Building an Online Community of Creators Through MIT App Inventor

by

Kelsey K. Chan

S.B., Massachusetts Institute of Technology (2018)

Submitted to the Department of Electrical Engineering and Computer Science

in partial fulfillment of the requirements for the degree of Master of Engineering in Electrical Engineering and Computer Science at the

MASSACHUSETTS INSTITUTE OF TECHNOLOGY

June 2019

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Author ................................................................

Department of Electrical Engineering and Computer Science

May 24, 2019

Certified by ............................................................

Harold Abelson

Class of 1922 Professor of Computer Science and Engineering

Thesis Supervisor

May 24, 2019

Accepted by ...........................................................

Katrina LaCurts

Chair, Master of Engineering Thesis Committee
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Abstract

An online community whose primary activity involves sharing personal creations is called an Online Community of Creators (OCOC). These communities provide a space where one user’s work can serve as inspiration for others and where users can offer feedback to each other, thus fostering creativity and helping users learn and grow. I designed and implemented a stand-alone gallery where App Inventor programmers can showcase their projects and receive feedback on their work. The goals of this new gallery were (1) to encourage more users to share their projects and (2) to increase the discoverability of shared projects among the App Inventor community. Based on the user study results, the new gallery addresses many usability pain points that users faced in the old gallery. Users expressed that they are more likely to share projects and view projects using the new gallery. By continuing to improve the usability of the gallery user interface, we hope to encourage even more users to publish projects to the gallery and to explore projects created by other members of the App Inventor community.

Thesis Supervisor: Harold Abelson
Title: Class of 1922 Professor of Computer Science and Engineering
Acknowledgments

I would like to thank the MIT App Inventor team for sharing their knowledge with me and for supporting me through the process of building and testing the new project gallery.

In particular, I would like to thank Hal Abelson for his encouragement and guidance as I built out the gallery prototype; Evan Patton for meeting with me weekly and offering his technical expertise whenever I hit roadblocks; Jeff Schiller for helping me debug my code and for showing me how to setup the gallery test instances; Josh Sheldon for providing feedback on the design of my user tests; Natalie Lao and Danny Tang for calming me down every time I felt like my thesis was an insurmountable obstacle; Nichole Clarke for giving me tips and feedback on writing my thesis and for being a constant inspiration to me; Kevin Liu for patiently helping me with \LaTeX formatting; and last but definitely not least, Mary Zhong for helping me build the gallery prototype, for completing the COHES training at my last minute request, and for helping to conduct my classroom user study. I would not have been able to complete my thesis without the support and encouragement of all of these incredible individuals.

I would also like to thank all the user study participants without whom I would not have any results to share. Thank you for your time and for validating my work for the past year; it makes all the time and effort worth it.
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Chapter 1

Introduction

Online communities centered around sharing personal creations are referred to as Online Communities of Creators (OCOCs) [1]. These online communities provide an environment where members can discuss each other’s work and associate particular contributions with their creators. Effective OCOCs support creative development by encouraging members to explore other people’s work, often serving as inspiration for new creations [1].

Many OCOCs support remixing, whereby a user can download another user’s project and use that as a starting point for their own project. Users often enjoy remixing other people’s work because it allows them to “learn from, experiment with, and add on to the work of other users” [2]. Furthermore, a study done on the Scratch online community showed that users who remix more often have “larger repertoires of programming commands” [3]. Exposure to computational thinking concepts through remixing is also associated with an increased likelihood of applying those concepts to new projects [3].

MIT App Inventor is an online platform that allows students and novice programmers to build mobile applications using a block-based programming language. The goal of my thesis is to help strengthen the App Inventor online community by redesigning the project gallery. The existing project gallery only supports project sharing from one out of the four different App Inventor instances. Furthermore, the existing project gallery requires users to be registered and logged in to view projects.
The new project gallery that I prototyped for my thesis is a standalone gallery that supports sharing apps created from all App Inventor instances. I designed the new user interface with two primary goals in mind: (1) to encourage more users to share their projects and (2) to increase the discoverability of shared projects throughout the App Inventor community. By making shared projects more visible among the App Inventor community, we hope to see an increase in remixing activity and increased collaboration among users.

The remainder of this thesis is organized as follows. I will discuss related work (Chapter 2) and present the key features of the new gallery user interface design (Chapter 3). In Chapter 4, I highlight the major components of the new standalone gallery, as well as discuss the interface between the gallery and the ai2 App Inventor instance. In Chapter 5, I discuss two user studies that I conducted and analyze the results from those experiments. Lastly, I outline improvements to the gallery that can be explored in the future (Chapter 6) and conclude (Chapter 7).
Chapter 2

Related Work

2.1 MIT App Inventor

MIT App Inventor is a blocks-based programming language that allows anyone and everyone to create fully functional mobile applications. Millions of users from 195 countries have used App Inventor to create almost 38 million apps \[4\]. There are currently four different instances of App Inventor; however, the ai2 instance is the only one with an app gallery to which users can share their projects. The ai2 app gallery currently features more than 100,000 apps, but these projects are only accessible to registered users who have logged in.

This project aims to create a standalone gallery that supports sharing apps created from all App Inventor instances. The new gallery will have many of the same features as the existing ai2 gallery, but it will also have many enhancements to further encourage project sharing and remixing among the community.

2.2 Computational Action

Computational action is a framing of computational education that emphasizes giving students the opportunity to apply their computational skills to solve real problems in their lives and communities \[5\]. As a platform that allows students to create mobile applications to solve problems in their communities, MIT App Inventor has been
researched extensively as a platform for computational action.

There are two key dimensions for understanding how to create educational experiences that enable students to engage in computational action: computational identity and digital empowerment. Tissenbaum et al. define computational identity as “a person’s recognition of themselves as capable of designing and implementing computational solutions to self-identified problems or opportunities” [5].

Developing one’s computational identity involves being able to see oneself as part of a larger community of computational creators. That is, it is important for students to feel like “their work is authentic to the practices and products of broader computing and engineering communities” [5]. Improving the usability and visibility of the MIT App Inventor gallery not only makes it easier for students to explore other mobile applications made using App Inventor, but it will also give students the feeling that they are learning real-world practices.

It is also important for students to feel that their work has an impact on their community. Not only can students readily use their App Inventor mobile applications to solve problems in their community, but they can also extend the reach of their projects by publishing them to the App Inventor Gallery. We hope that students will be inspired by seeing other people download and interact with their projects.

### 2.3 Scratch

Similar to MIT App Inventor, Scratch is a block-based programming language and online community. It is designed for children ages 8 to 16, but people of all ages use it to create interactive stories, games, and animations [6]. Since its first release in 2003, the user base of more than 30 million people have shared more than 38 million projects [7]. The thriving online community of Scratchers is one reason why Scratch has been so successful at inspiring children to use programming as a way of creative expression. Many Scratchers are strongly motivated by “the opportunity to share their projects in front of a large audience—and receive feedback and advice from other Scratchers” [8]. More than 190 million comments have been posted on various
projects, studios, and user profile pages \[7\]. Any project shared to the Scratch community can be remixed, which encourages Scratchers to learn from each other by building upon other people’s ideas or projects \[9\]. Over 15% of shared projects are remixes \[8\]. Many of the new gallery features were inspired by features of the Scratch online community.

### 2.4 Diffusion of Innovation

For her Ph.D. dissertation, Elisabeth Sylvan used “diffusion of innovation” as a framework to study OCOCs, including Scratch \[1\]. Everett Rogers defined “diffusion of innovation” as “the process by which an innovation is communicated through certain channels over time among members of a social system” (as quoted in \[1\]). Members of the community go through five stages to adopt new innovations: awareness, interest, evaluation, trial, and adoption \[1\]. Table 2.1 shows how Sylvan measured each stage of adoption within the Scratch online community.

The stages of adoption in App Inventor can be measured in a similar manner, the biggest difference being that the existing App Inventor gallery does not support user commenting because there is no team of moderators. The other measures, however, can be used to evaluate how well the new gallery promotes the diffusion of innovation as an OCOC.

### 2.5 YouTube

YouTube is an online video sharing platform whose mission is to create an “online video community” \[10\]. By combining content creation and distribution with social networking features, YouTube is an ideal platform for users to “create, connect, collaborate, and circulate novel and personally meaningful media” \[11\]. As a result, YouTube has a participatory culture in which members feel empowered to not only consume existing media on the site but also to actively contribute their own creations.

According to Clement Chau’s piece on YouTube as a participatory culture, there
<table>
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<tr>
<td>Adoption</td>
<td>Using specific concepts or files in his or her own work, particularly on multiple occasions</td>
<td>Project uploads based on previous project</td>
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are several main characteristics of YouTube that make the platform effective at cultivating a culture that encourages user participation [11]. First off, there are relatively low barriers to engaging with the YouTube community both actively and passively. Passive users who watch videos, read comments, and view likes/dislikes but do not respond are still contributing to the community because viewing videos adds to the view count associated with each video [12]. Active users are those who post comments, rate videos, and/or upload their own content to the site [11]. Overall, it is easy to enter the YouTube community because users can choose to engage passively on the periphery or actively add content in the form of comments, ratings, or videos [11].

The second part of the participatory framework is a strong support for creating and sharing projects. Sharing YouTube videos is facilitated through auto-generated links to projects [11]. Popular videos in the community are highlighted on the front page of YouTube, and registered users can also view their subscriptions from the homepage. YouTube makes it easy for content discovery because users can find videos bottom-up
Users are more motivated to participate when they believe that their contributions are meaningful. YouTube keeps track of all user views, comments, and ratings, so all of these interactions can be considered meaningful to the platform. View counts and video ratings are displayed prominently below each video, and videos with the most views and highest ratings are highlighted on the homepage. Additionally, video producers who engage with comments on their videos are more likely to retain subscribers and gain more views [11].

YouTube promotes social connection among users by allowing users to customize their profile, friends list, and subscriptions list to keep track of their favorite channels and members. Furthermore, users can choose to be notified whenever a new video is posted on a channel to which they are subscribed [11]. The emergence of collaborative channels where multiple users publish content to the same channel is another example of how users collaborate with team members to create new, innovative videos.

The new App Inventor gallery incorporates several features from the YouTube platform to help promote a participatory culture. The new design emphasizes maintaining a low barrier to participation in the community, providing strong support for creating and sharing projects, allowing users to contribute meaningfully to the platform, and promoting social connection among users.

