Project Deliverable C
Conceptual Design, Project Plan, and Feasibility Study

Parts C1 and C2: Conceptual Design and Project Plan

Group A3

Austin Wu [300129117]
Benjamin (Ben) Saulnier [300121338]
Callum French [300128814]
Eleanor (Ellie) Rumsey [8274066]
Matthew (Matt) Yakubu [300123797]

01/10/2020

GNG 2101 – Intro. to Product Dev. and Mgmt. for Engineers

Faculty of Engineering – University of Ottawa

Table of Contents

C.1 Conceptual Design

Core functionality

Problem Statement

Photoshop has a cluttered and unfriendly interface that is especially challenging for our client, Madison, who has a fluctuating disability that occasionally affects their physical and neurological ability. An ideal solution would allow the Madison to continue to use Photoshop or other digital drawing tools, but provide additional functionality that would simplify the interface and allow multiple options for input, including voice, drawing tablet, and/or keyboard input.

List of required product functions and sub-functions

The following list of functions provides high-level goals of our system, broken down into smaller sub-functions. These goals were determined based on the client needs and problem statement as well as target specifications (from Deliverable B). Higher functions are seen as each number, the letters underneath are sub-functions to complete the higher function, and the roman numerals are sub-sub-systems to ensure that the client will have the best possible experience.

1. Unclutter Photoshop interface and make it more friendly for Madii
   a. Larger icons
   b. Improved color picker
      i. Different from normal gradient or wheel HSV/RGB selector (Madii finds it difficult to differentiate colors in these)
   c. Improved brush selection
      i. Organise list of available brushes
      ii. Highlight frequently used brushes
   d. Simpler UI for finding commands and tools in menus
   e. Help functionality
      i. Tutorials
      ii. Tooltips in-app
      iii. Search for commands
   f. Drawing guides for shaky hands
      i. Line smoothing
      ii. Shape creation
   g. Command history
      i. Command repetition
2. Allow various input sources to accommodate for Madii's disability
   a. Voice commands
      i. Voice Navigation

ii. Vocal drawing aid
b. Drawing tablet & pen
i. Can be used as a mouse
c. Keyboard input
3. Avoid possible triggers for Madii's disability
a. No red colours in interface
b. No fast pop-ups or animations

Task breakdown

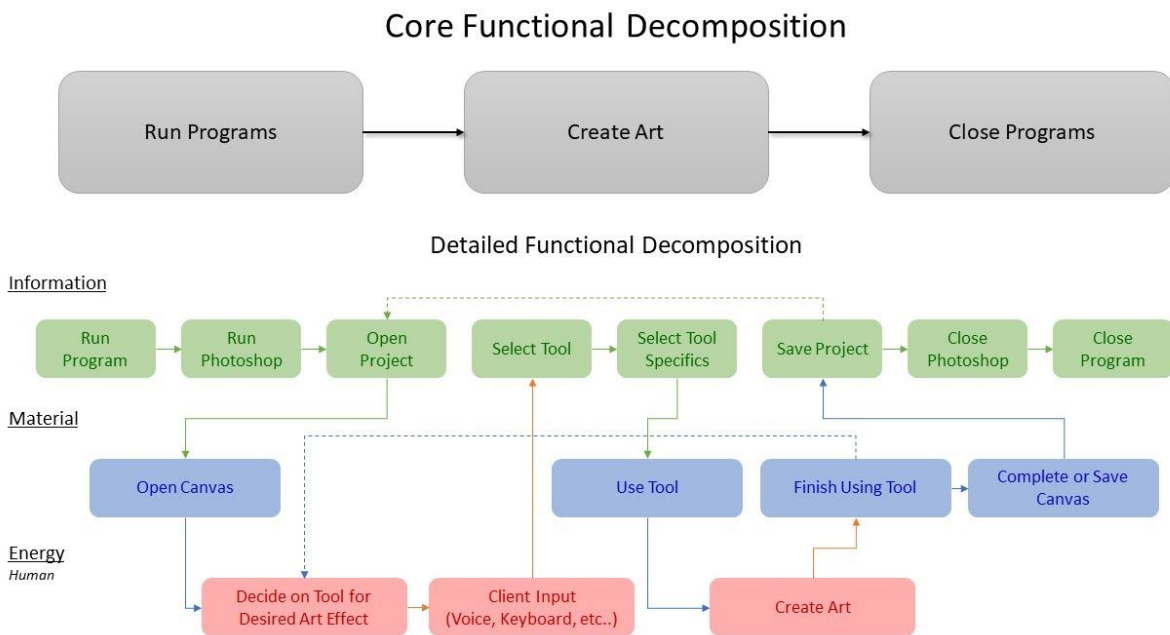The following diagram is a functional decomposition flowchart, showing basic task breakdown.

