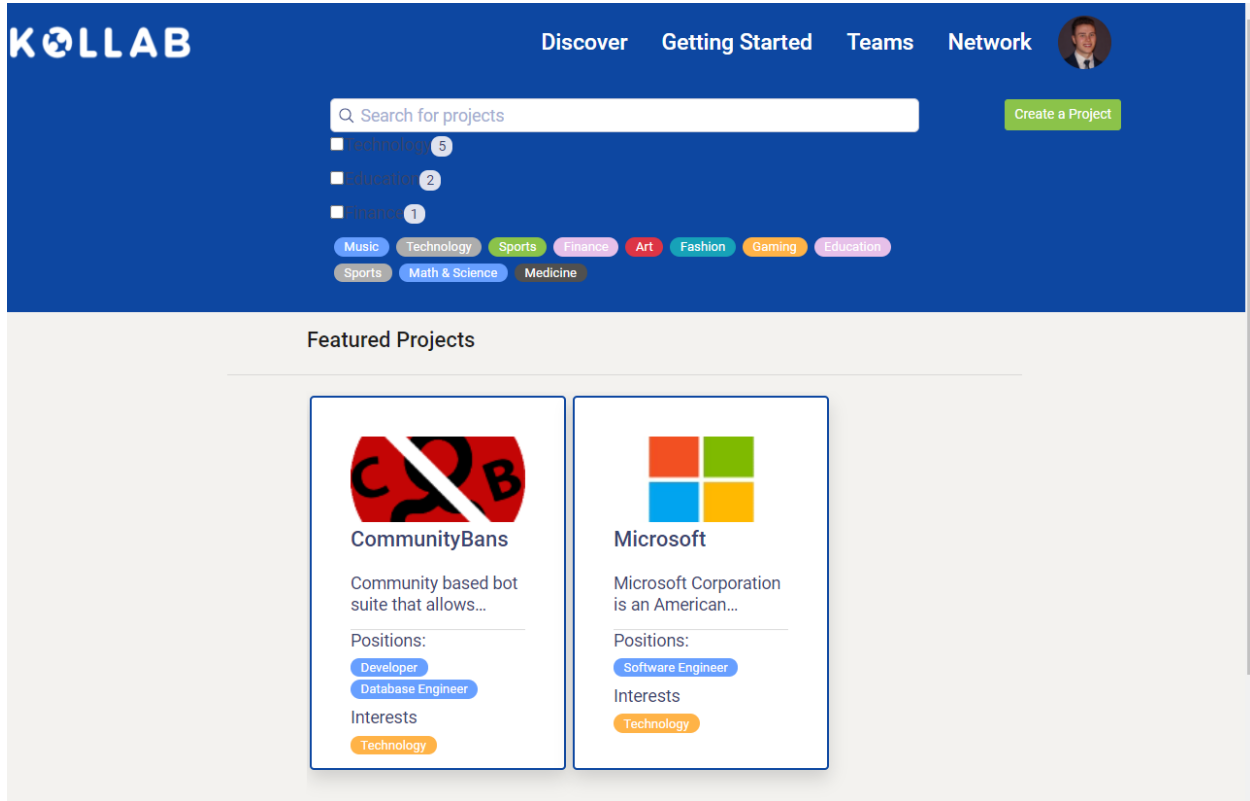
**Figure 6: Messaging**

**Figure 7: Getting Started Page** The following image shows the Getting Started page of our application.



