From Concept to Prototype: The Iterative Design of Robert Schumann City-Walk Application

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ABSTRACT

The Robert Schumann City-Walk application aims to foster cultural engagement and local exploration through an interactive and accessible platform. This report outlines the iterative design and usability testing processes used to enhance the prototype's design and functionality. Beginning with brainstorming sessions, the team identified core features and translated them into low-fidelity prototypes, culminating in a Balsamiq prototype. Usability testing was conducted using think-aloud protocols, pre/post-test surveys, and pilot studies to iteratively refine the design. Key findings from user testing provided insights into improving navigation, VR integration, and reward mechanisms. This document reflects on the iterative improvements made and evaluates the strengths and weaknesses of the final prototype.

1 INTRODUCTION

Cultural tourism plays a pivotal role in promoting heritage and community engagement. The Robert Schumann City-Walk application seeks to elevate this experience by offering an interactive tool that guides users through historical landmarks while fostering long-term engagement through gamification. The application targets tech-savvy travelers and culture enthusiasts, offering features such as account management, VR-based visual experiences, intuitive navigation, and a reward system.

This report documents the design process from brainstorming to usability testing and iteration. The goal was to create a user-centered application, addressing accessibility and usability challenges while ensuring a seamless experience. The iterative process allowed for continuous improvements based on real user feedback.

2 PROTOTYPE DESIGN

2.1 Brainstorming and Core Functional Decisions

The process of designing the application was started by holding individual brainstorming sessions that opened up the possibilities of features/functions that can be integrated into the application within the project guidelines [2]. This activity was followed by the group discussions that led the way to consolidate ideas and establish the 4 core functionalities.

The key features -keeping in mind that the application was made for and as a tourist exploration tool and focusing on the user persona of a tourist or local explorer who values simplicity, interactiveness, and cultural learning- that were decided upon included:

- **Account Management**: The functional backbone of the app, allowing the users to create and manage an account which enables them to save their progress in the application if they wish and allow a 'Guest' mode of surfing the app if one does not wish so.
  - Rationale: The functionality of allowing users to create an account provides a personalized experience, such as saving their progress and allowing them to continue the experience where they left off. A 'Guest' mode allows immediate and casual access with no barriers to entry and increasing inclusiveness.
- **Navigation**: A function allowing the user to select the desired destination and navigate accordingly. It should also contain the primary sight information to introduce the user to the desired landmark.
  - Rationale: The navigation function supports the user in basic exploration of the city landmarks, and promotes cultural history by presenting sight information. This will also minimize the need for external tools such as physical or electronic maps and also imprint a historical understanding of the locations in the city.
- **VR Experiences**: This function contains the hallmark feature of the application, which is to allow the user to visually experience the landmark with embedded graphical functions such as but not limited to a 3D interactive image, VR Video, and 360-degree image.
  - Rationale: This feature is to provide an immersive experience to the user and to emotionally connect the user with the history and significance of the city landmarks. This VR functionality perfectly aligns with the app's goals of cultural promotion and exploration.
- **Reward System**: A way to gamify [3] the application was decided upon the implementation of a progress-based reward system, which will reward the user based on a finalized parameter that differentiates the user from others at a local or global level in a specific timeline.
  - Rationale: By implementing a progress-based reward system, users are rewarded based on their achievements, encouraging exploration and interaction with landmarks. This feature differentiates users on local or global leaderboards within specific time periods creating a sense of accomplishment and competition. This feature enhances the app's engagement with the user in a fun way.

2.2 Achieving Application Objectives

The Robert Schumann City-Walk application is designed to achieve the following key objectives, making it a valuable tool for city exploration.

- **History Engagement**: The app's VR feature allows users to experience 3D imagery, instilling a deep connection with the city's history. Integrating educational content into the VR experience ensures that users not only enjoy the experience but are also educated about the landmarks.
- **City Exploration**: The navigation feature allows the exploration process by providing easy mapping and directions. It also offers valuable information about landmarks along the way, removing the need for additional tools and making the app a one-stop solution.
- **Accessibility and Usability**: The app's account system is user-friendly, addressing both guests and registered users. Guests can explore without signing up, while registered users can track their progress and keep records of the landmarks they have visited.
- **Rewarding**: The reward system which includes achievements and leaderboards, motivates the users to explore more and return frequently. This gamification element adds an enjoyable and competitive aspect to the app.

In summary, the Robert Schumann City-Walk app combines these features to provide a complete city experience, suitable for both tourists and locals.

2.3 Prototype Iteration

Low-Fidelity Paper Prototypes: The initial outlines of how the application looks were conceptualized in multiple pen and paper drawings of each possible page. An example of it can be seen in Figure 1 as the main landing page of the map functionality. This demonstrates the diverse design ideas of the implementation of the same functionality.