Figure 1: Functional decomposition chart

Product concepts

The following concepts were generated from the team members as potential solutions to the problem statement.

	1	2	3
Table 1: Product concepts generated by the project team, three per member			
Austin	An external custom keyboard that allows for rebinding of keys and hotkey functions for photoshop	Tool integrated into wacom tablet that allows for easy switching between tools, rapid copy pasting capabilities	New UI that allows for simplifying down the menus in photoshop
Ben	A more accessible UI over Procreate to allow user to work under many circumstances	An ergonomic pen for the wacom tablet, allowing user to hold pen more comfortably	A plug-and-play accessible keyboard that comes with accessible design software
Callum	A voice input program that will select small icons and help navigate challenging menus	A new UI to place over Photoshop, simplifying the UI	A series of easy-to-access quick "help" videos to walk clients through the complexity of photoshop, built in.
Ellie	A toolbar UI that can be used with Photoshop (or other tools) with basic commands that can be activated by mouse, keyboard, or voice	A UI that focuses specifically on aspects of the Photoshop UI that the client felt overwhelmed by - e.g. color picker, brush size	A tool integrated into the Wacom tablet that uses gesture commands for tools such as fast copy/paste, line smoothing
Matt	A voice command system that makes it sufficient to complete simple drawing processes for any possible art concepts.	A simplistic UI that will be designed to make navigation easier while using Photoshop	A modification to the wacom tablet that stores the most common drawing patterns read by the tablet.

Analysis and evaluation of concepts

Analysis based on metrics

In Deliverable B, nine metrics were established to evaluate solutions. These same metrics have been added here and will be used to evaluate the solutions from Table 1.

	Metric	Units	Ideal	Acceptable
	Table 2: Target specifications from Deliverable B			
1	UX as empathetic with client	Personal ranking	5	4-5
2	Number of repeatable functions	Positive integer (count)	100	20-100
3	Icon size	px or cm (on-screen)	50px/2.5cm	35-100px/ 1.4-3.0cm
4	Customizability	Personal ranking	5	3-5
5	Number of commands recorded	Positive integer (count)	100	50-100
6	Assistive features	Personal ranking	5	5
7	Prevalence of red	% on startup	0%	<10%
8	Presence of fast pop-ups	Yes/No	No	No
9	Hardware Integrability	Personal Ranking	5	5

The metrics in Table 2 were used to evaluate all fifteen proposed concepts seen in Table 1. The results of this evaluation are shown below in Table 3.

	Concept	Metric (cross-reference to Table 2)								
		1	2	3	4	5	6	7	8	9
Austin	1	3	100	1.4cm	5	100	3	0%	No	5
	2	4	>10	N/A	4	N/A	2	0%	No	5
	3	5	N/A	50px	3	N/A	4	0%	No	N/A
Ben	1	4	100	50px	2	1	4	0%	No	N/A
	2	3	N/A	N/A	5	>10	3	0%	No	4
	3	5	100	50px	4	100	5	0%	No	5
Callum	1	3	N/A	N/A	3	100	4	0%	No	3
	2	5	N/A	50px	4	N/A	4	0%	No	5
	3	2	N/A	N/A	1	N/A	3	<10%	No	N/A
Ellie	1	5	100	50px	5	100	5	0%	No	5
	2	5	50	50px	4	100	4	0%	No	N/A
	3	4	20	N/A	2	10	4	0%	No	5
Matt	1	5	20	N/A	3	20	4	0%	No	4
	2	4	N/A	50px	4	N/A	4	0%	No	5
	3	5	10	N/A	5	10	4	0%	No	5

Table 3: Metric analysis of all product concepts

Notes:
1. Any features, such as those relating to the UI, are given the ideal metric value because they can be built to meet these specifications
2. Top priority metrics, such as prevalence of red and fast pop-ups, were specifically avoided by all team members during concept generation
3. Yellowed boxes indicate successfully reaching the target values, and was used to visualize how successful a possible solution could be

Plus/minus analysis with base concept

An idea that was common to more than one concept was a simplified UI for Photoshop. This idea was taken as the reference for a sum of weighted scores comparison in the following table.

