

1. Description

“MultiPixel is an online relaxation video game designed to offer a more enjoyable experience for stressed individuals during their leisure time. Our program is unique as it offers free, easy access to pixel painting software, helping solve the problem of users who want to play and enjoy games, but for any reason, cannot download them. We at MultiPixel wish to offer a social and artistic break from the world where you and all your friends can paint and share art.”

In this deliverable, we finished up our testing so we could ensure that the produce we made was what we wished to deliver. We do so by doing unit tests, some that are automated tests and some that are mock tests with Jest. Next, we did some acceptance tests with Selenium. Finally, we did validation tests by interviewing different customers and getting their thoughts as users. Using all this information together we were able to reflect on whether or not we satisfied our Initial value prompts, and if we completed our MVP. Not to spoil anything, but the answer is Yes! The project was an overall success!

As always, Heres out Git:

<https://github.com/thomasrotchford/CS386-2024-multiPainter/tree/main>

2. Verification (tests)

The verification for our project comes from a mix of tests. First, we made a mock function using Jest, as well as we also made some unit tests with Jest. And after that, we Used Selenium for Acceptance tests.

Unit tests

Testing Framework: Jest

Link to GitHub Folder: <https://github.com/thomasrotchford/CS386-2024-multiPainter/blob/main/Unit%20Testing/Mock%20CreateBoardPage.js>

Test Case/Mock Function: We created a mock function for the test case of a user opening the CreateBoard page and we tested if it renders correctly. This mock function was included in CreateBoard.test.js. We also had a jest.config.js and babel.config.js file to configure Jest to understand ReactJS.

The test passed.

```
// Mock function for opening the page
jest.mock('./CreateBoard', () => ({
  __esModule: true,
  default: () => <div>Mock CreateBoard Page</div>,
}));
```

Figure 1: Jest Image

The jest.mock() function replaces the CreateBoard implementation with a mock implementation.

The mock implementation is a div that renders called “Mock CreateBoard Page”.

```
describe('CreateBoardPage', () => {
  it('renders without crashing', () => {
    render(<CreateBoardPage />);
  });
});
```

Figure 2: Jest Image

Jest's `describe()` function tests the `CreateBoard` component, while Jest's `it()` function tests if it renders without crashing.

This tests to see if the `render()` function is called correctly without throwing errors.

The outcome of the test execution is 1 test and 1 pass, meaning that the page renders and the test passes.

We did, however, have a deprecation warning. which suggests we could find more updated testing softwares in the future, or update our current testing software.

```
Last login: Wed May 1 13:24:33 on ttys000
[coltonleighton@coltons-air-3 ~ % cd Downloads
[coltonleighton@coltons-air-3 Downloads % cd CS386-2024-multiPainter
[coltonleighton@coltons-air-3 CS386-2024-multiPainter % cd multipainter
[coltonleighton@coltons-air-3 multipainter % cd src
[coltonleighton@coltons-air-3 src % cd Create
[coltonleighton@coltons-air-3 Create % npm test

> create@1.0.0 test
> jest

(node:10385) [DEP0040] DeprecationWarning: The `punycode` module is deprecated. Please use a userland
(Use `node --trace-deprecation ...` to show where the warning was created)
PASS ./CreateBoard.test.js
  CreateBoardPage
    ✓ renders without crashing (11 ms)

Test Suites: 1 passed, 1 total
Tests: 1 passed, 1 total
Snapshots: 0 total
Time: 1.385 s
Ran all test suites.
```

Figure 3: Jest Image

Outside of this mock test, we also did some unit testing. We showed this before in D6, but as this is the unit testing section, it is still highly relevant

For the next portion of our unit tests, we used the framework Jest for our ReactJs code. A few configuration files were required for Jest to parse through the JSX. We tested the `CreateBoard.js` file which holds the board layout as that one of the largest pieces of our website.

Here is the testing framework we used: Jest Documentation

And Here is where we stored it all: Testing Folder!

Now these functions are a bit similar to before, but they don't use any mock elements, the following are strictly unit testing.

Test Cases

First, we have another version of the previous test, that doesn't use the mock element. It's a unit test of the page as a whole. Which writing this, I see how that more similar to an acceptance test, but as its a unit test for the whole website if you consider a page a single unit

Next, we had a unit test that tested if we could render our current brush color element.

Next, we had a unit test that tested if we could render the palette container element.

Next, we had a unit test that tested if we could render the board settings element.