To adhere to the methodology of the case study presented in 'Getting the Right Design and the Design Right' [1], three prototypes were made; one by each member, to incorporate different ideas based on the same 4 core functionalities.

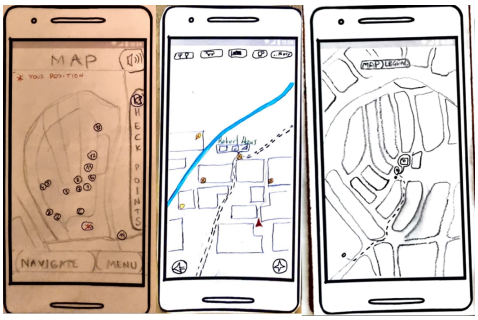

Figure 1: Map Landing Page of Individual Paper Prototypes.

Refined Low-Fidelity Paper Prototypes: Based on user feedback gained from the usability tests conducted [1], better versions of prototypes were made which included missing detailed elements, reorganization of function pages, etc. Some existing features were kept and some were refined further.

The rationale behind the introduction, exclusion and modification of features was primarily the user feedback detailed in Section 3 Usability Methodology; apart from this, more rounds of group discussions were held to address the issues collected in the tests.

Final Balsamiq Prototype: The final prototype was laid out in the 'Balsamiq Wireframes' application in functional modules after another round of usability tests. This is understood as the prototype after the final round of assessments, and all the iterations after this round would be summative and not formative.

2.4 Example Iteration

Map Landing Page In Figure 1, each prototype had a different way of showing the landmarks around the city but more or less achieved the given goal, i.e. a list of landmarks.

The first version from the left provided a vertical bar on the right which can be pressed (as seen in Figure 2 also) and is followed by a list of landmarks to choose from. The middle version displays the landmarks on top of the page in the shape of clouds to tap on. The last version is designed as a dual page that shifts itself into a legend page containing all the landmark information.

These design differences were consolidated based on the rationale from the tests and the group discussions and incorporated in the 'Final Balsamiq prototype'.

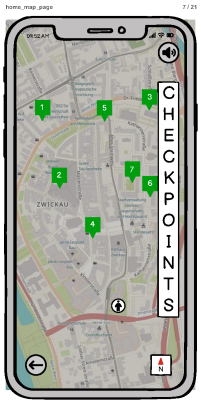

Figure 2: Map Landing Page of Final Prototype.

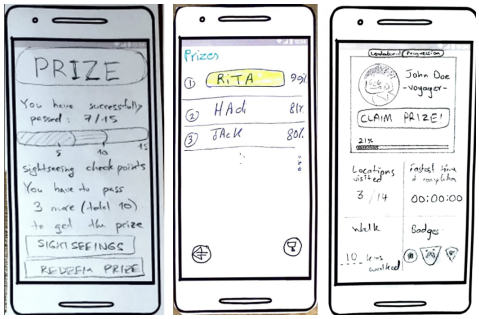

Figure 3: Reward Pages of Individual Paper Prototypes.

Reward System As seen in Figure 3, The first prototype from the left lacked clarity in presentation and odd placements of buttons. The prototype on the right went against the goal of making the

application simpler to use, so the middle prototype was chosen as the ideal and with refinement in design, the final page can be seen in Figure 4.

Again, these design differences were also finalized based on the rationale from the tests and the group discussions and incorporated in the 'Final Balsamiq prototype'.

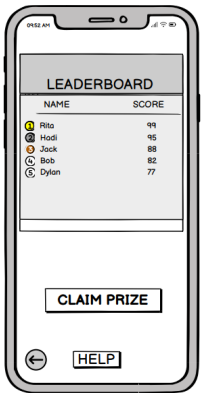

Figure 4: Reward Page of Final Prototype.

This process of Iterative design of the application -backed by the usability tests (more details in Section 3)- led to a refined version and significant improvements in the core features. These refinements contributed to a more user-centered and easy-to-use application.

3 USABILITY METHODOLOGY

3.1 Participants and Testing Setup

Participants were selected from within the university students and staff (ages 22–50), representing the app's target demographic of the general public. Testing was conducted in a controlled environment with participants using the Paper prototypes and the developers simulating the app functions by providing the necessary app pages when required.

3.2 Pre-Test Surveys

Before the test, participants were briefly questioned about their familiarity with mobile applications, VR systems, etc. This provided the base for us to work with the feedback received.

Other trivial information pertaining to the study may have been assumed to be present with the participants.

3.3 Think-Aloud Protocol

All the participants were asked to communicate their thoughts loudly to the developers while navigating through the application.