2.6 My Contributions

My thesis involves designing and prototyping a new project gallery that is compatible with all instances of App Inventor. It uses ideas from Scratch and YouTube to promote project sharing and to facilitate project discovery. Furthermore, it supports measuring stages of adoption in the diffusion of innovation [1], which will be helpful for evaluating the overall effectiveness of the gallery in achieving its goals as an online community of creators.
Chapter 3

User Interface

In this chapter, I present the key features of the new gallery user interface design and address changes to the App Inventor project editing interface. The goals of these features were to encourage project sharing and to facilitate project discovery.

3.1 Sharing Projects

This section outlines changes designed to simplify the process of publishing projects to the gallery.

3.1.1 Publish projects from the Project Editor

There are two main views in App Inventor: the My Projects page, which lists all of the user’s projects, and the Project Editor, which allows users to edit individual projects. Most users spend a majority of the time working on their projects in the Project Editor.

Currently, the only way to share a project within App Inventor is to navigate back to My Projects, select the project to be shared, and click the “Publish to Gallery” button as shown in Figure 3-1. This additional step is a potential barrier to project sharing because users who do not spend much time on the My Projects page may be unaware that project sharing exists. A user who has been working on a project
Figure 3-1: The existing method of publishing an app to the App Inventor Gallery from the My Projects view in the Project Editor may miss out on the opportunity to share their project simply because they do not realize it is an option. On the other hand, the Scratch interface has a prominent “Share” button, which makes it easier for users to directly share their projects after creating them as shown in Figure 3-2.

To avoid cluttering the Design Toolbar, which contains commonly-used buttons to create and edit the project itself, we added the “Add project to gallery” button to the Projects dropdown menu (see Figure 3-3). It is located in the same section as other menu items related to exporting projects (e.g. “Export selected project (.aia) to my computer”).

We updated the interface to display “Add to Gallery” and “Add project to gallery” instead of “Publish to Gallery” because we wanted users to feel comfortable sharing works-in-progress to receive feedback from others (see Figure 3-4). We also considered using the word “Share” like in Scratch; however, the App Inventor team is currently working on adding real-time collaboration to the Project Editor interface, so the word “Share” is reserved for inviting other users to collaborate on the same project.

3.1.2 Indicate draft status of project

Any shared project on Scratch can be marked as a draft (see Figure 3-5). Although marking a project as a draft does not necessarily change how the program runs,
Figure 3-2: Users can share a Scratch project from the project editor

Figure 3-3: Adding a project to the gallery from the Project Editor
some users may feel more comfortable sharing a project that is a work-in-progress to get feedback from others if there is a clear way to indicate that the project is a work-in-progress.

The new gallery supports marking App Inventor projects as drafts (see Figure 3-6). Some may argue that the gallery will become cluttered if people start sharing unfinished projects; however, the value of a gallery is not only as a curated collection of finished projects, but also as a place where people can share what they have been working on and give feedback to others. Furthermore, future iterations of the project gallery can implement a project filter that lets users choose to view all projects, view drafts only, or view completed projects only.

### 3.2 Increasing Discoverability

Knowing that others will view and interact with their projects may incentivize more App Inventor creators to publish their projects to the gallery. In order to encourage more people to browse apps in the gallery, we want to make it easier for people to find apps that interest them. This section outlines design changes to make App Inventor projects more discoverable.
Figure 3-5: Shared Scratch projects can be marked as drafts

Figure 3-6: Shared App Inventor projects can be marked as drafts
3.2.1 Search by category tag

The App Inventor Project Gallery contains many different types of applications, ranging from Pong games to medical apps for patients with diabetes. In the spirit of YouTube video categories, we allow users to classify their projects under one or more of these categories: “Games”, “Arts and Music”, “Education”, “Lifestyle”, and “Health” (see Figures 3-7 and 3-8).

3.2.2 Feature App of the Month Winners

The Scratch homepage features a curated list of recent projects that is updated on a regular basis. It is considered a very big deal to be featured on the Scratch homepage because it dramatically increases the traffic to that user’s project and profile page. The YouTube homepage also highlights top videos that may be of particular interest to users [11]. App Inventor gives out App of the Month awards to a couple projects every month, but the winners are not featured as prominently. Instead of being featured from the App Inventor homepage, the winners are currently posted on the App Inventor website (http://appinventor.mit.edu/explore/app-month-gallery.html).

We decided to feature the App of the Month winners on the gallery homepage
to increase visibility of award-winning projects and creators and to encourage more users to submit their apps to the competition (see Figure 3-9). Promoting App of the Month winners on the gallery homepage also makes it easier for people to find high-quality projects to learn and get inspiration from. In addition, projects that have been awarded the App of the Month Award are labeled as such on the project detail page (see Figure 3-10).

3.2.3 User following

Any user on YouTube can subscribe to any other user. The benefits of subscribing to users are two-fold. First, there is a tab you can select to view all the recently published content produced by users to whom you have subscribed (see Figure 3-11). Second, you can opt-in to be notified immediately whenever a user whom you follow publishes a new video. User subscriptions help cultivate the social aspect of the content creation community, as well as support the content discovery process [11].

We added a “Follow” button on each App Inventor user’s profile so that people can follow each other on the platform (see Figure 3-12). App Inventor has many power users who generate high quality content, so we expect many users to follow them.
Figure 3-9: Featured App of the Month Award Recipients in the Gallery

Figure 3-10: Project detail page for a featured App of the Month
The Subscription tab on YouTube displays recently published videos by users to whom you have subscribed. On the platform, providing power users more visibility within the community. Less experienced App Inventor programmers can learn from the projects created by power users and publish projects of their own to the gallery. Users with a large number of followers can also help the App Inventor team more easily identify new App Inventor power users within the community.

A given user’s profile page shows a list of all the users whom that user follows, as well as a list of all the users who follow that user (see Figure 3-13). When a user is logged in, they can see all the recently published projects created by users whom they follow by visiting the Explore page and selecting the Following tab.

Displaying followers and “followees” on people’s profile pages makes it easier for people to find new App Inventor users to follow and serves as another avenue to find interesting projects to download and remix.

### 3.2.4 Search by User

The existing gallery supports direct links to each project. However, there are no direct links to user profiles. Instead, the only way to navigate to a user’s profile is to find a project published by that user and then to click on the username associated
The new gallery prototype provides a direct link to user profile pages. This makes it easier for App Inventor users to promote all their shared projects using a single link. Furthermore, the new gallery’s search feature has a separate results section for users that match the search query (see Figure 3-14). On the other hand, the existing gallery only displays a list of projects whose title or author matches the search query. As a result, it is difficult to distinguish projects whose title matches the search query from projects whose author matches the search query. With a gallery with more than 100,000 published projects, separating out users from projects makes the interface much easier to use.

### 3.2.5 Featured Project on Profile

Many users have more than one project published to the gallery, but they may have a particular project that they want to highlight among all their shared projects. YouTubers can choose a featured video for their channel, and Scratchers can choose to feature a specific project on their profile page. In the new App Inventor gallery, a section of the user profile is reserved for a Featured Project (see Figure 3-12). Users...
Figure 3-13: (a) The profile page shows a list of people whom the user follows and a list of followers. (b) Users can choose a featured project to highlight at the top of their profile page. (c) Users can view a list of their favorite projects on their profile.
can choose which one of their shared projects they want to feature. By default, the featured project is the most recently shared project.

### 3.2.6 Favorited Projects

The existing App Inventor gallery supports “liking” projects and updates the total number of likes that a project has received. However, after liking numerous projects, a user has no way of viewing all the projects they have liked all in one place. This makes it difficult for users to revisit projects that they liked in the past.

In the new gallery prototype, every user’s profile page displays the projects they have favorited (see Figure 3-13). This makes it easier for users to go back and find projects they liked in the past, and it also helps visitors discover interesting projects when visiting other user’s profile pages.

### 3.2.7 Screenshots

In order to try out someone else’s project from the gallery, the user must first create a copy of the project in App Inventor. From there, the user can either connect to the MIT App Inventor Companion app on a mobile device or emulator, or they can
generate the APK file and install it on their mobile device. This process is more involved than other platforms like Scratch, where users can typically test out another user’s project with the single click of a button.

As a result, the frequency at which users download and try out each other’s applications may be lower because of all the steps involved in the process. Although this iteration of the gallery does not address this issue directly, it does allow users to upload screenshots of their app, similar to those that are included in Google Play Store and the Apple App Store. Adding screenshots (see Figure 3-15) can be a great way for project creators to promote their applications and encourage other users to go through the steps necessary in order to try out their app.

3.3 Summary of Key Features

To streamline the process of publishing projects to the gallery, I added a menu item to the Project Editor View that allows users to publish projects without returning to the My Projects page. Additionally, by allowing users to indicate that a project is a draft, I hope to encourage more users to share their projects so that they can receive feedback from others as part of the project creation process.

The new gallery also has several features to make it easier for people to find projects that interest them. Each project can be associated with one or more category tags, so users may search the gallery for projects that fall under certain categories. App of the Month Winners are featured prominently on the front page of the gallery so that users can easily find high-quality projects. Users can follow each other, which makes it easier for them to keep track of projects recently published by specific users. The new gallery also supports linking directly to user’s profile pages, which facilitates user self-promotion. Furthermore, users can select a project to feature on their profile so that visitors know which project to look at when visiting other people’s profile pages. The profile page also provides easy access to all the projects the user has favorited. Lastly, users can look at the screenshots associated with published projects to get a feel for the application before downloading and testing it out themselves.
Figure 3-15: Users can associate screenshots with their published projects.
Chapter 4

System Design and Implementation

This chapter describes the steps taken to implement the gallery and to make it compatible with existing App Inventor instances. Section 4.1 explains the system design and implementation of the standalone gallery web application, and Section 4.2 covers the interface between the standalone gallery web application and the existing ai2 App Inventor instance.

4.1 Gallery Web Application

4.1.1 Technology Stack

The new gallery follows the client-server architecture. The client side uses React.js to render components for the user interface, and the server side uses Node.js and Express to handle requests and provide other services. On the server side, we use Sequelize ORM with Postgres as the database. Files are saved directly to the server’s local file system.

The test instance of the new gallery is currently hosted on a virtual machine in OpenStack.