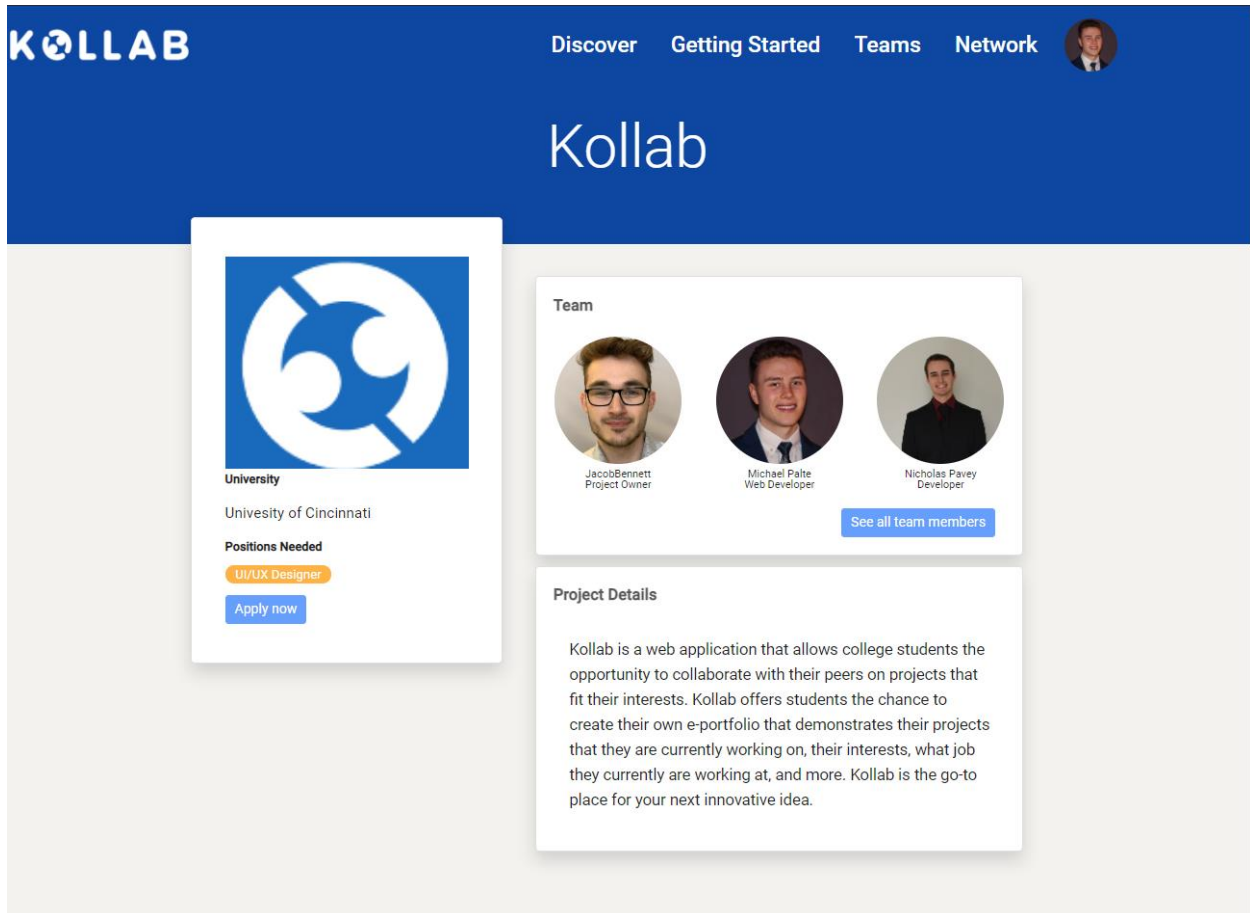
**Figure 7: Getting Started Page**

*Figure 8: Discover Page* The following image show the discover page of the application.



