

# HCI Assingment 7: Final Report

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## 1 Introduction

We are pleased to present our final report for the human-computer interactions course, in which we have developed a startup called Robin AI. This startup aims to transform unimaginative data entries into visually appealing and interactive visualizations, in order to enable data exploration.

In this report, we will outline the development process of Robin AI, following the five stages of the human-centered design process. Through these stages, we will be detailing the steps that we took to understand the needs and motivations of our target users, define the problem that we were trying to solve, generate and evaluate ideas, create prototypes, and conduct user testing.

## 2 Observation

In this chapter, we will be discussing the observation stage of the human-centered design process, which is also known as the "empathize" stage. During this stage, our goal was to gain a deep understanding of our target users and their needs, so that we could create a product that truly meets their expectations and helps them achieve their goals.

To do this, we conducted a variety of research activities, including creating personas, developing context scenarios, and conducting interviews with potential users. These activities allowed us to gather valuable insights into the motivations, pain points, and desired outcomes of our target users, and helped us to identify the problems that our app could solve.

One of the key problems that we identified through our research was the gap between the capabilities of existing data science and artificial intelligence technologies and the understanding and skills of typical business users. We found that many businesses and managers were hesitant to implement AI projects due to the high level of technical skills required, the lack of explainability of algorithms, the difficulty of fine-tuning algorithms in an intuitive way, and the speed and cost of development.

To address these problems, we focused on creating a user-friendly interface that would allow even non-technical users to easily access and make use of the full range of AI solutions available to them. We also prioritized explainability and the ability to quickly and cheaply develop prototypes, in order to build trust and facilitate rapid adoption of our product. To better understand the context in which our users operate, we developed a context scenario for our persona, Marvin Scherer.

Marvin is a SAP Data Science Consultant who stands at the intersection between data and business processes in his company. He is curious and driven to understand his company's data and draw insights from it, and is excited by the idea of using our tool to make data more tangible and interactive for all levels of expertise. Marvin will likely use our tool when he needs to explore and brainstorm ideas, or when he has a specific direction in mind but is unsure of what data he has and how to access it. By using our tool to rapidly understand the organization's data and how it fits in the context of related data, Marvin can encourage data discovery and collaboration with other users.

Through our personas and interviews, we gained a detailed understanding of the context in which our users operate, and the specific challenges and goals that they face. We used this information to inform the development of our app idea and our design decisions, ensuring that we were creating a product that truly meets the needs of our target users.

### 3 Idea Generation

In this chapter, we will be discussing the idea generation stage of the human-centered design process, also known as the "define" stage. This stage is all about taking the insights that we gained from our observations, and using them to generate ideas for our product. We created a series of wireframe sketches that depicted different phases of our product.

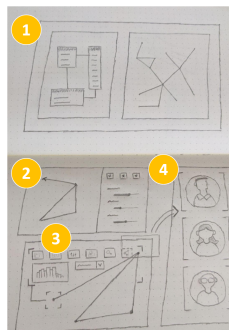


Figure 1: Wireframe Sketching

1. **Introduction:** The first wireframe sketch depicted the transition from traditional database visualizations to a more interactive and tangible form. This sketch showed the traditional visualization on the left, and our more innovative implementation on the right, highlighting the key differences between the two approaches.
2. **Configuration:** The second wireframe sketch depicted the configuration of global parameters. In this sketch, the user is able to make different aesthetic choices or manipulate the nature of the visualization to their liking.
3. **Exploration:** The third wireframe sketch depicted the gathering of information through manipulating the network. In this sketch, the user is able to explore the network structure to understand connections, or zoom into specific nodes (representing SQL tables) to see the details of the data and use it for other analytic purposes.
4. **Sharing:** The fourth wireframe sketch depicted the sharing of insights with other users. In this sketch, the user is able to package their findings and send them to other users in the company, along with all the necessary documentation for them to replicate the results.

In addition to these wireframe sketches, we also designed a hybrid sketch that combined a photo trace with our wireframes. This hybrid sketch (shown below) helped us to put our persona's context scenario into a concrete, physical environment, and allowed us to better understand how our product would fit into the day-to-day workflows of our users. This helped us to ensure that we were creating a product that truly meets the needs and goals of our target users.