4.1.2 Database Models

The following models are used to represent different entities in the Postgres database:
4.1.3 UI Components

React is a component-based JavaScript library used for building interactive user interfaces. Encapsulated components that manage their own state can be combined to make complex UIs. Here is a partial list of the components that are used to make the new gallery interface:

- **GalleryApp**: Component that renders preview information for a single project

- **GalleryContainer**: Component that retrieves a list of projects from the server and renders a GalleryApp component for each project

- **ProjectDetail**: Component that renders detailed information about a project and handles actions like “favoriting” the project, editing the project information, removing the project from the gallery, and opening the project using an App Inventor instance
- **UserPreview**: Component that renders a user’s profile picture and a link to the user’s profile page

- **Profile**: Component that renders a user’s profile page and handles actions like following a user. Renders a **GalleryApp** component for each project shared or favorited by the user and a **UserPreview** component for each follower and followee.

### 4.1.4 Server Endpoints

The client communicates with the server by sending requests to one of many endpoints made available by the server. The **GET** endpoints send back requested information to the client, and the **POST** endpoints carry out actions on the server. Here is a partial list of the endpoints that the client uses to communicate with the server:

#### Project Endpoints

- **/api/projects**: **GET** endpoint that returns a list of published projects with detailed information about each one

- **/api/project/:id**: **GET** endpoint that returns detailed information about the project with the given id

- **/api/project/create_or_update**: **POST** endpoint that publishes a new project based on the information provided in the request body or updates an existing project if it already exists. The request body should contain the following fields: `title` (string), `authorId` (string), `projectId` (string), `appInventorInstance` (string), `aiaFile` (file), and `token` (string).

- **/api/project/edit**: **POST** endpoint that edits an existing project based on the information provided in the request body. The request body may contain the following fields: `title` (string), `id` (number), `description` (optional text), `tutorialUrl` (optional string), `credits` (optional text), `isDraft` (boolean), `tagIds` (optional JSON string representation of an array of numbers), and `newImage` (file).
• /api/project/add_favorite: POST endpoint that adds a project to the user’s list of favorite projects. The request body should contain a JSON object with fields corresponding to the userId and projectId in the gallery.

• /api/project/remove_favorite: POST endpoint that removes a project from the user’s list of favorite projects. The request body should contain a JSON object with fields corresponding to the userId and projectId in the gallery.

User Endpoints

• /api/user/:username: GET endpoint that returns detailed information about the user, including shared projects, favorite projects, followers, and followees

• /api/user/search: GET endpoint returns a list of users that match the provided search query

• /api/user/create: POST endpoint that creates a new user based on the information provided in the request body. The request body should contain the following fields: authorId (string), name (string), username (string), and appInventorInstance (string).

• /api/user/edit: POST endpoint that edits an existing user based on the information provided in the request body. The request body may contain the following fields: id (number), name (string), bio (optional text), and featuredProjectId (optional string).

• /api/user/add_following: POST endpoint that creates a new following relationship between the logged in user and another user. The request body should contain a JSON object with fields corresponding to the followerId and followeeId.
• /api/user/remove_following: POST endpoint that removes an existing following relationship between the logged in user and another user. The request body should contain a JSON object with fields corresponding to the followerId and followeeId.

Instead of creating separate endpoints for creating, updating, and removing projects, it would make more sense for future iterations of the gallery to make use of the HTTP verbs POST, PUT, and DELETE. The user endpoints can be updated in a similar manner.

4.2 Interface with App Inventor

4.2.1 Design Requirements

The new gallery must be a standalone web application that is compatible with all instances of App Inventor. In other words, users of all App Inventor instances, not just ai2, must be able to publish projects to the gallery. Additionally, anyone should be able to view projects in the gallery, even if they are not logged in. This is in contrast to the existing implementation of the gallery, which is built into the ai2 App Inventor instance and thus only allows users of ai2 to publish and view projects. From the new gallery, users should be able to open projects using any App Inventor instance.

Users should also be able to log into the new gallery using their existing App Inventor credentials. That is, if a user is logged into an App Inventor instance, the new gallery should automatically log the user into their gallery account, too.

There must also be a way to import already published projects from the existing App Inventor gallery into the new gallery.

In the future, there may be interest in creating more than one gallery instance. By default, users of any App Inventor instance will be able to publish to any gallery instance; however, additional mechanisms (e.g. user whitelisting within a gallery instance) may be introduced to restrict the users who can publish to a given gallery. This requirement is not discussed extensively in this thesis, though it may be the
topic of future work.

### 4.2.2 Publishing Projects

Any App Inventor instance can publish a project to the gallery by making a POST request to the `/api/project/create_or_update` endpoint with information about the project specified in the request body. The following values can be specified for each published project:

- **title** (string)
- **authorId** (string)
- **projectId** (string)
- **appInventorInstance** (string)
- **aiaFile** (file)

In addition, the request body must contain a `token` field, whose value contains encrypted information about the logged in user's identity. More information about how each App Inventor instance retrieves the encrypted information about the logged in user's identity is detailed in Section 4.2.4.

Before adding a project entity to the database, the gallery server decrypts the token from the request body and ensures that the `authorId` specified in the request body corresponds to the logged in user (as determined by the decrypted token value). If the provided `authorId` does not match the logged in user, the project is not added to the gallery.

### 4.2.3 Opening Projects

Each App Inventor instance supports importing projects from Base64 encoded files by visiting a URL of the form `http://ai2.appinventor.mit.edu?locale=en&repo=[link to Base64 encoded version of AIA file]`. All the projects published to the new gallery are saved on the server's local file system and can be retrieved at
a URL of the form http://gallery-test.appinventor.mit.edu/api/exports/[filename of Base64 encoded version of AIA file]. The draft flag associated with each published project has no bearing on whether or not a project is retrievable from the exports URL. Thus, opening a project from the new gallery using App Inventor is as easy as clicking a button that opens a URL of the form http://ai2.appinventor.mit.edu?locale=en&repo=http://gallery-test.appinventor.mit.edu/api/exports/[filename of Base64 encoded version of AIA file].

4.2.4 User Authentication

When a user logs into App Inventor, they should automatically be logged into the gallery as well. Since each App Inventor user is uniquely identified by the email associated with their account, we associate each gallery user with their App Inventor email using the authorId field.

The new gallery relies on a session cookie sent along with each request to authenticate the user sending the request. Since the new gallery and each of the App Inventor instances are hosted on different domains, the App Inventor instance cannot directly set the session cookie for the new gallery domain. Instead, whenever a user logs into an App Inventor instance, the App Inventor instance builds a token containing the encrypted user information and creates a hidden iframe with the URL set to the new gallery’s /api/user/set_login_cookie?token=[user info token] endpoint. Upon receiving a GET request at this endpoint, the new gallery server verifies the validity of the token and then sends a response back that sets the session cookie accordingly. Future requests sent to the new gallery server will contain this session cookie.

4.3 Importing Existing Projects to the New Gallery

Part of deploying a new App Inventor gallery requires the ability to port all the projects that have been published to the existing gallery into the new gallery. As part of preparing the test gallery instances for the user studies, I imported a subset of the
existing gallery’s published projects into the new gallery. Although the mechanisms described below may not scale well (i.e. might not be the most effective way to port all the published projects in the existing gallery), they show that it is possible to import published projects from the existing gallery to the new gallery.

4.3.1 Downloading AIA Files

As detailed in Section 4.2.2, publishing a project to the new gallery involves sending a POST request to the /api/project/create_or_update endpoint with information about the project (e.g. title and description), as well as the project AIA file. Therefore, for each project that I wanted to port from the existing gallery to the new gallery, I needed to download the corresponding AIA file. To accomplish this task, I wrote a Python script that used Selenium to automate the process of viewing over 100 projects on the existing App Inventor gallery and exporting the AIA files to my computer’s local file system. The script also used the Beautiful Soup Python package to parse the HTML of the web page to get information about the published project, including the title, description, author, credits, tutorial URL, and featured project image. The information about each project was saved as a JSON file on my computer’s local file system as well.

4.3.2 Publishing Projects to the New Gallery

Once all the information about the projects had been collected, I wrote another Python script that sent POST requests to the new gallery’s /api/project/create_or_update endpoint. Each POST request contained information about a project and included the AIA file in the form body.

4.3.3 Publishing Projects to the Existing Gallery

For my user study, I created a new test instance of App Inventor, which meant that the gallery started off completely empty. In order to populate the new instance of the existing gallery with the same projects that I used to populate the new gallery, I
created three new App Inventor servlets that together allowed projects to be published via POST requests. Prior to implementing these additional servlets, the existing gallery did not have an externally-facing endpoint that supported publishing projects.

Each of the three servlets corresponds to a different endpoint that handles POST requests:

- The ReceiveGalleryProjectInfoServlet creates a new gallery project based on the project information provided in the POST body.

- The ReceiveGalleryProjectServlet accepts POST requests whose body contains the contents of a project’s AIA file in binary. The servlet stores the AIA file using Google Cloud Storage and associates the published project (as specified by the request URI) with this AIA file.

- The ReceiveGalleryProjectImageServlet accepts POST requests whose body contains binary image data. The servlet stores the image using Google Cloud Storage and associates the published project (as specified by the request URI) with this image.

After populating the test instances for the new and old galleries, I conducted two user studies to evaluate the effectiveness of the two galleries. The next chapter covers the user studies in detail and analyzes the results from the experiments.
Chapter 5

User Study and Analysis

This chapter describes two user studies that were conducted to see what people think about project sharing and project discovery using the new and old galleries. The first study was conducted in a classroom setting and focused on high school students as users. The second study involved completing a set of tasks for each gallery and emphasized the overall usability of the user interface.

5.1 Classroom Study

5.1.1 Target Users

App Inventor is a platform used by many high school students to learn computer science through programming mobile applications. Mobile Computer Science Principles (Mobile CSP), for example, is a program funded by the National Science Foundation with the goal of providing high school students a “broad and rigorous introduction to computer science” using App Inventor \[13\]. The Mobile CSP course satisfies all requirements of the College Board’s AP Computer Science Principles course, which was designed to encourage more high school girls and other underrepresented minorities to participate in computer science \[14\].

The first user study targets App Inventor users who are high school students. This study was conducted with two high school computer science classes at Boston Latin
Academy. Both of these classes were following the Mobile CSP curriculum. Before beginning the study, students were asked to fill out a pre-survey (see Appendix A.1) to gather information about their prior experience with sharing and browsing projects using the existing App Inventor gallery.