Finally, here is the output of all our tests

```
test('renders without crashing', () => {  
  render(<CreateBoardPage />);  
});
```

Figure 4: Alt text

```
test('renders current brush color', () => {  
  const { getByText } = render(<CreateBoardPage />);  
  const brushElement = getByText(/Current Brush Color/i);  
  expect(brushElement).toBeInTheDocument();  
});
```

Figure 5: Alt text

```
test('renders palette container', () => {  
  const { getByText } = render(<CreateBoardPage />);  
  const paletteTitle = getByText(/Palette:/i);  
  expect(paletteTitle).toBeInTheDocument();  
});
```

Figure 6: Alt text

```
test('renders board settings', () => {  
  const { getByText } = render(<CreateBoardPage />);  
  const settingsTitle = getByText(/Board Settings/i);  
  expect(settingsTitle).toBeInTheDocument();  
});
```

Figure 7: Alt text

One test failed because of what Jest perceived to be a syntax error on line 71 of paletteBoard.js, however, it is not an actual error and the last 4 test cases passed. That being said we can still go back to fix the syntax error, as its a good idea to remove anything which could lead to a bug. So once we remove that syntax error, all our tests can succede

```
Test Suites: 1 failed, 1 passed, 2 total
Tests:      1 failed, 4 passed, 5 total
Snapshots:  0 total
Time:       2.199 s
Ran all test suites related to changed files.
```

Figure 8: Alt text

Acceptance test

This test was able to login and submit a painting to a user profile and verify the success of the operation. I outputed the results to a log file to show steps as well as where this may have failed.

Test Framework:

We automated this with Selenium for Python.

Github Link:

https://github.com/thomasrotchford/CS386-2024-multiPainter/tree/main/Acceptance_Testing

Link to a specific Test:

At the following link, there is a python script that when executed in the terminal, tests firefox and chrome. It verifies that (with the correct user credentials) a user is able to login, draw a painting with different colors and properly submit that file. They then will be able to see that on their profile. This test is output to a text file to see detailed steps and results of the process.

Test Results for Firefox and Chrome submissions below:

<pre>Begin Testing now Username input Password input Logging in Current paintings now = 8 https://www.multi-pixel.com/Create Beginning Paint Board At https://multi-pixel.com/Create Palette generated... Board divs generated... Painting board: Panting square 1 rgba(0, 0, 0, 1) Panting square 2 rgba(0, 0, 0, 1) Panting square 3 rgba(0, 0, 0, 1) Panting square 4 rgba(0, 0, 0, 1) Panting square 5 rgba(0, 0, 0, 1) Panting square 6 rgba(0, 0, 0, 1) Panting square 7 rgba(0, 0, 0, 1) Panting square 8 rgba(0, 0, 0, 1) Panting square 9 rgba(0, 0, 0, 1) Panting square 10 rgba(0, 0, 0, 1) Panting square 11 rgba(0, 0, 0, 1) Panting square 12 rgba(0, 0, 0, 1) Panting square 13 rgba(0, 0, 0, 1) Panting square 14 rgba(0, 0, 0, 1) Panting square 15 rgba(0, 0, 0, 1) Panting square 16 rgba(0, 0, 0, 1) Panting square 17 rgba(0, 0, 0, 1) Panting square 18 rgba(0, 0, 0, 1) Panting square 19 rgba(0, 0, 0, 1) Panting square 20 rgba(0, 0, 0, 1) Panting square 21 rgba(0, 0, 0, 1) Panting square 22 rgba(0, 0, 0, 1) Panting square 23 rgba(0, 0, 0, 1) Panting square 24 rgba(0, 0, 0, 1) Panting square 25 rgba(0, 0, 0, 1) Submitting now Entering user info Submitting the template information Failure https://www.multi-pixel.com/Profile Signed Out Previous Paintings: 8 Now: 9 Test result: success</pre>	<pre>Begin Testing now Username input Password input Logging in Current paintings now = 9 https://www.multi-pixel.com/Create Beginning Paint Board At https://multi-pixel.com/Create Palette generated... Board divs generated... Painting board: Panting square 1 rgb(0, 0, 0) Panting square 2 rgb(0, 0, 0) Panting square 3 rgb(0, 0, 0) Panting square 4 rgb(0, 0, 0) Panting square 5 rgb(0, 0, 0) Panting square 6 rgb(0, 0, 0) Panting square 7 rgb(0, 0, 0) Panting square 8 rgb(0, 0, 0) Panting square 9 rgb(0, 0, 0) Panting square 10 rgb(0, 0, 0) Panting square 11 rgb(0, 0, 0) Panting square 12 rgb(0, 0, 0) Panting square 13 rgb(0, 0, 0) Panting square 14 rgb(0, 0, 0) Panting square 15 rgb(0, 0, 0) Panting square 16 rgb(0, 0, 0) Panting square 17 rgb(0, 0, 0) Panting square 18 rgb(0, 0, 0) Panting square 19 rgb(0, 0, 0) Panting square 20 rgb(0, 0, 0) Panting square 21 rgb(0, 0, 0) Panting square 22 rgb(0, 0, 0) Panting square 23 rgb(0, 0, 0) Panting square 24 rgb(0, 0, 0) Panting square 25 rgb(0, 0, 0) Submitting now Entering user info Submitting the template information Failure https://www.multi-pixel.com/Profile Signed Out Previous Paintings: 9 Now: 10 Test result: success</pre>
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3. Validation (user evaluation)