Figure 2: Hybrid Sketch

## 4 Prototype

In the prototyping stage of our startup, we went through several iterations of prototyping, starting with paper prototyping and moving on to high-fidelity prototypes in Figma. Through self-testing and user testing, we learned how to improve and refine our prototypes to better meet the needs and goals of our users.

In the paper prototype phase, we created a task flow that guided the user through the process of exploring and sharing data within our application. This task flow included a welcome page, dataset selection and preview, customization options, initial visualization, data exploration and analysis, and a sharing feature.

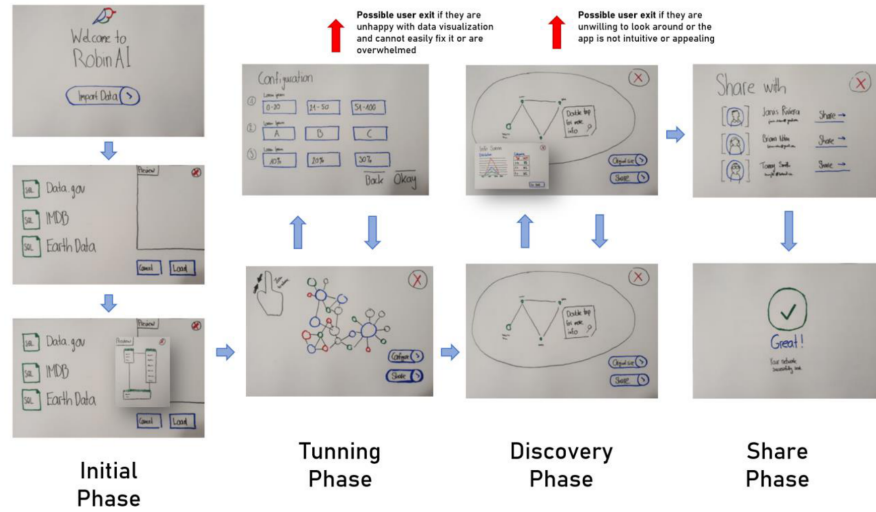


Figure 3: Outline of RobinAI paper prototype and task flow

We also designed interactive elements and elaborated on the overall design of our product to match the theme of our application. These elements included pop-up menus for dataset preview, help functionality for customization, and visualizations and analysis options for data exploration.

In the high-fidelity prototype phase, we built on the task flow and interactive elements of the paper prototype. We added additional features such as an artificial intelligence model recommendation and a success page to complete the sharing process.

Through self-testing and user testing, we learned the importance of providing guidance and help functionality throughout the app, as well as the need for a clear and intuitive design. We also learned that it was important to offer multiple options for data exploration and analysis, and to make the sharing

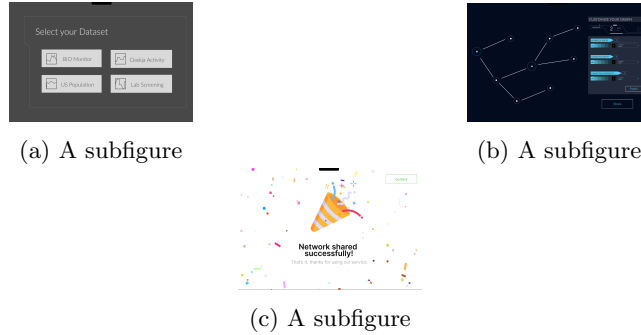


Figure 4: Figma Prototype: Selected Screens

process as seamless as possible.

For a full interactive preview of our high-fidelity prototype, please refer to this [Link](#).

## 5 Test

In order to appropriately validate our product, we designed a user study that would replicate the experience of a new user of the tool. Firstly, a context scenario was created whereby the test user was informed that RobinAI is a new tool in their organization that is designed to help business users become better acquainted with their company’s data and share insights they find with other users. Secondly, the prototype and tasks are designed to have the user select a business dataset they are interested in, click through the dataset visualization in order to find an interesting connection, and lastly share this insight with another user. This task was chosen as it is easy to measure and succinctly captures one of the main goals of our tool; to improve communications between business and technical users in an organization. Thirdly, the user is given documentation that presents the context scenario and task they are to complete. Fourthly, the user uses the prototype and attempts to complete the task. While they do so, their screen and audio are recorded and they are encouraged to speak out loud about their internal thought process as they complete the task. Fourthly, once the task is completed, the user fills a survey giving us feedback on the usability of our tool and their experience with it.