*Figure 8: Discover Page*

**Figure 9: Project Details Page** The following images shows the Project Details page of the application.



**Figure 9: Project Details Page**

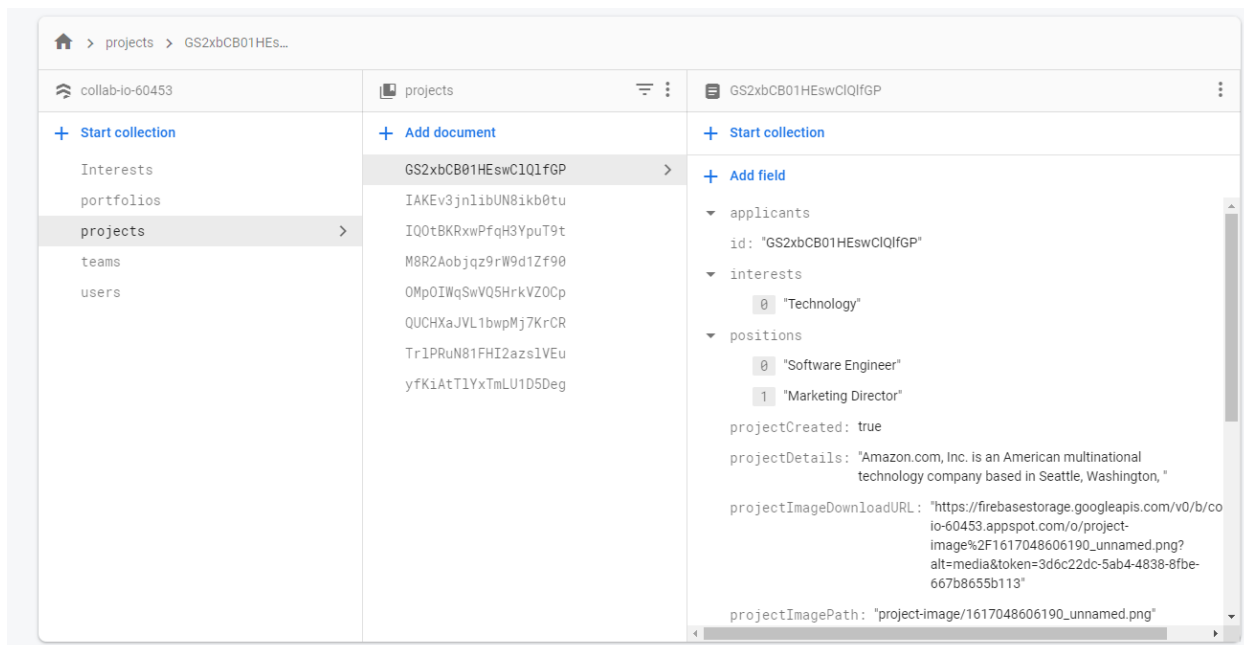
## Database

The database that we use is called “Firestore”. Firestore is a realtime database that supports cloud functions and is overall one of the best ways to create a good architecture for our back end for our application. Firestore was created by google, and supports free usage until you

reach a certain amount of read/writes, then you have to pay. The price is very low though for reads, but a little more expensive for writes. Working with Firestore has allowed us to easily manipulate data between collections as well as interconnect all of our data between our component-based application.

The database structure consists of five tables: Interests, Portfolios, Projects, Teams, Users. Figure 9 shows the tables and the document id associated and the object data that is listed in each document id.

**Figure 10: Firestore Database** the following images shows the collections and documents of in our database



**Figure 10: Firestore Database**

## **Security**

The security architecture is very complex when it comes to firebase, we are using some authentication tokens for our login page, such as Google login, Facebook login, yahoo login, and more. These tokens are being backed up through their providers, so there isn't a lot of security that goes into it. We also have our own sign in application though, which requires a lot more security and our goal is to provide the best security for all of our users, so that their passwords are all secure and their privacy is secure and they feel at ease using our application.

## **2.7 Testing**

### **Overview**

This section contains the process being used for testing Kollab. Testing is one of the most important things when it comes to creating a web application. The individuals who should use this section are Developers, Project managers, team members, and testers.

### **Scope and objectives**

The scope of testing is divided into three parts: security, community engagement, and database usage. When it comes to security, we need to make sure that when we encourage new users to join the website, that their data is being encrypted and that in no way possible, their data is hackable. For example, when using Postman, you are able to attack our website with https, and we need to make sure that that doesn't happen. When it comes to community engagement, we need to make sure that the website is fluid to go through, people understand why everything is there, and it's not confusing. The other aspect, database usage is very important, we need to

ensure that when we are querying that we are not reading the data twice, and that we are not going over the usage.