The results from the pre-survey are compiled in Figure 5-1. Out of the 49 students who participated in the study, 23 (47%) of them agreed or strongly agreed with the statement “I am familiar with the App Inventor gallery.” 22 (45%) of them agreed or strongly agreed with the statement “I have shared a project,” and 17 (35%) of them agreed or strongly agreed with the statement “I have viewed or downloaded other people’s apps.” Only 9 students (18% of the participants) agreed or strongly agreed with the statement “I have remixed other people’s apps,” which suggests that of the students who had prior experience working with the App Inventor gallery, a majority only shared and viewed apps on the gallery. They did not partake in remixing, which is the process of making changes to other people’s apps and sharing the modified projects to the gallery.
5.1.2 Study Design

The goal of this user study was to evaluate how well the new gallery’s features (1) encourage more users to share their projects and (2) increase the discoverability of shared projects. We wanted to observe how the gallery might be used in a classroom setting by observing how high school students share their projects and look for published projects to remix. Remixing is the process of downloading a published project, modifying it, and sharing the modified project to the gallery.

To preserve anonymity, each student was assigned a random email and password to log into the test App Inventor instances and galleries. The email was also used to identify users on each of the survey handouts.

Students were asked to download a project they made previously using App Inventor and then to publish the same project to both the new and existing galleries. To account for potential bias that could be introduced based on the order in which the participant viewed the galleries, one class published their projects to the existing gallery first, and the other class published their projects to the new gallery first. Students were also asked to browse the galleries for projects they would want to remix. The instruction handout that was given to students can be found in Appendix A.2 and Appendix A.3.

Students were asked to fill out a survey regarding their experience after using each gallery. That is, after publishing a project and finding a project to remix using the first gallery, the student completed a survey for the first gallery before preceding to do the same for the second gallery. The gallery survey questions can be found in Appendix A.4 and Appendix A.5.

5.1.3 Results

New Gallery

The gallery survey asked participants to indicate the degree to which they agreed with the following statements:

- I would share my projects to this gallery.
I would share my projects to this gallery.

I would use this gallery to view other people’s projects.

I would use this gallery to remix other projects.

I would use this gallery to follow other people.

The answer options included “Strongly agree”, “Agree”, “Neutral”, “Disagree”, and “Strongly disagree”.

Figure 5-2 shows the distribution of survey responses across all 41 participants who interacted with the new gallery. We referred to the new gallery as Gallery A during the user study to avoid introducing bias into the results if the participants were to know which gallery was new or old. It is possible that using A and B to differentiate the two galleries still introduced bias, so future studies should use gallery names that do not imply any sort of ordering.

I conducted one-sample t-tests to evaluate the participant responses to each question. Each answer option was mapped to a numerical value: Strongly agree (5), Agree (4), Neutral (3), Disagree (2), and Strongly disagree (1). The null hypothesis for each test was that the population mean was 3, and the alternate hypothesis was that the population mean was greater than 3. Table 5.1 summarizes the results from the t-tests. Thus, we have evidence to support the claims that users would use the new gallery to share projects, view projects, remix other projects, and follow users.

<table>
<thead>
<tr>
<th>Mean</th>
<th>4.33</th>
<th>4.45</th>
<th>3.83</th>
<th>3.78</th>
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<tbody>
<tr>
<td>Sample standard deviation</td>
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<td>0.74</td>
<td>0.98</td>
<td>1.2</td>
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<td>n</td>
<td>41</td>
<td>41</td>
<td>41</td>
<td>41</td>
</tr>
<tr>
<td>t-score</td>
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<td>12.5</td>
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<tr>
<td>p</td>
<td>0.00001</td>
<td>0.00001</td>
<td>0.00001</td>
<td>0.00008</td>
</tr>
</tbody>
</table>

Table 5.1: One sample t-test summary of the Gallery A survey responses for the classroom activity
Figure 5-2: New gallery survey results for all classroom activity participants

**Existing Gallery**

The gallery survey asked participants to indicate the degree to which they agreed with the following statements:

- I would share my projects to this gallery.
- I would use this gallery to view other people’s projects.
- I would use this gallery to remix other people’s projects.

The answer options included “Strongly agree”, “Agree”, “Neutral”, “Disagree”, and “Strongly disagree”.

Figure 5-3 shows the distribution of survey responses across all 43 participants who interacted with the existing gallery. We referred to the existing gallery as Gallery B during the user study to avoid introducing bias into the results if the participants were to know which gallery was new or old. It is possible that using A and B to differentiate the two galleries still introduced bias, so future studies should use gallery names that do not imply any sort of ordering.
I conducted one-sample t-tests to evaluate the participant responses to each question. Each answer option was mapped to a numerical value: Strongly agree (5), Agree (4), Neutral (3), Disagree (2), and Strongly disagree (1). The null hypothesis for each test was that the population mean was 3, and the alternate hypothesis was that the population mean was greater than 3. Table 5.2 summarizes the results from the t-tests. Thus, we have evidence to support the claim that people would share projects to the existing gallery, view projects in the existing gallery, and remix projects from the existing gallery.

**Gallery Comparison**

There were 35 students who completed the surveys for both the new gallery (Gallery A) and the existing gallery (Gallery B). I compared each of these student’s responses to the Gallery A survey to their responses to the Gallery B survey. I used the same mappings for each of the answer options to a numerical value: Strongly agree (5), Agree (4), Neutral (3), Disagree (2), and Strongly disagree (1). Paired difference
I would share my projects to this gallery.
I would use this gallery to view other people’s projects.
I would use this gallery to follow other users.

<table>
<thead>
<tr>
<th>mean</th>
<th>sample standard deviation</th>
<th>n</th>
<th>t-score</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.33</td>
<td>0.69</td>
<td>41</td>
<td>12.2</td>
<td>0.00001</td>
</tr>
<tr>
<td>4.45</td>
<td>0.74</td>
<td>41</td>
<td>12.5</td>
<td>0.00001</td>
</tr>
<tr>
<td>3.83</td>
<td>0.98</td>
<td></td>
<td>5.39</td>
<td>0.00001</td>
</tr>
</tbody>
</table>

Table 5.2: One sample t-test summary of the Gallery B survey responses for the classroom activity

<table>
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<tr>
<th>mean</th>
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<th>t-score</th>
<th>p</th>
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<td>0.66</td>
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<tr>
<td>0.29</td>
<td>0.62</td>
<td>35</td>
<td>2.72</td>
<td>0.005</td>
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<tr>
<td>-0.029</td>
<td>0.89</td>
<td></td>
<td>-0.19</td>
<td>0.43</td>
</tr>
</tbody>
</table>

Table 5.3: Summary of the paired difference t-tests for the Gallery A survey and for the Gallery B survey (classroom activity)

t-tests were conducted to evaluate whether students agreed more with the statements with regard to Gallery A than to Gallery B.

Table 5.3 summarizes the results of comparing student responses for the two galleries. We can conclude that the average person agrees more with the statement that they would share and view projects using Gallery A than with the statement that they would share and view projects using Gallery B. However, on average, users did not express that they would be more likely to use one gallery over the other to remix projects.
5.1.4 Results for Students With No Prior Gallery Experience

10 out of the 49 participants answered “Neutral”, “Disagree”, or “Strongly disagree” for all four of the pre-survey questions. In this section, I discuss the Gallery A and Gallery B survey responses for the 10 participants who presumably have no prior experience with the existing App Inventor gallery.

New Gallery

One-sample t-tests indicated that on average, participants expressed that they would share projects using the new gallery (M = 4.4, SD = 0.70) t(9) = 6.33, p < 0.0001, that they would view projects using the new gallery (M = 4.4, SD = 0.84) t(9) = 5.25, p = 0.0003, and that they would follow other users using the new gallery (M = 3.9, SD = 0.99), t(9) = 2.86, p = 0.009. However, we do not have evidence to conclude that users would remix other projects using the new gallery (M = 3.6, SD = 1.2), t(9) = 1.62, p = 0.070.

Old Gallery

One-sample t-tests indicated that on average, participants expressed that they would share projects using the old gallery (M = 4.3, SD = 0.67) t(9) = 6.09, p < 0.0001, that they would view projects using the old gallery (M = 4.3, SD = 0.82) t(9) = 4.99, p = 0.0004, and that they would remix other projects using the old gallery (M = 4.2, SD = 1.0), t(9) = 3.67, p = 0.003.

Gallery Comparison

Paired difference t-tests were conducted to compare user responses to the Gallery A survey and Gallery B survey for the 10 users with no prior experience with the existing App Inventor gallery. There was no significant difference in the scores for Gallery A and Gallery B for sharing projects, viewing projects, or remixing projects (see Table 5.4). From this observation and the results described in 5.1.3, we can conclude that users who have prior experience with the existing App Inventor Gallery preferred the
I would share my projects to this gallery.
I would use this gallery to view other people’s projects.
I would use this gallery to remix other projects.

<table>
<thead>
<tr>
<th>mean</th>
<th>0.10</th>
<th>0.10</th>
<th>-0.60</th>
</tr>
</thead>
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<tr>
<td>sample standard deviation</td>
<td>0.74</td>
<td>0.32</td>
<td>1.35</td>
</tr>
<tr>
<td>t-score</td>
<td>0.43</td>
<td>1.00</td>
<td>-1.41</td>
</tr>
<tr>
<td>p</td>
<td>0.34</td>
<td>0.17</td>
<td>0.10</td>
</tr>
</tbody>
</table>

Table 5.4: Summary of the paired difference t-tests for the Gallery A and Gallery B survey responses among participants with no prior experience with the existing App Inventor gallery

new gallery, but users who do not have prior experience with the gallery do not have a significant preference.

### 5.1.5 Analysis

We might not be able to conclude definitively that one gallery is better than the other, though the results from this classroom activity at least provide some evidence that the new gallery is at least as good as the existing gallery in the areas we care about most: sharing, browsing, and remixing projects.

The qualitative results from the classroom activity provide valuable insight into ways that we can further improve the new gallery’s user interface. Here are the most common sentiments shared by the participants regarding the two galleries. The number following each statement indicates the number of participants who gave similar feedback. Because we ran behind schedule in the class where participants viewed the new gallery second, we did not have as many free response answers for the new gallery. The full list of feedback and suggestions for the two galleries can be found in Appendix D.1.