Metric	Simplified Photoshop UI (Reference)	Concepts to compare														
		Austin			Ben			Callum			Ellie			Matt		
		1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
1	0	-	+	0	0	0	0	+	0	-	+	+	0	+	0	-
2	0	-	-	0	0	-	-	0	0	-	0	-	-	-	0	0
3	0	0	0	0	0	-	0	-	0	-	0	0	-	-	0	-
4	0	0	-	0	0	-	-	-	0	-	0	-	-	0	0	0
5	0	-	0	0	0	-	-	-	0	-	0	-	-	-	0	0
6	0	-	0	0	0	+	0	+	0	0	+	0	+	+	0	+
7	0	0	0	0	0	0	0	0	0	-	0	0	0	0	0	0
8	0	+	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9	0	0	0	0	-	+	+	0	0	-	+	0	0	0	0	0
Total	0	-3	-1	0	-1	-2	-2	-1	0	-7	3	-2	-3	-2	0	-1

Table 4: Concept ranking (sum of weighted scores)

Methods used for evaluation

These evaluations were done during a team meeting with all group members. Group consensus was used for decision-making, with a focus on client empathy. Ideas were compared against each other using both quantitative and qualitative measures of the value they provided to the client as well as some basic feasibility discussion (e.g. would a concept be easy to collaborate on remotely).

Choice of promising solutions

Promising solutions were selected based on scoring from the above analyses as well as by unique features that deserved to be given attention. The following six concepts were selected for further analysis:

Ellie - Concept 1

A toolbar UI that can be used with Photoshop (or other tools) with basic commands that can be activated by mouse, keyboard, or voice.

Ben - Concept 2

An ergonomic pen for the wacom tablet, that allows the user to hold the pen more comfortably.

Matt - Concept 1 and Callum - Concept 1

These two concepts were almost identical and thus will be treated as one. This is a voice command-based system that facilitates clicking small icons, navigating menus, and other simple processes in Photoshop.

Austin - Concept 1

An external custom keyboard that allows for rebinding of keys and hotkey functions for Photoshop.

Ellie - Concept 2

A UI that focuses specifically on simplifying aspects of the Photoshop UI that the client felt overwhelmed by, such as the color picker and brush properties.

Matt - Concept 3

An addition to the wacom tablet that stores the most common drawing patterns and gestures performed on the tablet.

High-value features from chosen concepts

Features that provided the most value to the client were extracted from the chosen concepts and some additional ideas and details were added through discussion. They are listed as follows with brief descriptions:

1. Simplification of Photoshop menus, icons, and tools
    a. Specifically mentioned by client as strong need
2. Simplification and redesign of the brush properties tool and color picker
    a. Specifically mentioned by client as strong need
3. Improvement of Wacom pen

        a. Client mentioned pain in hand when using normal Wacom pen

        b. A hardware concept the client is already familiar with; easily integrable

4. Re-creation of simple art processes using voice commands, e.g. "draw circle"

        a. Client is currently unable to use Photoshop when they don't have control of their hands

5. Voice commands for menu navigation, tool selection

        a. Client is currently unable to use Photoshop when they don't have control of their hands

6. Tactile buttons or external keyboard to control Photoshop

        a. Easier to manipulate than a mouse

        b. Buttons provide a larger interface than Photoshop icons

7. Gesture and command repetition

        a. Saves effort for the client

8. Line smoothing

        a. Mentioned by the client as a specific need

9. Physical or on-screen drawing guides

        a. Client currently draws with two hands; they rest one on their tablet in order to guide their lines

Selected features for concept design

From the discussion of high-value features, the team then narrowed down the desired concept features to the following five ideas:

Simplification of Photoshop UI

This would involve making the menus, icons, and tools in Photoshop easier for the client to navigate and use. All icons would need to be larger and tools that the client does not use would be hidden. Improvements would also be made to the brush selection tool and color picker. Voice activation could also be implemented here.

Integration with Wacom tablet

As the Wacom tablet is the tool that the client currently uses to create their art, it would be ideal to allow them to keep using it with the new product. The tablet functions as a mouse as well, so its integration could be limited to that, or options with the buttons and pen could be explored.