### 5.1 Think Aloud

For our test, a user went through our prototype in order to achieve the task of finding some interesting insights in their dataset and sharing their findings with other colleagues. From our review of their experience, there were two main qualitative takeaways from the think aloud,

Firstly, there is much more consideration that needs to be taken into account when it comes to application navigation, even when the navigation is only designed to accomplish one task. The user consistently found themselves saying, "How do I go back?" and asking for an undo button. Additionally, the user consistently kept asking for an undo button which allowed them to try multiple analysis on the dataset. This was particularly interesting and points to a fundamental tension in our product. We have an end goal which is to share information, yet we also have the goal to encourage data exploration (not a linear process). We focused on completing sharing but neglected the data sharing aspects. As a result, while the user was looking around the dataset visualization they found they needed more navigation tools in order to properly explore, but all the functionality was pushing them towards the share button. The user found themselves constantly saying "I don't want to share yet." This sharing focused design helped accomplish the sharing task but hindered the exploration task which the user kept trying to accomplish.

Secondly, much more interaction is needed to be implemented to fulfill the promise of data exploration that the user is promised. This was a pleasant surprise as the context scenario that was presented to the user and the design of the app itself does instigate the user to naturally want to click around and investigate. However, one of the consistently repeating comments in the think aloud was; "not clickable", following the desire to analyze another part of the data. This issue stems in part from being the first draft of the prototype and the discovery process involved in building this new tool. Because the tool is centered around data discovery and interaction, much more thought and work will need to be invested in developing the tool further. RobinAi must be superficially simple so that visualizations are simple for users to manipulate and not be intimidated. However, the tool must offer enough detail and interaction so that users that wish to dive deeper into the data can do so. For this first draft, more emphasis was placed on simplification and simple interactions but we were pleasantly surprised to have our users ask for more detail and technical exploration functionality.

## 5.2 Survey

In order to extend our qualitative analysis, we implemented two surveys; the SUS (System Usability Scale) and UEQ (User Experience Questionnaire). These surveys grant us a more objective view of our application and when used with multiple users allow for statistical analysis of the results. Due to technical difficulties we were only able to have one think aloud from our users, however, we did have two participants test our prototype. We do, however, have two responses for our survey. A demographic description of our testers is summarized in the table below.

The SUS Survey is a quick way to measure the usability of an application. For our results we scored 52.5 for User 1 and 55 for User 2. The proximity of these scores grant validity to the score, although more users are needed to know defini-

Table 1: User Survey Demographics

	Age	Sex	Job	Edu.	Race	Earn.	Lang.
User1	18-24	Female	Student	Master's	Asian	10K-30K	Hindi
User2	18-24	Male	Student	Bachelor's	White	50K-70K	German

tively. These scores are below the average score of 68 and lay around the 20<sup>th</sup> percentile for SUS scores. These results inform us that there is still much to be improved about the application. These issues are foreseen as we are attempting to change an existing user-database UI. As we do this, we will undoubtedly find implementations that do not work as expected. All these failures will help us in learning how not to implement these new user-database interface. Specially, we scored particularly low in "I found the system unnecessarily complex", ease of use, and integrated features. This informs us that in the next iterations more development is required to give the whole application a more cohesive narrative. Rather than having multiple features work together in a purely functional way, there is a need to implement a user metaphor (perhaps that of a navigation map) to bring cohesion to our goal of having a tool that serves as a map of data to users and a tool for exploration.