Our Validation aims to ensure that we developed the right product. We were able to complete 3 interviews in the time allotted and we got lots of good responses!

Script

Here is our Script for validation!

Task 1: Explore Website (Expected time: 5 Mins) Task Description: Asked users to explore the website, and told them to try to look at every page they can. Tell us when they think they found every page

Collected Data

[How easy it is to navigate - what pages are useful - how we can improve navigation]

Questions Asked

NOTE: Every Q is a question, and every A is whatever the interviewee answered. Every A is blank as this is just the script. If you wish to see the interviews, they are in one folder up in deliverables

<https://github.com/thomasrotchford/CS386-2024-multiPainter/tree/main/Deliverables>

Q1) Did you have any difficulty finding particular pages? (I.E. free draw, templates, community, sign-up, sign-in, home, or profile page). If so, what challenges in navigation did you run into? Can you link it to a particular element?

A1)

Q2) How was your user experience? Did you find ease in navigation? Any particular element or feature that was particularly helpful/confusing?

A2)

Q3) Which page did you find most engaging and useful? Which page did you find the least engaging and least useful?

A3)

Q4) For navigation, do you have any further comments, suggestions for improvement, or additional features that you feel could help mitigate confusion, enhance the user experience, or increase the overall quality of the webpage?

A4)

Task 2: Account Management (Expected time: 5 Mins) Task Description: Asked users to log in and view their profile. Provided no further explanation on how to do this

Collected Data

[Feedback on how sign in process works - First impressions of profile - Thoughts on the issue with encryption]

Questions Asked

Q1) How straightforward is the sign-up/sign-in/view profile process? Do you feel any steps are confusing / are there steps where you encountered difficulties? If so, what could we improve?

A1)

Q2) Upon viewing your profile what were your first impressions, Are there any features you found most interesting? Are there any more implementations you would like to see on these profiles?

A2)

Q3) On a scale of 1-10 how satisfied were you with the following [Sign-up / Sign-in / Profile]

A3)

Q4) For the Sign-Up process, do you have any further comments, or suggestions for improvement, or additional features that you feel could help mitigate confusion, enhance the user experience, or increase the overall quality of the webpage?

A4)

Task 3: Design Pixel Art (Expected Time: 10-20 mins) Task Description: The user is instructed To create 3 drawings, one of easy difficulty, one of medium difficulty, and one of hard difficulty. User is asked to interact with as many features on the free draw page as they feel fit.

Collected Data

[User experience of drawing - User rating of easy/medium/difficult drawing - User's favored features]

Questions Asked

Q1) How was your experience in creating art?

A1)

Q2) What was your favorite palette among the options provided? Why? How good is it about the color picker?

A2)

Q3) How are the controls? Are they intuitive or confusing, could you find any bugs? Would you change anything about how this page works?

A3)

Q4) For the drawing process, do you have any further comments, or suggestions for improvement, or additional features that you feel could help mitigate confusion, enhance the user experience, or increase the overall quality of the webpage?

A4)

Task 4: Explore the Community & Work on a template (Expected Time 5-10 minutes) Task Description: The User is asked to browse the community page to their liking, and when satisfied they are asked to choose a template and try to complete it. No further instructions

Data Collection

[Feedback on how the community page is styled - Feedback on how the art in the community page is - Feedback on how hard it is to find the template - Feedback on how the template mode works]

Questions Asked

Q1) As you explored the community page, what were your initial impressions of the artwork? The layout? The order in which you saw the art pieces?

A1)

Q2) How do you feel about the search functionality? Is there anything you feel we should change about it?

A2)

Q3) How was the process of selecting a painting from the community page for work on as a template? How was the actual template drawing experience?

A3)

Q4) For the Template process, do you have any further comments, or suggestions for improvement, or additional features that you feel could help mitigate confusion, enhance the user experience, or increase the overall quality of the webpage?