This of course, taken from [1], was the primary feedback content that would be used in the Iterations of the project prototypes. The participants were encouraged to communicate their thoughts, no matter how trivial they might sound.

3.4 Task and Requirements Mapping

Table 1: Defined Test Tasks

Task ID	Task Description
T1	You are visiting Zwickau and want to explore the city, register on the application.
T2	You want to attend a concert at the Robert Schumann House, navigate there.
T3	You have arrived at the Robert Schumann House, interact with the VR model.
T4	You received a tour completion prize, redeem it at the coffee-shop/city-library.

3.4.1 Defined Test Tasks.

Table 2: Success Requirements

Req ID	Requirement Description
R1	Create an account and modify it.
R2	Configure the routes and navigate to landmarks.
R3	Experience the City History in VR mode.
R4	Observe the City visuals through the years.
R5	Claim rewards based on milestones and progress.

3.4.2 Success Requirements.

Table 3: Mapping Tasks to Requirements

Task ID	R1	R2	R3	R4	R5
T1	X				
T2		X			
T3			X	X	
T4					X

3.4.3 Mapping Tasks to Requirements.

3.4.4 Analysis and Commentary. The defined tasks and success requirements serve as the foundation for our usability testing, aimed at evaluating the Robert Schumann City-Walk application.

Tasks were designed to cover essential user interactions, from account creation (T1) to accessing immersive VR experiences (T3), and are directly mapped to key success requirements. This mapping ensures that each task addresses one or more specific requirements, promoting a comprehensive evaluation of the app's capabilities.

For instance, Task T1 ensures the app's functionality aligns with requirement R1, focusing on user account management. Task T3 is integral for delivering an immersive VR experience, thus linking it to both R3 and R4. This thorough mapping enables effective identification of areas requiring refinement, fostering iterative improvements.

The results of this mapping informed the subsequent design iterations, highlighting strengths in user engagement through VR interactions, while also indicating areas for enhancement such as improved route configuration (R2) and reward claiming processes (R5).

4 RESULTS

4.1 Prototype A: Think-Aloud Test Results

Table 4: Prototype A: Think-Aloud Test Results

Task	Success	Observations	Errors
T1: Log in	Yes	Smooth process	None
T2: Navigate	No	Confusing steps	Wrong turns
T3: VR Activation	With Help	Needed guidance	Missed prompt
T4: Redeem Reward	Yes	Clear process	None

In Prototype A, the log in and reward redemption features were executed successfully, showcasing a smooth and error-free process. However, navigation challenges emerged as participants often found steps unclear, leading to incorrect paths. VR activation was accomplished with assistance, highlighting a need for better initial prompts.

4.2 Prototype B: Think-Aloud Test Results

Table 5: Prototype B: Think-Aloud Test Results

Task	Success	Observations	Errors
T1: Log in	Yes	Clarification needed	Submit button missed
T2: Navigate	With Help	Clarification needed	Menu issue
T3: VR Activation	Yes	Smooth and fast interaction	Back button missed
T4: Redeem Reward	With Help	Confusing menu	None

For Prototype B, while login and VR interaction were largely successful, indicating efficient functionality, navigation required extra user guidance, partly due to menu issues. The reward redemption process also needed user support, attributed to complex menu design, impacting overall task completion.

4.3 Prototype C: Think-Aloud Test Results

Prototype C results exhibited proficient execution of the login and navigation tasks, although users encountered some issues with menu navigation and button recognition. The VR activation did not succeed as expected, revealing opportunities for enhancing the initial setup experience. Assistance was necessary for the reward redemption process due to some interface misunderstandings.

Overall, these findings indicate a strong basis in account management functionalities across all prototypes, but highlight challenges in navigation clarity and VR activation that will need addressing in future iterations. Enhanced user interface guidance and clearer menu designs emerge as key areas for refinement to improve user experience further.

Table 6: Prototype C: Think-Aloud Test Results

Task	Success	Observations	Errors
T1: Log in	Yes	Efficient	None
T2: Navigate	Yes	Confusing menu	Button not recognized
T3: VR Activation	No	Missed initial setup	Minor delay
T4: Redeem Reward	With Help	Confusing menu	Claim button missed

5 CONCLUSION

The Robert Schumann City-Walk application successfully integrates cultural exploration with interactive technology. Iterative design and usability testing allowed the team to identify and address key pain points, resulting in an intuitive and engaging prototype.

While the final prototype demonstrated strengths in VR integration and visual design, further work is needed to optimize navigation and reward redemption features. Future iterations should focus on addressing these areas and expanding the app's functionality to include more landmarks and user incentives. This project underscores the importance of iterative design and usability testing in creating user-centered applications.

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