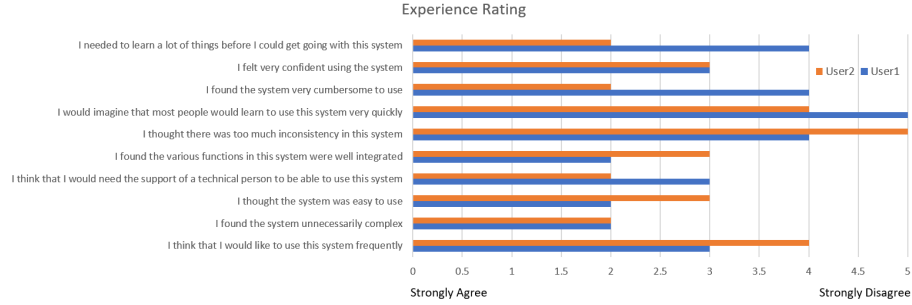


Figure 5: SUS Results

The UEQ results grant a more detailed overview of specific aspects of the application the user experience. We are very happy to see that our users found our prototype innovative, interesting, pleasant, and enjoyable. This informs us that in the current prototype there is fundamental functionality that works as expected and our users enjoyed their experience. However, as the SUS directs us as well, there are deficit in usability that need to be met. The prototype scored particularly low in unfriendliness and demotivating. We believe that these adjectives are the result of poor usability experience specially as it comes to navigation and discovery. This stems back to an earlier issue, where in the think aloud we found that because the tool is for discovery even in the prototype more details must be added to give the user the sense of searching for hidden treasure in their data. Additionally, we are now very aware of the need for more basic navigational functionality like undo and back buttons. These additions

should help address these basic deficits and further iterations will help fine tune the solution.

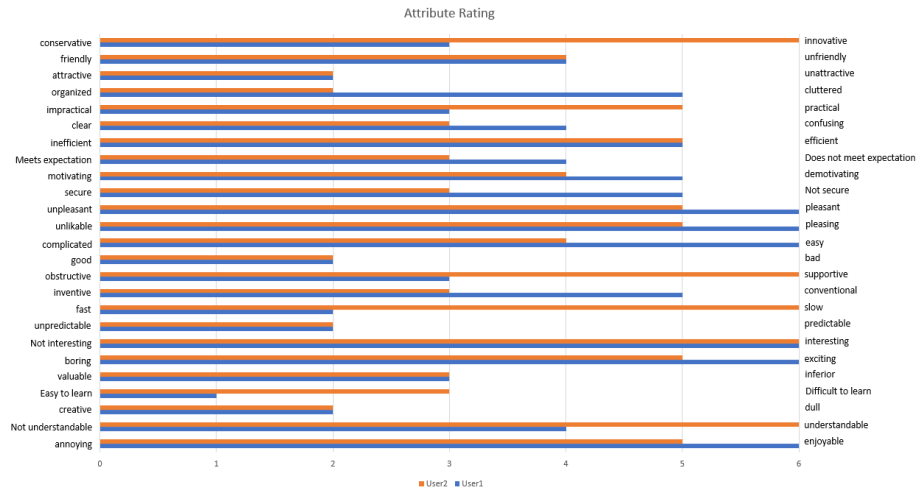


Figure 6: UEQ Results

## 6 Evolve

In the evolve stage, we have identified several areas where we believe our product can be improved upon based on the research findings from the testing phase.

This testing and feedback was very fruitful and we are very pleased to take this research on board for the next iteration of our product. There are, however, limitations to this testing due to a small testing pool. Therefore, these results must be taken with some caution, while they seem to be pointing in the right direction, there may be some things that are still missing. For this initial test, the setup was simplified to get some valuable initial feedback. Now that we have a better understanding of our user and tool, we think we can also improve the testing metrics for our next testing iteration. Completion time is perhaps not the best metric for our product as we are primarily focused on data discovery. This task is not necessarily optimized through completion time, but may require another metric that measures interaction in the application, like event measures such as clicks per specific buttons.

We plan to make improvements for in-app navigation. We believe the addition of an undo button and backwards buttons, will help resolve many current usability issues. In addition to these technical improvements, we also recognize the need for better guidance and support for our users. If we had additional time, we would consider adding in-app tutorials and resources to help users understand



and navigate the application more easily. Specifically, we plan to measure this through our error rate. Although the error rate in our current prototype is low, we believe there is still room for improvement. In the future, we plan to investigate potential causes for errors and implement solutions to further reduce the error rate.

Creating a more cohesive UX is also a more meta-goal we plan to address in the next iteration. The current metaphor we use of a network, we find can be too foreign and conceptual. We believe a more tangible metaphor like a map could be more useful. By perhaps keeping the connections visualized by networks by making the UI more similar to a map, user will instantly understand that this tool is meant for navigation and discovery through a database. Additionally, we will add much more detail for each datasets that a user can go through during their test. This simulates a much more realistic situation and grant the user a more tangible sense of what we envision data discovery would look like.

Finally, if we feel confident in the product's potential and believe it is ready for market, we plan to bring RobinAI to market by identifying and targeting specific industries and organizations that would benefit the most from our product. We would also consider partnerships and collaborations with other companies and organizations to help promote and distribute the product.