A4)

Final Closing Questions (Expected time 5-10 mins) Q1) Based on your experience with the Mutipixel website prototype, how satisfied are you with the overall user experience?

A1)

Q2) On a scale of 1 to 10, how likely are you to recommend Mutipixel to your friends or colleagues? What factors influenced your rating?

A2)

Q3) Did Mutipixel meet your expectations in terms of providing a social and artistic break for you and your friends, as described in the initial value proposition?

A3)

Q4) Which features or functionalities did you find most essential or valuable during your interaction with Mutipixel?

A4)

Q5) Were there any must-have features or functionalities that you felt were missing or could be improved upon?

A5)

Q6) Did you notice any security, performance, portability, availability, or maintainability issues while using Mutipixel? If so, please elaborate.

A6)

Q7) Are there any specific areas where you feel Mutipixel could differentiate itself further from competitors or better meet the needs of its target audience?

Q7)

Results: We conducted the user evaluation with 3 users so far.

We interviewed someone experienced in art who has used the website before, who will be called User 1, Someone not experienced in art who has not used the website before, who will be called User 2, and someone very experienced in art and digital art, who has never used the website before, who will be called User 3.

Here is the data we collected

For Task 1 All Users found it easy to navigate the website and found almost all pages, however no users found the Sign-Up page. When asked about this, User 1 said they didn't feel they needed to do that yet so they never visited the page, and User 2 said they didn't even think about it.

There was a consensus that the nav bar was the most useful tool in navigation and all users liked it. Both User 2 and User 3 felt confusion on the home page, as the main page buttons lead to the same places as the nav bar. This is likely a place we will rework for the website. User 3 also pointed out that the "template" button leads to the "paint" tab, which is confusing.

For the most interesting and engaging page, the users agreed that free-draw and community were the most engaging, and also agreed that the main page and the template were the least engaging. This is a good example of places for us to work on for the next iteration of the website

For things to be implemented and improved. User 1 noted that it could add to the website overall if we cleaned up the "paint" page, and made its use more clear. User 2 felt it could be a nice easter egg if the buttons had SFX or the cat meowed and got up and moved when you clicked on it. User 3 suggested we have more professional text on the home page, and more information or pictures on the home page to explain our website and vibes. They said it would be nice if we had an about us / about multipixel page on the website. A tutorial would also be nice they said.

For Task 2 All users agreed that the sign-in process was rather straightforward, though all users noted that since the sign-up lacked the information for the rules on passwords, it would have been impossible to do without my instructions. Because of this, one of our next steps is adding those instructions to the page, as well as making a rule that doesn't let the form progress if the password isn't improved.

The Users also helped us find lots of bugs in this program. First, there was the password bug of not showing the requirements. Second, User 2 pointed out that we don't check for duplicate usernames. Third, User 1 pointed out that our submit buttons on the modal look strange, we don't know for sure, but we feel it is because our modal might not be connected to our CSS. Fourth, User 3 pointed out that there are fonts on the profile page that do not match. Fifth, User 3 pointed out that the buttons after signing up do not link to the expected areas. Sixth, user 1 pointed out that there's no resend verification button.

Bugs aside, we also got lots of information on what users would like to see on the profile page. It was a universal opinion that the sign-in page was bland, and could use some more stylization, as well as all users agreed that profile pictures and profile information would be useful.

For Task 3 For the third task, all users were able to the free draw page, and complete 3 different drawings, though many Users rushed through the drawings, this was likely because many Users during the interview may not have been in a fully artistic state of mind. We have seen before outside of these interviews, images of high complexity, such as “Handsome Squidward” or “Champion”.

The users liked the variety of options and buttons to click. Many users interacted with the music and found it humorous, and a good fit for the website. They all also looked through all the palettes, and there were variations on which palette was the favorite, as it generally was just the User’s favorite color. Many of the users also loved the free-color palette.

The only negative data we found, is many users struggle with the click and drag bug, where it sometimes causes a cross to pop up, and it no longer drags. This is a minor bug that our team has been looking into, but all users recommend removing it

For Task 4 For the fourth task, all users skimmed the community page for a bit, before eventually settling on a template to draw. Many users felt that it was not readily intuitive that you needed to click on images on the community page to access the templates.

They recommended that it could be useful to have an in-between page that pops up when you click on images in the community page that includes information about the image. This page would also include a button which lets you use this as a template

We also learned that many people wished there were ways to personalize the community page. One idea was to develop a way to sort the images by different aspects, such as by relevance or by likes. Another idea that our Users were interested in, was a way to have more images per column or have a way where they can manipulate how many columns they would wish to see

Lastly, all users felt that the search function made sense, but could be improved, to search by more characteristics, as well as we learned of the existence of some bugs we could improve on

For Final Questions Many of our Users mentioned that they had already answered all they could and offered all the implementations they desired.