Command and gesture history and repetition

This would include the ability to recreate frequently used processes by recording their use history in the system. Voice activation could also be used here.

Help system

The client feels overwhelmed by the options available in Photoshop. The proposed solution will make their interaction with the program simpler but also more limited. A friendly help system would help build the client's confidence with Photoshop's tools alongside the solution.

Tactile buttons

The client may not always be able to manipulate a cursor on a screen, in which case large, tactile buttons would be a useful feature.

Line smoothing

The client has complained about their drawn lines being shaky if their hands are unstable. Adding line smoothing functionality to the solution would add value in these situations.

Decision on group design concept

Ideal product

An ideal solution to the client's needs would allow them to create art using any form of input; voice, gesture, tablet, keyboard, or mouse. This system would be uniquely adapted to fit their needs at any given time and provide an easy to use interface, being able to switch between any input form at any time. Art creation could be a whole body process using large gestures, or require as little movement as just talking. It would record frequently used gestures and commands and could be requested to repeat these either through the UI or by any of the aforementioned input methods. At any point while using this system, the client would be able to request assistance with the commands, tools, or system in general. This ideal solution would be comparable to Tony Stark's assistant Jarvis from the Iron Man movies (pictured below).
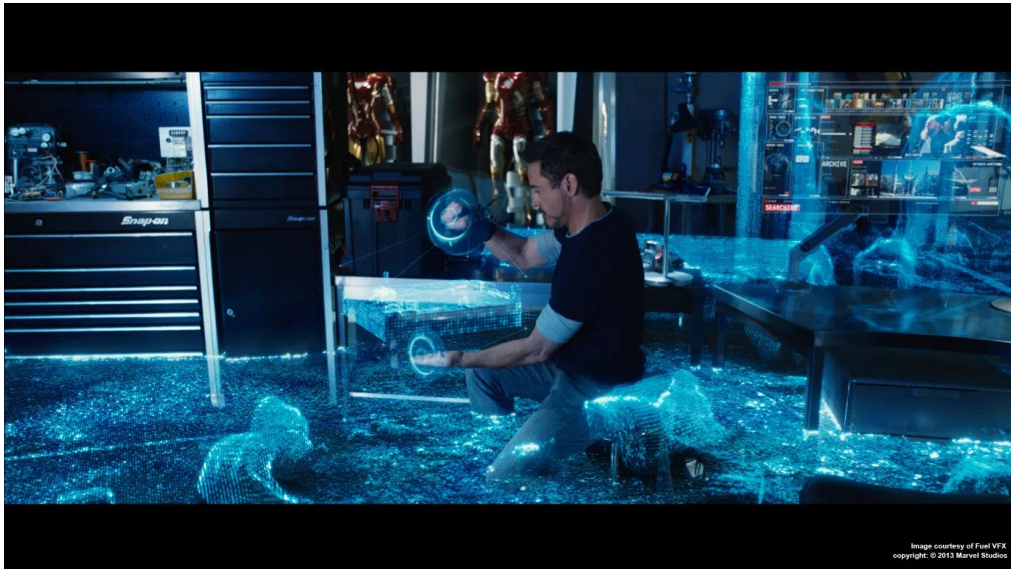
Unfortunately, the scope and resources required to create such a system are beyond those available to the team at the moment. A more realistic concept must be designed, that can still meet client needs.

Feasible product

It is important that the system can be used with whatever abilities Madi has at a given time. Voice input as a feature is more of a priority than creating an external keyboard or button system as the client already is using an environment they can manipulate with their hands and has expressed issues with that approach. As well, a software rather than hardware solution would be cheaper, involve less setup for the client, eliminate the need for shipping and delivery (especially with COVID-19) and facilitate remote team collaboration.

The UI of this system needs to be simpler than what Photoshop currently has, and provide improvements specifically in icon size, color picker, brush selection, and menu navigation. A history function will also be a valuable feature, allowing the client to repeat recently and frequently used commands and/or gestures.Ideally the UI should be intuitive enough to reduce the need for a full help system; however if time permits it would be valuable for the client to have introduction tutorials or a help database available.

Product concept conclusion

Based on the above criteria, the solution for this project is an auxiliary interface that runs as a desktop application concurrently to Photoshop. This system can be controlled by voice, mouse, wacom tablet (as mouse), or keyboard. The UI should include large icons and simple menu navigation, color picking, and brush selection. These tools are all tied to the corresponding Photoshop tools. Functionality of the system also includes a record of command history that can be repeated.