### **Entry and Exit Criteria Entry Criteria**

Entry Criteria:

- Security check has been designed and completed
- Website traffic increases over the next few weeks
- Database tests designed and completed
- New survey sent out and completed

Exit Criteria:

- All tests have been completed
- Website traffic increases
- Survey results improve from original survey

#### **2.7.1 Database Testing**

Database security is one of the most important things when it comes to running a website, with firebase we are doing all of our authentication through firebase and we have setup our own sign in and log in form as well. Our goal for the tests for this was to ensure that all of the data that was being passed in wasn't being merged or overriding other sets of data. For testing we had QA do tests on creating multiple accounts and setting up their own e-portfolios. An important aspect of firebase was the ability to ensure that when users uploaded a photo, it would get stored as a store blob that would be implemented into Firebase storage, we had testers ensure that uploading images worked without any duplicates or bugs.

*Figure 11: Firebase Rules the following table shows our firebase rules for the website.*

```
service cloud.firestore {
  match /databases/{database}/documents {
    // This allows read and write for entire database and should not be left in once in production
    match /{document=**} {
      allow read, write;
    }
    // Reusable function to determine document ownership
    function isOwner(userId) {
      return request.auth.uid == userId;
    }
    match /users/{userId} {
      allow write, read: if isOwner(userId);
    }

    match /boards/{document} {
      allow read;
      allow create: if requestMatchesUID();
      allow update: if resourceMatchesUID() && requestMatchesUID();
      allow delete: if resourceMatchesUID();
    }

    function requestMatchesUID() {
      return request.auth.uid == request.resource.data.userId;
    }

    function resourceMatchesUID() {
      return request.auth.uid == resource.data.uid
    }
  }
}
```

*Figure 11: Firebase Rules*

### **2.7.2 Website Testing**

We used several test cases to verify that all the functions of the website operate at the fullest capabilities and that users were able to create their own portfolios and create projects. A goal that is important for us is the ability to have users collaborate, and with that we wanted the testers to create two accounts. One account would be used as a project owner, where they would create a project and then they would create another account and that account would apply to be a team member for the project that was just created. The project owner account would then accept the applicant, and once this happened the user who applied would have full access to the project's details. They would have access to the team's page where the team of that project would see the scrum board and the projects instant messaging service. Once testers have ensured that users who applied are able to collaborate, then that is the main test of the website.

### **Conclusion of testing**

The testing process taught us the importance of testing all of our features throughout our project. With testing we were able to find bugs early on within our application and we were also given a lot of good feedback that can help the user navigate throughout the website easier. The goal of Kollab is the ability to collaborate with your other college students and the testers ensured that every aspect of Kollab lives up to that, and students are able to roam freely through the application and start their creative endeavors.

### **2.8 Budget**

This table below displays the budget for our project. This is an estimation of the real world costs that this project would take, this project will start off as a small business, but overtime with the firebase storage costs it may increase, but this will be supplied with the revenue that we make.

**Table 1: Project Budget** The following table below displays the budget for our project. It is an estimation of real-world costs. The budget represents what Kollab would be billed for the services our company provided, as well as the costs to maintain the services we implemented.

<b>Kollab</b>				
NO.	Item	Unit, Hours	Unit Price	Total
		Software		
1	Google Domains	1	\$14.99(Yearly)	\$14.99
2	Firestore Database	1	Free, until we need more storage.	\$0
	Subtotal			\$14.99
		LABOR		
3	Logo Design	1	\$60	\$60
	Subtotal			\$60
	Total:			\$74.99

**Table 1: Project Budget**

## **2.10 Problems encountered and Analysis of Problems solved**

Our problems that we encountered were based on development and the opinions that we all had going into development. Everyone has great ideas, but at the end of the day the idea's that matter the most are the ideas that make the end users' life enjoyable and easy. We as a team have been very good about communication and being able to talk through all our ideas and note down different UI/UX examples that the end user would love.