We also used this section to collect the Users’ overall satisfaction with this website which was on average a 9/10 and their overall willingness to recommend the website to others which was a 7/10 (many had not artsy friends and felt they couldn’t find others who were interested. This was great information to gather because it means we satisfied almost everything we aimed for

Other than that, many users were interested in quality-of-life improvements such as bug fixes, more functionalities, or more pages or modes.

Lastly, we were also able to learn that many of our users were big fans of the custom color picker palette.

Reflections

For the first task, Our nav bar worked well, however, the home page and its buttons were confusing so we will change that. There was a little learning curve to finding things on the website, but certain things weren’t fully clear, as many people didn’t know immediately that the Sign-Up or community template pages could be accessed. The users performed this task as expected, but were much faster than I expected. They just sped through the pages and didn’t read much. Perhaps some more tutorial text could help. They also produced the actions expected. The most liked pages were the free-draw and community, and the least liked were the home page and the base paint/template page. Overall, I feel we satisfied our value proposition, as many people described switching between the pages as easy, which matches the ideas behind our value proposition of making the website “a break from the world”. We also had good recommendations on what other implementations people would like to see, including a tutorial, an information page, and SFX / easter eggs for the buttons.

For the second task, All users felt that the sign-in process was straightforward forward which is good for satisfying our Value Proposition of making a program that can be navigated with ease. We also found

lots of bugs during this verification. None that broke our program, though many could be improved to give our website a better user experience. Reflection-wise, we also reviewed lots of information on what future implementations and elements users would like to see in the profile section, such as profile pictures or profile descriptions. So overall, the users found little learning curve other than the bugs we intend to fix, and they were able to perform the tasks as expected, following our value proposition of having an "easy artistic release website". That being said, we wish to improve on the bugs mentioned a lot more, to make our user experience better.

For the third task All users felt that the free-draw process was very streamlined, though they all agreed that the click-and-drag bug being dealt with would greatly improve the user experience. Many of the Users were also unfortunately tired in the interview, so the complex art pieces were kind of rushed, so we didn't have much time to stress test the program. But as mentioned earlier, we have had it done before so we know it is possible. Some people wanted some further implementations like an eraser, dropper, or fill tool. We desire to implement these all, but much coding will need to be done to implement this. Users were able to complete the tasks as expected, and since we can have any users make and submit pixel art, so we satisfied our initial value proposition of making "A place to create, share, and explore".

For the fourth task We observed that many of our Users enjoyed scrolling through the community page and found it as one of the most interactive and enjoyable pages on our website. Our users completed tasks as expected, but by this time of the interview, many were tired and did not feel like completing a template, perhaps shorter interviews will be beneficial in the future. Those who did go through completing their template were satisfied, though they mentioned that the page feels a little empty and more should be added to fill in the pages. Other than that, the only main change is to make finding the templates a little more explained and intuitive. However, since we have it working, that means we satisfied our initial value proposition of including the "magic of Paint by Numbers".

For the final questions There was no task for this section to complete, so we gained no information on that, but there were lots of wrap up questions that we were able to reflect on. Many of the users felt very satisfied with the website as a whole, as well as they wished to recommend it to others, which is a great sign that we satisfied the Value Proposition of creating a "Social and artistic break from the world, for you and all your friends. A place to share and explore your artistic mind. Feel like a child again, through the magic of Paint by Numbers" in its entirety. many users also mentioned that they want to come back in the future to see what further developments take place. Other than that, our users offered gold-plating ideas on what we could further implement (listed all above) which offer to create places to continue improving our website.

Overall

Overall, our team is highly satisfied with the project we made, and it appears through our verifications the users were too. It took around 500 man-hours to get the project to where it is today, and we will likely do more to keep on implementing all these ideas. All of our tasks assigned were able to be completed. They were sometimes unclear, but that is nothing we cannot change in later releases. Furthermore, in these reviews, we were able to learn what the Users were interested in for this project, which are mainly quality-of-life features allowing easier designs on the free draw or additional customizations on the profile. There are many places we have learned we can improve through bugs that we discovered in these tests as well. Lastly, while users were able to navigate the site, we worry there could still be a small learning curve, so we plan to implement a minor tutorial where we can teach the Users about some of our website's key functions. Lastly, as mentioned above, many people were greatly satisfied with the website, so our team feels we can conclusively say that we did satisfy our Initial Value Prompt, As well as we were successful in creating our Minimal Viable Product