The following tools have been chosen as the most likely to be used by our client in Photoshop, and should be included in the concept development for the system: mouse pointer, paint brush and brush selection panel, eraser, paint bucket, text, lasso/rectangle select, layer manipulation, zoom, and color select.

Visual representation of design concept

The following is a possible UI for the system, and will provide the basis for rough prototyping.
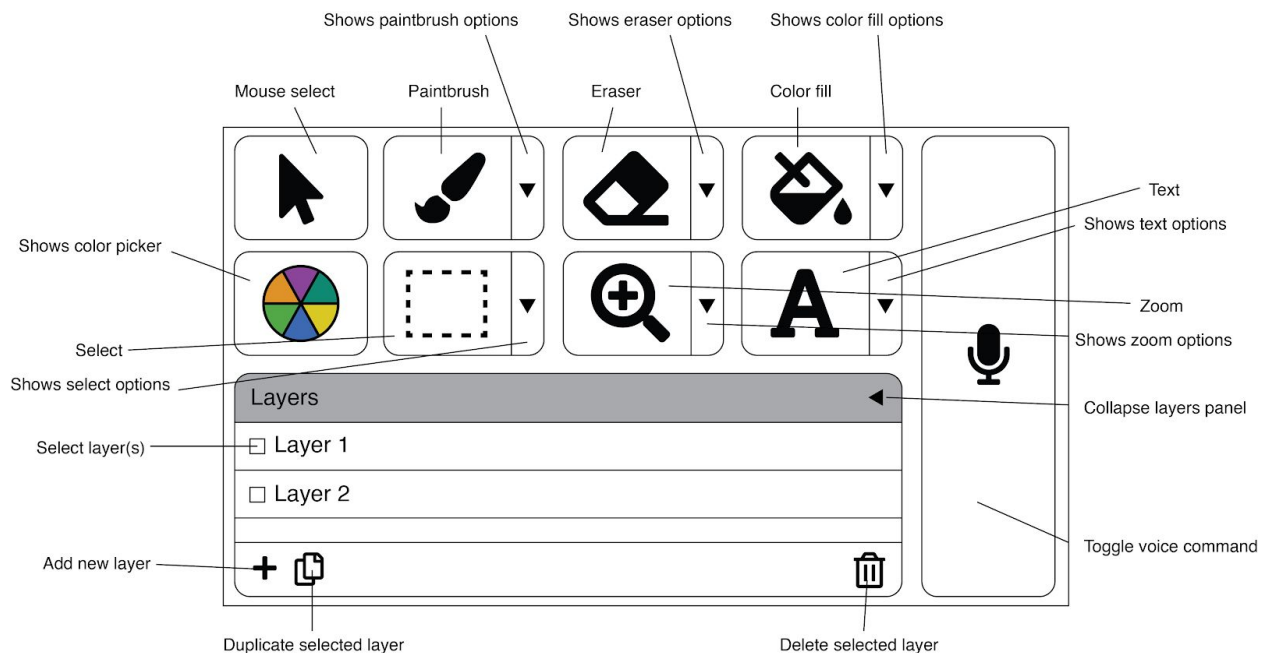

Figure 2: Visual representation of design concept

Concept as related to target specifications

Our project concept will meet the aesthetic target specifications such as the absence of red, no fast pop-up windows as well as larger icons. These specifications were our top priority because they directly impact Madison's disability and have been known to trigger it at times.

The specifications that are related to accessibility were important to us because we want Madi to be able to use our product whenever they need it, no matter the obstacles they may be facing at that particular time. Madi's fluctuating disability meant that a couple different solutions may be required for the solution. Our software solution allows the user to use voice commands to complete simple tasks on days where hand functionality is low, as well as improve the UI because Photoshop can be difficult to navigate at times and become overwhelming. This may include a new task bar, larger icons and frequently used icons all to improve the way the client will interact with our program.

The hardware solution, if implemented in addition or as replacement to the software solution, would focus on comfort and simplicity. Considering a hardware solution is important as well because Madi discussed during the client interview about how current technology has not been working for them and they would like a better option to create art when using their hands. Some features of the hardware solution might include quick copy and paste, a line straightener, eraser, zoom, and more. Some drawbacks may include pricing as including a hardware component may become expensive and using a closed source software like Photoshop could prove to be a challenge to work with.