**Top 5 Pieces of Feedback for the New Gallery (41 participants)**

1. The featured projects list was useful for identifying high quality projects. (19)
2. Sharing projects is easy. (18)

3. It is cool to see other people’s projects using the gallery. (12)

4. Browsing the gallery is a good way to get ideas on starting projects. (8)

5. It is useful to indicate that a project is a draft (e.g. other people can offer suggestions for how to make the app better). (7)

**Top 5 Suggestions for the New Gallery**

1. Change the default project picture or encourage users to edit the picture. (4)

2. Add more tags. (3)

3. It is confusing to know when your project is actually uploaded. (2)

4. Add project ratings. (2)

5. Add support for project comments. (2)

**Top 5 Pieces of Feedback for the Old Gallery (43 participants)**

1. Sharing projects is easy. (30)

2. It is easy to find interesting projects to look at or remix. (22)

3. The number of likes and downloads is useful for gauging the quality or popularity of an app. (20)

4. It is interesting/fun to look at other projects. (14)

5. The number of likes and downloads provides positive feedback to the creator. (8)
Top 5 Suggestions for the Old Gallery

1. Add support for project comments. (3)
2. Make the text color more visible. (3)
3. Make the button that says “more apps” clearer. (3)
4. Show more projects on scroll rather than require the user to click on the “more apps” button. (1)
5. Add a better indicator of app quality. (1)

One of the survey questions for the old gallery asked students what they thought about displaying the number of likes and downloads for each project in the search results list of projects. Both of these numbers are shown on each project’s detail page; however, the motivation of this question was to see whether or not users found it useful to see these numbers displayed for each project in the search results list. Based on the student responses, it was difficult to tell if students were commenting on the existence of the number of likes and downloads in general or if they were commenting specifically on the usefulness of displaying the numbers in the search results. In the future, it would be beneficial to further explore this nuance by testing two versions of the new gallery, one which does not show the number of likes and downloads in the search results list, and one which does show the number of likes and downloads.

The teacher of the two computer science classes also mentioned that the biggest reason why they do not share projects to the gallery more often is because they rarely have projects that become finished projects. If the goal is to encourage more people to share projects to the gallery, regardless of whether or not they are completely finished, then it is important for users to know that they can share project drafts and get feedback from other programmers in the App Inventor community.

During the classroom activity, I noticed that the most exciting part for the students was guessing which projects their peers made. They were highly interested in
seeing the work that their friends made, which is useful information if we want to encourage more computer science classes to use the App Inventor gallery. Section 6.2.5 goes into more detail about how we can make it easier for teachers and students to keep track of projects created by their class.

5.2 Usability Test

5.2.1 Target Users

The usability test participants included 4 high school students and 9 college students. The study participants had varying experience creating apps with App Inventor and sharing projects with the App Inventor gallery. As a result, I was able to see how a person’s familiarity with App Inventor and the App Inventor gallery affected their interactions with the two galleries.

Participants were first asked to fill out a pre-survey (see Appendix B.1) to help us gather information about their prior experience with sharing and browsing projects using the App Inventor gallery. Out of the 13 participants who completed the usability test, 3 (23%) of them agreed or strongly agreed with the statement “I am familiar with the App Inventor Gallery,” and 9 (69%) of them disagreed or strongly disagreed with the statement. Almost all of the participant strongly disagreed with the statements “I have shared a project”, “I have viewed or downloaded other people’s apps”, and “I have remixed other people’s apps.” This suggests that while some participants had prior experience with App Inventor, most of them did not partake in sharing projects to the gallery or browsing other people’s projects on the gallery. The pre-survey responses are summarized in Figure 5-4.

5.2.2 Study Design

The goal of this study was to evaluate the usability of the gallery user interface and to see whether or not the new gallery helps users overcome pain points that exist in the old gallery. In particular, this study focused on the user’s experience with sharing
To preserve anonymity, each participant was assigned a random email and password to log into the test App Inventor instances and galleries. The email was also used to identify users on each of the survey handouts.

The study was split into two phases. During the first phase, the participant was randomly assigned to either the existing gallery or the new gallery. They were then asked to complete a set of tasks associated with the chosen gallery. Participants were encouraged to think aloud when completing the tasks. Afterward, they were given a survey with questions regarding the overall usability of the gallery (see Appendix B.4). The second phase of the study was identical to the first, except that the participant was asked to complete a second set of tasks using the other gallery.

The tasks simulated the process of publishing a project to the gallery and looking for different projects that were published to the gallery by other users. The tasks for the new gallery also covered features unique to the new gallery (e.g. following a user and adding app screenshots). The tasks can be found in Appendix B.2 and Appendix
5.2.3 Results

The first part of each gallery survey contained the 10 System Usability Scale (SUS) questions [13]. The old gallery had an average score of 60.6 and a standard deviation of 20.0, and the new gallery had an average score of 79.2 and a standard deviation of 10.8. I conducted a one-sided paired difference t-test by subtracting the SUS score for the two galleries and found an average difference of 18.7 and a standard deviation of 18.8. The positive difference indicates that on average, users gave higher SUS scores to the new gallery than to the old gallery. These results were statistically significant (p = 0.002), so we have evidence to conclude that the new gallery is more user-friendly than the old gallery.

The second part of the gallery survey asked participants to indicate the degree to which they agreed with the following statements:

- I would share my projects to this gallery.
- I would use this gallery to view other people’s projects.
- I would use this gallery to remix other people’s projects.
- I would use this gallery to follow other users.

The answer options included “Strongly agree”, “Agree”, “Neutral”, “Disagree”, and “Strongly disagree”.

New Gallery

Figure 5-5 shows the distribution of survey responses across the 12 participants who interacted with the new gallery. We referred to the new gallery as Gallery A during the user study to avoid introducing bias into the results if the participants were to know which gallery was new or old. It is possible that using A and B to differentiate the two galleries still introduced bias, so future studies should use gallery names that do not imply any sort of ordering.
I conducted one-sample t-tests to evaluate the participant responses to each question. Each answer option was mapped to a numerical value: Strongly agree (5), Agree (4), Neutral (3), Disagree (2), and Strongly disagree (1). The null hypothesis for each question was that the population mean was 3, and the alternate hypothesis was that the population mean was greater than 3. Table 5.5 summarizes the results of the t-tests. The average user expressed that they would use the new gallery to share projects, view projects, and follow users, but we do not have evidence to support the claim that users would use the new gallery to remix projects.

Old Gallery

Figure 5-6 shows the distribution of survey responses across the 12 participants who interacted with the old gallery. We referred to the old gallery as Gallery B during the user study to avoid introducing bias into the results if the participants were to know which gallery was new or old. It is possible that using A and B to differentiate the two galleries still introduced bias, so future studies should use gallery names that do
I would share my projects to this gallery. I would use this gallery to view other people’s projects. I would use this gallery to remix other projects. I would use this gallery to follow other people.

<table>
<thead>
<tr>
<th></th>
<th>Gallery A</th>
<th>Gallery B</th>
</tr>
</thead>
<tbody>
<tr>
<td>mean</td>
<td>3.9</td>
<td>3.3</td>
</tr>
<tr>
<td>sample standard deviation</td>
<td>0.99</td>
<td>1.30</td>
</tr>
<tr>
<td>n</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>t-score</td>
<td>3.19</td>
<td>0.89</td>
</tr>
<tr>
<td>p</td>
<td>0.004</td>
<td>0.2</td>
</tr>
</tbody>
</table>

Table 5.5: One sample t-test summary of the Gallery A survey responses for the usability tests

<table>
<thead>
<tr>
<th></th>
<th>Gallery A</th>
<th>Gallery B</th>
</tr>
</thead>
<tbody>
<tr>
<td>mean</td>
<td>3.9</td>
<td>3.7</td>
</tr>
<tr>
<td>sample standard deviation</td>
<td>0.99</td>
<td>1.15</td>
</tr>
<tr>
<td>n</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>t-score</td>
<td>3.19</td>
<td>2.00</td>
</tr>
<tr>
<td>p</td>
<td>0.004</td>
<td>0.03</td>
</tr>
</tbody>
</table>

Table 5.6: One sample t-test summary of the Gallery B survey responses for the usability tests

not imply any sort of ordering.

I conducted one-sample t-tests to evaluate the participant responses to each question. Each answer option was mapped to a numerical value: Strongly agree (5), Agree (4), Neutral (3), Disagree (2), and Strongly disagree (1). The null hypothesis for each question was that the population mean was 3, and the alternate hypothesis was that the population mean was greater than 3. Table 5.6 summarizes the results of the t-tests. The average user expressed that they would use the existing gallery to view projects, but we do not have evidence to support the claim that users would use the existing gallery to share projects, remix projects, or follow users.
Figure 5-6: Old gallery survey results for all usability test participants

**Gallery Comparison**

I also compared each participant’s responses to the Gallery A survey to their responses to the Gallery B survey. I used the same mappings for each of the answer options to a numerical value: Strongly agree (5), Agree (4), Neutral (3), Disagree (2), and Strongly disagree (1). Paired difference t-tests were conducted to evaluate whether students agreed more with the statements with regard to Gallery A than to Gallery B.

Table 5.7 summarizes the results of comparing student responses for the two galleries. We can conclude that the average person agrees more with the statement that they would share projects and follow users using Gallery A than with the statement that they would share projects and follow users using Gallery B. However, we do not have evidence to reject the null hypothesis that the average person feels equally about viewing projects using Gallery A and viewing projects using Gallery B. We also do not have evidence to reject the null hypothesis that the average person feels equally about remixing projects using Gallery A and remixing projects using Gallery B.
I would share my projects to this gallery. I would use this gallery to view other people’s projects. I would use this gallery to remix other projects. I would use this gallery to follow other people.