Another problem that we encountered was cloud Firestore functions which ended up being the most optimal way for us storing data and creating custom scripts for Image Upload, Messaging Service, as well as search functionality. These were key implementations that took months to do and If we would've had more knowledge or if there was more documentation on these services then we would've had more time to accomplish more tasks and develop more features.

## **2.11 Recommendations for Improvement**

We are very happy with how our project turned out. There are always things that we would like to innovate on, and we'd like to create more features, but the team truly worked hard and we feel very happy to deliver this application at the IT Expo. I think in terms of improvement I think one thing that we could have done better is to create a standard for coding architecture. All 3 of us have experience working in Angular but we all develop our components in a different way. Having a more robust component design would be better off in terms of scalability for the future.

### 3 CONCLUSION

---

#### **Lessons Learned**

This project has provided all three of us with many technical development learning experiences, every page in this application has involved some sort of learning process to implement the features that we desired. Through the planning and beginning stages of creating this web application we learned the importance of planning ahead, scheduling sprints, and creating user stories that would shape our path of development in a way that provides the most useful features and wastes the least amount of development time. We learned how to collect, organize, and quickly plan changes based on user feedback.

#### **Abilities and Skills Developed Throughout Project**

Through this project we have developed an immense set of skills on the development side: We have gained a huge amount of experience with the Angular framework, as we used it as the base of our web application, Firebase, Firestore, and Cloud Functions for web hosting, user authentication, data creation, instant messaging, and storing all of our information from projects to portfolios in a NoSQL database, Azure DevOps for project management, automated pull request testing, and detailed managed version control, Ngx-Image-Cropper for editing and creating images from the users frontend, SASS for a more advanced feature set of styling and formatting over vanilla CSS.

On the side of business and project management we have learned: How to create better user stories, which are the basis of our development direction. How to better manage time, planning sprints, dividing tasks into subtasks, and meeting established deadlines. We have also

established knowledge on how to create a business, manage costs and plan for the future of the business after Sr. Design completion.

### **Plans for Continued Development**

We will continue our development efforts on the project based on our established features and desired features. There will be more emphasis on getting the application set up to handle a large-scale production environment. Development on the final production look and feel of the application will be continued to create a cohesive, professional, yet easy to use user interface that we have already established. We will ramp up the amount of user and project data being stored and accessed as we will be looking for real users to begin using and testing our site to provide real world user feedback. We have planned a focused effort on the administration and moderation side of the application where we will be expanding the feature set for users depending on their admin or moderator account status.

## REFERENCES

---

Google Cloud Databases. *Google Cloud*, Google <https://cloud.google.com/products/databases/>.

McKay, J., Dr. & Watty, K. (2017, February 02). EPortfolios: What employers think. Retrieved August 25, 2020, from <https://www.globalfocusmagazine.com/eportfolios-what-employers-think/>

Jindal, A. (2020, April 06). Importance of projects on Résumé. Retrieved November 09, 2020, from <https://medium.com/%40aarnavjindal/importance-of-projects-on-r%C3%A9sume-3efd7ef74da0>

Virangama, A. (2020, May 06). Building the Perfect Resume. Retrieved November 09, 2020, from <https://medium.com/@anjaliVirangama/building-the-perfect-resume-f86dff78060b>

<https://firebase.google.com/docs/database/web/structure-data>

Marczak, C., Dr. (2017, December 12). Studies show impact of education outside the classroom. Retrieved April 10, 2021, from <https://mauryalliance.com/studies-show-impact-of-education-outside-the-classroom/>

## 4.2 Appendix

**Appendix A: IT Expo Poster** The following image displays our team’s poster which will be used during the IT Expo.



*Figure 12: IT Expo Poster*