C.2 Project Plan

An image of the Project Plan can be seen below. It will be updated as time goes on, especially breaking down tasks under each prototype to ensure that the group can present a complete product. Additionally, a PDF of the Project plan has been attached, which is higher definition.
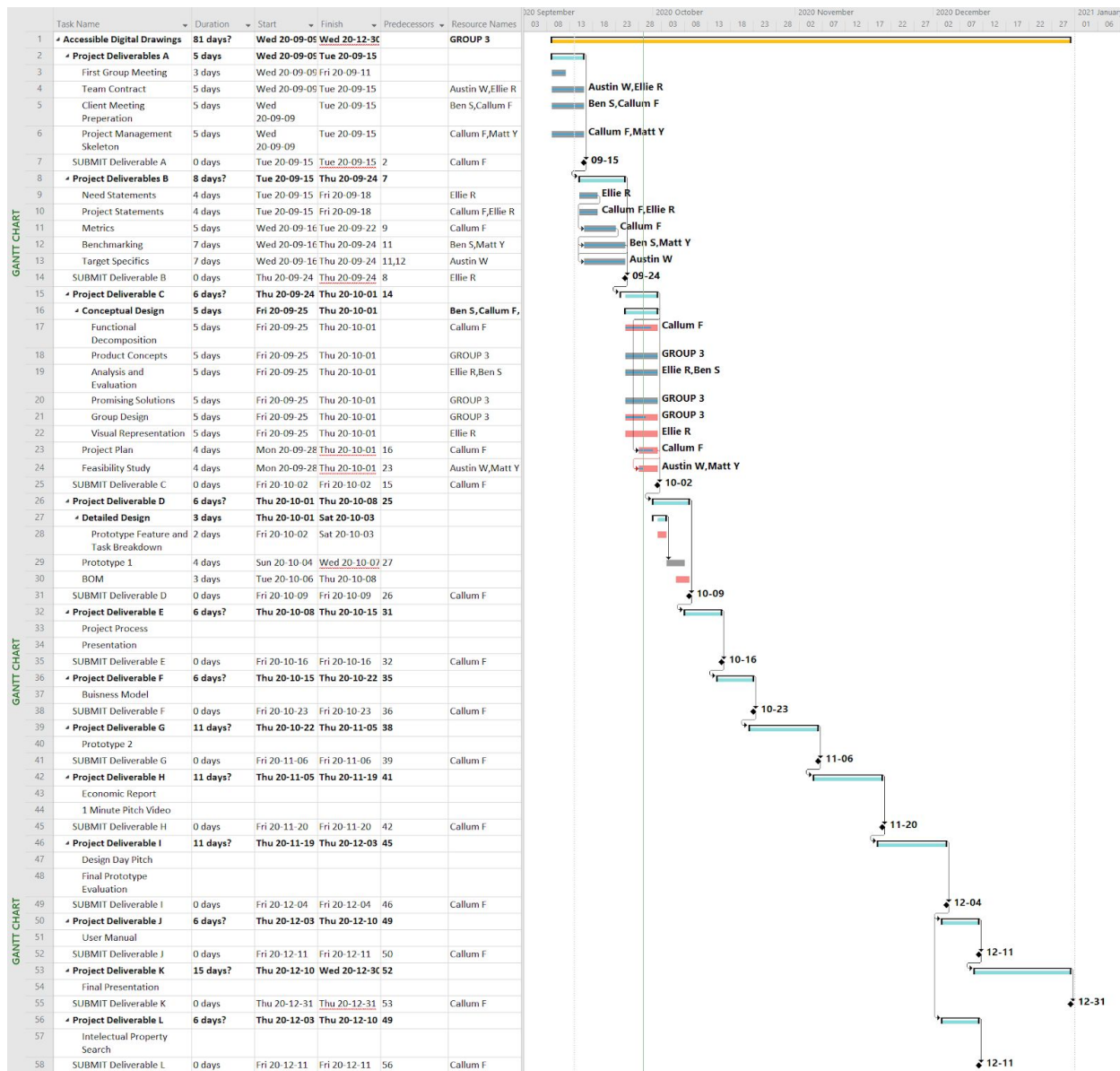

Figure 3: The detailed project timeline breakdown for group A3's Accessible Digital Drawings