<table>
<thead>
<tr>
<th></th>
<th>I would share my projects to this gallery.</th>
<th>I would use this gallery to view other people’s projects.</th>
<th>I would use this gallery to remix other projects.</th>
<th>I would use this gallery to follow other people.</th>
</tr>
</thead>
<tbody>
<tr>
<td>mean</td>
<td>0.58</td>
<td>0.25</td>
<td>0.25</td>
<td>1.0</td>
</tr>
<tr>
<td>sample standard deviation</td>
<td>1.08</td>
<td>1.06</td>
<td>1.29</td>
<td>1.04</td>
</tr>
<tr>
<td>n</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>t-score</td>
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<td>0.82</td>
<td>0.67</td>
<td>3.32</td>
</tr>
<tr>
<td>p</td>
<td>0.04</td>
<td>0.2</td>
<td>0.3</td>
<td>0.003</td>
</tr>
</tbody>
</table>

Table 5.7: Summary of the paired difference t-tests for the Gallery A survey and for the Gallery B survey (usability tests)

5.2.4 Analysis

Based on the SUS scores, we can conclude that the new gallery is more user-friendly than the existing gallery. We also have evidence that users would rather use the new gallery to share projects and follow users.

The participants also shared some qualitative feedback about the two galleries, which is summarized below. The complete list of feedback can be found in Appendix D.2.

Selected New Gallery Feedback

- Let users edit project information before publishing
- Make a publish button instead of having to look through menus
- Expected a share button and button to copy profile link
- Let users like apps and follow users from project preview
- Show how many likes or remixes directly in Explore preview

Selected Old Gallery Feedback

- Accessing profile page was difficult
• Color scheme makes things hard to see

• Did not know where to find “Add to Gallery”

• Expected back button to lead back to the previous gallery page

• Liked pop-up feedback when trying to publish with missing required fields. Would be nice if the culprit textbox was highlighted.

5.2.5 Other Observations and Future Improvements

As I was watching users complete the usability tasks, I also noticed several pain points that users faced. In this section, I go over the most common issues with the user interface for each gallery.

Old Gallery

• Publishing Workflow: The biggest challenge that users faced was figuring out how to publish their projects to the gallery, especially when they had a project open in the Designer view. The only way to publish a project to the existing gallery is to navigate away from the Designer view to the My Projects view, which users who are unfamiliar with App Inventor rarely know how to do. Considering how difficult it is for users to find the “Publish to Gallery” button even when they are actively looking for a way to publish their project, it is unlikely that users will stumble upon the functionality to share their project on their own. This is unfortunate because it means that fewer people end up sharing their projects to the gallery. This pain point is somewhat addressed in the new gallery, which allows users to share their project from the Designer view.

• Publishing Form: Users seemed to have trouble figuring out what each of the textboxes on the publishing form corresponded to. They had to read the long description associated with each textbox. Also, because the description was an input box placeholder, users had to clear the textbox in order to see the
placeholder description text again. Additionally, the ordering of the textboxes was not intuitive; users expected the description textbox to be above the tutorial and credit textboxes.

- **Project link sharing**: Some users had trouble finding a shareable project link. Many instinctively tried to share projects by copying the link in the address bar of the browser, which actually is not a permalink to the project. Instead, in order to find a shareable link to the project, the user must click on the “Share” button, which brings up a textbox that contains the project permalink.

- **Searching for your own apps**: Users found it difficult to locate the projects they had previously published to the gallery. They often tried clicking the “My Projects” tab, which would take them to the list of all their App Inventor projects, published or not.

- **Update Profile Button**: The existing gallery has a page where users can update their profile information (e.g. profile photo and website URL). Users found it frustrating that there was no visual feedback to confirm that their profile changes were saved after clicking on the “Update Profile” button. One user expected the page to redirect to the actual profile page after saving their profile changes.

- **Update Profile Image**: On the “Edit your profile” page, users assumed that they could modify their profile image by clicking on it; however, in reality, they can only edit their profile image by clicking on the link below the profile image that says “Upload your profile image”. This misconception is likely a result of allowing users to modify their project’s featured image by clicking on the image itself instead of clicking on a separate link below the image. This is an example of a user interface inconsistency that frustrates users.

- **Project Preview**: Users expected to be able to interact with the project previews in the app search results. For example, users expected to be redirected to the author’s profile page by clicking on the author’s username in the preview,
and they expected to be able to like apps from the project preview. However, the existing gallery does not support this behavior.

- **Heart Icon**: Users expected to be able to click on the heart icon to like an app instead of clicking on the “Like” text next to the heart icon.

- **Using the Back Button**: Users expected to be able to navigate to the previous gallery page by clicking on the browser’s back button. However, the existing gallery does not support this behavior.

- **Search Tab**: There is a separate tab in the gallery that shows search results, which was confusing for some users. They did not expect search results to show up in a separate tab alongside the “Recent”, “Tutorials”, “Featured”, and “Popular” tabs.

**New Gallery**

- **Publishing Workflow**: Users were unsure if they successfully published their project. This was especially true for the users who saw the existing gallery first because the existing gallery has a “Publish” button that users can click after adding all the additional project information. Future iterations of the new gallery should update the publishing process for the new gallery so that users can fill in information about their project before actually publishing it to the gallery. This will also solve the problem of having projects in the gallery that lack descriptions.

- **Screenshots**: Several users tried to upload multiple screenshots at once, so we should update the file selector to accept multiple uploads.

- **Project link sharing**: Some users who viewed the existing gallery first were confused about which link to use to share a project. The existing gallery has a “Share” button on each project page, which pulls up a link that can be used to share the project. We expected users to use the URL in the address bar to share their projects, but some users tried looking for a “Share” button, which
does not exist for projects in the new gallery. We should look into finding a seamless way to integrate a “Share” button into the project pages for the new gallery so that users can either copy and paste the URL shown in the address bar or click on the “Share” button to find a shareable project link.

- **Profile link sharing:** Some users expected there to be a “Share” button to share a link to a user’s profile page. Similar to project link sharing, we should add a “Share” button on every user’s profile page that pulls up a shareable profile link. Users could then choose to copy the URL from the address bar or click on the “Share” button.

### 5.3 Summary of User Studies

The first user study I conducted was a classroom activity where students were asked to share one of their projects to the new gallery and to the existing gallery. Based on their survey responses for each gallery, users expressed that they would use the new gallery to share projects, view other people’s projects, remix projects, and follow other users. Participants also indicated that they would use the old gallery to share projects, view other people’s projects, and remix projects. When comparing user responses to both galleries, I found that users expressed that they would be more likely to use the new gallery to share and view projects.

The second user study I conducted was a usability test where participants completed a set of tasks related to sharing and browsing projects using the new gallery, and a separate set of tasks related to sharing and browsing projects using the old gallery. Based on the SUS responses, users found the new gallery to be significantly more user-friendly than the old gallery.

In the next section, I outline additional improvements for the gallery that can be explored in the future.
Chapter 6

Future Work

In addition to the suggested improvements highlighted in Sections 5.1.5 and 5.2.4, there are several other areas that are worth exploring in the future.

6.1 A/B Testing in Production

The user studies covered in Chapter 5 were useful for analyzing low-level user interactions with the gallery UI. However, it is difficult to determine if the UI changes actually encourage people to share their projects to the gallery more often and to explore the gallery for projects to remix. In order to better evaluate the new gallery’s effectiveness at promoting both of these actions, it is worth looking into conducting A/B testing of the two galleries in production and tracking the following statistics:

- the total number of gallery page visits,
- the average number of projects shared per user,
- the number of users who publish at least one project,
- the number of users who download at least one project from the gallery,
- the average number of projects downloaded per user,
- the number of users who publish at least one remixed project to the gallery,
the average number of remixed projects published per user, and

the average number of projects liked per user.

6.2 Additional Features

There is still a decent amount of work to be done on the new gallery before it can be deployed in production. Here are some of the features that could improve the gallery user experience.

6.2.1 Live Companion Testing

One of the strengths of the Scratch platform is the ease at which projects can be tested out. The web-based projects include games, animations, and music videos, many of which can be played with the single click of a button on the project page. On the other hand, App Inventor users must go through a comparably lengthy process in order to test out projects from the gallery. First, they must save their own copy of the project, and then they must either connect to the MIT App Inventor Companion App for live testing, or they must build the APK associated with the project and install it on a mobile device.

To encourage users to try out more apps from the gallery, we want to make the project testing process as seamless as possible. One way to do this is to enable live testing of apps. That is, we should make it possible for users to pull up the QR code used for connecting apps to the MIT App Inventor Companion App directly from the project information page and even potentially from the project previews (shown in search results and for projects listed on user profile pages). This way, users do not have to save a copy of the project before testing it out.

6.2.2 Mobile Gallery

Because App Inventor is used to create mobile applications, there should be support for a mobile-friendly version of the gallery. This could take place in the form of
an App Inventor Gallery native mobile application, or we could just make the App Inventor Gallery web application have a mobile-friendly user interface.

The live companion testing feature described in Section 6.2.1 can also be implemented on the mobile version of the App Inventor Gallery. Assuming that the user has the App Inventor Companion app already downloaded, the App Inventor Gallery should allow users to test out gallery projects by clicking a button that pulls up the project using the App Inventor Companion. This experience has the potential to be even more seamless than the web experience.

6.2.3 Open Project in Read-Only Mode

If a user wants to try out a project from the gallery or look at the project code, they currently have to create a copy of the project, which is then automatically added to their My Projects list. This process works, but some users may find it annoying that a project is added to their My Projects list every time they want to look at or test out a project from the gallery.

By allowing users to open projects in a read-only mode, users can look at or test out projects without having to add a copy of it to their My Projects list. If the user wants to make changes to the project, then they can use the Projects menu to save a writable copy of the project to their My Projects list.

6.2.4 Filtering Draft Projects

With the addition of the “Draft” label for shared projects in the App Inventor Gallery, we hope that more users will feel comfortable sharing work-in-progress projects to the gallery. However, this also means that the gallery will contain projects that are complete and polished, as well as projects that are works-in-progress. In order to make it easier for users to distinguish projects in early stages of development from projects that are essentially finished projects, we should consider adding a filter that gives users the option to exclusively view completed projects and the option to exclusively view project drafts.
6.2.5 Grouping Class Projects

During the classroom activity described in Section 5.1, many of the students enjoyed looking through projects in the gallery and guessing which projects were made by their friends. Because the gallery was sparsely populated to begin with and because all the students published their projects at the same time, it was quite easy for students to locate projects that were published by their peers. However, with a gallery that is completely open to the public, it is much harder to identify projects that were created by a single high school class.

To address this issue, we could implement sub-galleries or studios that can be curated by App Inventor users. This is similar to Scratch studios, which are created and curated by individual Scratch users.

A high school teacher could create an App Inventor Gallery studio and add her students’ projects to the studio. Students in her class can visit the studio to look at and try out each other’s projects. A shareable link to the studio would make it easy for the teacher and the students to share class projects with the rest of the world.

6.2.6 Newsfeed

By implementing a newsfeed within the App Inventor Gallery, users can view recent activity of users they follow. Recent activity may include recently published projects, recently favorited projects, and recently added comments if commenting is supported.

6.2.7 Commenting

Commenting is the most common way through which users provide feedback on other people’s projects. Scratch users have posted over 190 million comments on projects and studios [7]. In fact, many Scratch project collaborations have been the result of users leaving comments on other people’s projects or user profiles. Research on YouTube has also shown that video commenting is an important aspect of the participatory culture because the commenting feedback interaction motivates users to create more content for the site [11]. Studies have also shown that commenting is
the strongest predictor of social interaction on YouTube. That is, users maintain connections with others by leaving comments on their videos and channels [12].

The existing App Inventor gallery actually has a commenting feature, but it has been disabled because unlike Scratch, App Inventor does not have a moderation team to moderate user content. The ideal gallery would allow commenting, but due to the limitations of the App Inventor team, this iteration of rebuilding the project gallery did not include commenting.

6.2.8 Promote gallery from the main App Inventor website

The Scratch homepage prominently features projects recently created by users in the Scratch community (see Figure 6-1). The simple act of showing projects to users increases the likelihood that users will interact with other people’s projects.

The existing gallery is tied to ai2, the instance of App Inventor that is hosted using Google App Engine. As a result, the gallery is only accessible from within the ai2 app editor, which requires users to be logged in to see the gallery. Featuring App Inventor projects directly from the main App Inventor website (http://appinventor.mit.edu/) may be difficult, but adding a prominent link to the standalone project gallery is a simple alternative that will increase the visibility of shared projects (see Figure 6-2). People can browse the gallery without an App Inventor account, which will likely bring in more traffic to the project gallery and potentially inspire more people to use App Inventor to make their own applications. The new gallery has not yet been deployed, but after deployment, we can easily add a link to the new standalone gallery from the main website.

6.2.9 Search by custom tag or component

Although our current gallery prototype does not support custom tags, it might be worth adding that functionality in the future so that users can classify projects that do not fit as well into any of the preset categories.

Another useful way of classifying projects is by component usage. Not only can
Figure 6-1: Featured projects from the Scratch Homepage
component usage group together similar projects, but it can also be useful for people learning how to use App Inventor. For example, if a programmer wants to learn how to use the Map component, they could search the gallery for apps that use the Map component. Users who learn concepts through remixing are more likely to use those concepts when building their own apps later on [3]. Users could enter a query like “component:map” into the search bar to find projects that make use of the Map component (see Figure 6-3).

In order to implement this feature, we would need to look at the contents of the shared AIA file to identify the components that are used. From there, projects need to be tagged with the components used. The server could then find projects that use a certain component by querying the database for projects that have the corresponding component tag.

6.3 Summary of Future Work

The new gallery prototype already addresses many pain points that users faced when using the existing gallery. However, there are still many opportunities to improve
Figure 6-3: Searching for projects using the Map component

the new gallery. These improvements include integrating live testing with the App Inventor Companion app, creating a mobile-friendly version of the gallery, opening projects in read-only mode, and allowing users to search projects by component usage. Once the new gallery is ready to be deployed, conducting A/B testing of the existing gallery and the new gallery in production could provide valuable statistics about how users actually use and interact with the two galleries.
Chapter 7

Conclusion

The goal of this project was to create a new project gallery for MIT App Inventor that would (1) encourage users to share their projects and (2) make it easier for people to find projects that interest them.

When users share their projects online, they can get feedback from the community and receive positive validation when other users look at and download their projects. Users who contribute to the gallery are often inspired to continue making projects and to build upon their programming skill set.

Making it easier for people to find projects that interest them is important because viewing other people’s projects can be a valuable learning experience. Programming beginners can learn how to implement different application features by looking at other people’s code. By remixing other people’s code, users are more likely to incorporate new code blocks into their future programs. Also, users are more likely to share their projects if they know that other people will look at them.

For this project, I created a new standalone project gallery that allows users of any MIT App Inventor instance to share their projects in a central location. The new gallery also addresses several usability pain points that existed in the old gallery.

To test the new gallery, I conducted two user studies. The first user study was conducted with two high school computer science classes that used MIT App Inventor as part of their programming curriculum. I had the students share projects to the new and existing galleries and had them fill out surveys regarding their experiences.
with each gallery. Users expressed that they would be more likely to share and view projects using the new gallery rather than the old gallery.

The second user study was conducted with high school and college students. Participants were asked to complete a series of specific tasks to assess the usability of the user interface. By watching the participants interact with the new and old galleries, I was able to identify parts of the galleries that were difficult for users to use. From the gallery survey responses, I have evidence to conclude that the new gallery is significantly more user-friendly than the existing gallery.

Moving forward, there are still additional features that can be added to the gallery that could greatly improve the user experience. In addition, it is worth conducting A/B testing with the existing gallery and the new gallery to see which gallery users feel more comfortable using to share and remix projects. By making these changes to improve the gallery user interface, we hope to cultivate a culture within the MIT App Inventor community that promotes sharing projects and supporting other community members by viewing, downloading, and remixing their projects.
Appendix A

Classroom User Study Handouts

A.1 Pre-survey
Pre-Survey

<table>
<thead>
<tr>
<th></th>
<th>Strongly agree</th>
<th>Agree</th>
<th>Neutral</th>
<th>Disagree</th>
<th>Strongly disagree</th>
<th>Comments (optional)</th>
</tr>
</thead>
<tbody>
<tr>
<td>I am familiar with the App Inventor Gallery.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>In the past, I have shared a project to the App Inventor Gallery.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>In the past, I have viewed or downloaded other people’s apps from the App Inventor Gallery.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>In the past, I have remixed other people’s apps from the App Inventor Gallery.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
A.2 Tasks for Gallery A
Email: student________@no-reply.com

Tasks (Gallery A)


2. Log in with the email and password you were given.

3. If this is your first gallery, upload your project .aia file. Go to Projects > Import project (.aia) from my computer and select the .aia file.

   If this is your second gallery, you should see the project you uploaded previously.

4. Share your project to the gallery and update the project information accordingly.

5. Write down the link to your published project in the space below.

6. Find a project published by another user that you would like to remix.

7. Write down the link to the project you want to remix in the space below.
8. Why did you choose to remix this project?

9. Explore the other gallery features and write down any feedback you might have.

10. If you have time remaining, remix the project (i.e. make changes to the project to make it your own) and publish your app to the gallery.

11. Write down the link to your published project in the space below.
A.3 Tasks for Gallery B
Tasks (Gallery B)

2. Log in with the email and password you were given.
3. If this is your first gallery, upload your project .aia file. Go to Projects > Import project (.aia) from my computer and select the .aia file.
   If this is your second gallery, you should see the project you uploaded previously.
4. Share your project to the gallery and update the project information accordingly.
5. Write down the link to your published project in the space below.
6. Find a project published by another user that you would like to remix.
7. Write down the link to the project you want to remix in the space below.
8. Why did you choose to remix this project?

9. Explore the other gallery features and write down any feedback you might have.

10. If you have time remaining, remix the project (i.e. make changes to the project to make it your own) and publish your app to the gallery.

11. Write down the link to your published project in the space below.
A.4 Gallery A Survey
Email: student________@no-reply.com

Gallery A Survey

Part 1

<table>
<thead>
<tr>
<th></th>
<th>Strongly agree</th>
<th>Agree</th>
<th>Neutral</th>
<th>Disagree</th>
<th>Strongly disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>I would share my projects to this gallery.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I would use this gallery to view other people’s projects.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I would use this gallery to remix other people’s projects.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I would use this gallery to follow other users.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Free Response

1. What are your thoughts on the **project sharing process**?

2. What are your thoughts on using the gallery to **find interesting projects to look at or remix**?

3. Please comment on the usefulness of the following features. Please write “N/A” if you did not notice the feature.
a. Indicate that a project is a draft

b. Project tags

c. Featured projects list

d. User following

4. Is there anything that you would change about the gallery?
A.5 Gallery B Survey
Email: student________@no-reply.com

Gallery B Survey

Part 1

<table>
<thead>
<tr>
<th>Strongly agree</th>
<th>Agree</th>
<th>Neutral</th>
<th>Disagree</th>
<th>Strongly disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>I would share my projects to this gallery.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I would use this gallery to view other people’s projects.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I would use this gallery to remix other people’s projects.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Part 2

1. What are your thoughts on the project sharing process?

2. What are your thoughts on using the gallery to find interesting projects to look at or remix?

3. Please comment on the usefulness of seeing the number of likes and downloads a project has from the list of projects.
4. Is there anything that you would change about the gallery?
Appendix B

Usability Test Handouts

B.1 Pre-survey
Email: student________@no-reply.com

Pre-Survey

<table>
<thead>
<tr>
<th></th>
<th>Strongly agree</th>
<th>Agree</th>
<th>Neutral</th>
<th>Disagree</th>
<th>Strongly disagree</th>
<th>Comments (optional)</th>
</tr>
</thead>
<tbody>
<tr>
<td>I am familiar with the App Inventor Gallery.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>In the past, I have shared a project to the App Inventor Gallery.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>In the past, I have viewed or downloaded other people’s apps from the App Inventor Gallery.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>In the past, I have remixed other people’s apps from the App Inventor Gallery.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
B.2 Usability Tasks for Gallery A

Originally, each of the tasks appeared on its own page. They have been condensed in this reproduction to conserve space.
Usability Tasks A

Project Sharing

1. Add the project *BonjourPurr* to the gallery. Include the following information:
   a. Project title: Bonjour, Purr
   b. Description: This is a project I created that features my cat. When you click on the cat, it purrs.
   c. Tutorial URL: [https://www.youtube.com/](https://www.youtube.com/)
   d. Tags: Games and Lifestyle
   e. Draft status

Upload `featuredimage.png` as the featured image for your published app.

Add `screenshot1.png` and `screenshot2.png` as screenshots for the published project.

2. Give credit to the original app by adding “This app was based on Hal Abelson's Hello, Purr app.” to the published project page.

3. What link would you use to share your published project?

4. Find a list of all the projects that your user has published to the gallery.

5. Update your user's bio to say “I am an App Inventor programmer in the United States.”

6. Upload `profilepic.png` as your user's profile picture.

7. What link would you use to share your user profile?
Project Discoverability

1. Find a project called *Alpha Forge*. Open the project using App Inventor.
2. Find the profile page for *brianjones71*.
3. Find an app published by the user *brianjones71*.
4. Find a list of apps sorted by popularity.
5. Find three apps tagged with the **Games** tag. Add them to your favorite projects.
6. Follow the users *kidinthenet* and *DrBrask*.
7. Find the apps that have recently been published by users whom you are following.
8. Find your user’s profile page.
9. Find a list of all your favorited apps.
B.3 Usability Tasks for Gallery B

Originally, each of the tasks appeared on its own page. They have been condensed in this reproduction to conserve space.
Usability Tasks B

Project Sharing

1. Add the project *BonjourPurr* to the gallery. Include the following information:
   a. Project title: Bonjour, Purr
   b. Description: This is a project I created that features my cat. When you click on the cat, it purrs.
   c. Tutorial URL: [https://www.youtube.com/](https://www.youtube.com/)

Upload `featuredimage.png` as the featured image.

2. Give credit to the original app by adding “This app was based on Hal Abelson’s Hello, Purr app.” to the published project page.

3. What link would you use to share your published project?

4. Find a list of all the projects that your user has published to the gallery.

5. Update your user profile info link to [https://www.mit.edu/](https://www.mit.edu/).

6. Upload `profilepic.png` as your user’s profile picture.
Project Discoverability

1. Find a project called *Pictionary*. Open the project using App Inventor.
2. Find the profile page for *brianjones71*.
3. Find an app published by the user *brianjones71*. Give the app a “like”.
4. Find a list of apps sorted by popularity.
5. Find your user’s profile page.
B.4 Gallery Survey
## Gallery Survey

**Circle one**  
- Gallery A  
- Gallery B

### Part 1

<table>
<thead>
<tr>
<th></th>
<th>Strongly agree</th>
<th>Agree</th>
<th>Neutral</th>
<th>Disagree</th>
<th>Strongly disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. I think that I would like to use this gallery frequently.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. I found this gallery unnecessarily complex.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. I thought this gallery was easy to use.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. I think that I would need assistance to be able to use this gallery.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. I found the various functions in this gallery were well integrated.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. I thought there was too much inconsistency in this gallery.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Most people could learn to use this gallery very quickly.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. I found this gallery very cumbersome/awkward to use.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. I felt very confident using this gallery.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. I needed to learn a lot of things before I could get going with this gallery.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Part 2

<table>
<thead>
<tr>
<th></th>
<th>Strongly agree</th>
<th>Agree</th>
<th>Neutral</th>
<th>Disagree</th>
<th>Strongly disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>I would share my projects to this gallery.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I would use this gallery to view other people’s projects.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I would use this gallery to remix other people’s projects.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I would use this gallery to follow other users.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Part 3

Is there anything you would change about the gallery?
Appendix C

User Study Figures
<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly agree</th>
<th>Agree</th>
<th>Neutral</th>
<th>Disagree</th>
<th>Strongly disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>I am familiar with the App Inventor Gallery.</td>
<td>7</td>
<td>16</td>
<td>14</td>
<td>10</td>
<td>2</td>
</tr>
<tr>
<td>I have shared a project.</td>
<td>9</td>
<td>13</td>
<td>7</td>
<td>9</td>
<td>11</td>
</tr>
<tr>
<td>I have viewed or downloaded other people’s apps.</td>
<td>6</td>
<td>11</td>
<td>10</td>
<td>11</td>
<td>11</td>
</tr>
<tr>
<td>I have remixed other people’s apps.</td>
<td>1</td>
<td>8</td>
<td>4</td>
<td>18</td>
<td>18</td>
</tr>
</tbody>
</table>

Table C.1: Classroom activity pre-survey responses

<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly agree</th>
<th>Agree</th>
<th>Neutral</th>
<th>Disagree</th>
<th>Strongly disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>I would share my projects to this gallery.</td>
<td>19</td>
<td>17</td>
<td>5</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>I would use this gallery to view other people’s projects.</td>
<td>23</td>
<td>12</td>
<td>6</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>I would use this gallery to remix other people’s projects.</td>
<td>11</td>
<td>15</td>
<td>12</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>I would use this gallery to follow other users.</td>
<td>14</td>
<td>12</td>
<td>10</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

Table C.2: Classroom activity Gallery A survey responses

<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly agree</th>
<th>Agree</th>
<th>Neutral</th>
<th>Disagree</th>
<th>Strongly disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>I would share my projects to this gallery.</td>
<td>16</td>
<td>18</td>
<td>6</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>I would use this gallery to view other people’s projects.</td>
<td>19</td>
<td>17</td>
<td>5</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>I would use this gallery to remix other people’s projects.</td>
<td>15</td>
<td>16</td>
<td>7</td>
<td>4</td>
<td>1</td>
</tr>
</tbody>
</table>

Table C.3: Classroom activity Gallery B survey responses
<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly agree</th>
<th>Agree</th>
<th>Neutral</th>
<th>Disagree</th>
<th>Strongly disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>I am familiar with the App Inventor Gallery.</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>I have shared a project.</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>12</td>
</tr>
<tr>
<td>I have viewed or downloaded other people’s apps.</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>12</td>
</tr>
<tr>
<td>I have remixed other people’s apps.</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>11</td>
</tr>
</tbody>
</table>

Table C.4: Usability test pre-survey responses

<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly agree</th>
<th>Agree</th>
<th>Neutral</th>
<th>Disagree</th>
<th>Strongly disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>I would share my projects to this gallery.</td>
<td>3</td>
<td>7</td>
<td>0</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>I would use this gallery to view other people’s projects.</td>
<td>3</td>
<td>7</td>
<td>0</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>I would use this gallery to remix other people’s projects.</td>
<td>3</td>
<td>4</td>
<td>0</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>I would use this gallery to follow other users.</td>
<td>2</td>
<td>7</td>
<td>0</td>
<td>2</td>
<td>0</td>
</tr>
</tbody>
</table>

Table C.5: Usability test Gallery A survey responses

<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly agree</th>
<th>Agree</th>
<th>Neutral</th>
<th>Disagree</th>
<th>Strongly disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>I would share my projects to this gallery.</td>
<td>2</td>
<td>4</td>
<td>1</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>I would use this gallery to view other people’s projects.</td>
<td>3</td>
<td>4</td>
<td>1</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>I would use this gallery to remix other people’s projects.</td>
<td>1</td>
<td>4</td>
<td>2</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>I would use this gallery to follow other users.</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>

Table C.6: Usability test Gallery B survey responses
Appendix D

User Study Feedback

D.1 Classroom Study

D.1.1 New Gallery Feedback (41 participants)

1. The featured projects list was useful for identifying high quality projects. (19)

2. Sharing projects is easy. (18)

3. It is cool to see other people’s projects using the gallery. (12)

4. Browsing the gallery is a good way to get ideas on starting projects. (8)

5. It is useful to indicate that a project is a draft (e.g. other people can offer suggestions for how to make the app better). (7)

6. Project tags are useful for sorting. (5)

7. Following users is useful for getting projects from people you know (or certain creators). (5)

8. Tags are useful for knowing what type of app you are looking at. (5)

9. Browsing projects is easy. (5)

10. It is good to remix projects. (4)
11. The project sharing process is faster for this gallery compared to Gallery B. (4)

12. This gallery is more attractive than Gallery B. (3)

13. It is easier to find apps using this gallery compared to Gallery B. (2)

D.1.2 Suggestions for the New Gallery

1. Change the default project picture or encourage users to edit the picture. (4)

2. Add more tags. (3)

3. It is confusing to know when your project is actually uploaded. (2)

4. Add project ratings. (2)

5. Add support for project comments. (2)

6. Quality control of shared projects is lacking (i.e. does not require user to supply a description or app picture). (2)

7. Add options to refine searches. (1)

8. Recommend projects based on users’ likes. (1)

9. Add ability to filter out projects that match multiple tags. (1)

10. Let users follow the project creator from the project page itself. (1)

D.1.3 Old Gallery Feedback (43 participants)

1. Sharing projects is easy. (30)

2. It is easy to find interesting projects to look at or remix. (22)

3. The number of likes and downloads is useful for gauging the quality or popularity of an app. (20)

4. It is interesting/fun to look at other projects. (14)
5. The number of likes and downloads provides positive feedback to the creator. (8)

6. Looking at projects on the gallery is a good way to find inspiration. (6)

7. The number of likes and downloads is not useful. (5)

8. The gallery is ugly/not polished. (4)

9. Sharing projects is fast. (3)

10. Showing the number of likes and downloads gives less preference to “undiscovered” apps (1)

D.1.4 Suggestions for the Old Gallery

1. Add support for project comments. (3)

2. Make the text color more visible. (3)

3. Make the button that says “more apps” clearer. (3)

4. Show more projects on scroll rather than require the user to click on the “more apps” button. (1)

5. Add a better indicator of app quality. (1)

D.2 Usability Test

D.2.1 New Gallery Feedback

- Let users edit project information before publishing

- Make a publish button instead of having to look through menus

- Did not expect “Add to Gallery” to immediately publish the project (expected to edit project information first)
• Expected a share button and button to copy profile link
• Let users like apps and follow users from project preview
• Bring down search bar so that it is not in the header
• Show how many likes or remixes directly in Explore preview

D.2.2 Old Gallery Feedback

• Search bar was hard to find
• Accessing profile page was difficult
• Color scheme makes things hard to see
• Button layout can be improved (e.g. larger buttons)
• Did not know where to find “Add to Gallery”
• Expected back button to lead back to the previous gallery page
• Add tags or categories
• Commenting may be nice but hard to moderate
• Add search bar at the top of the website to search for projects even without clicking on gallery tab
• Liked pop-up feedback when trying to publish with missing required fields. Would be nice if the culprit textbox was highlighted.
• Share button was not intuitive


10. Rotman, D., Golbeck, J. & Preece, J. *The community is where the rapport is—on sense and structure in the youtube community* in *Proceedings of the fourth international conference on Communities and technologies* (2009), 41–50.


