PROTOTYPING GROUP PROJECT

EcoPlay

Group 27

Ryan Idowu, Elliot Lyons, Daniel Madaghjian and Bhavesh Sood

Trinity College Dublin
Coláiste na Tríonóide, Baile Átha Cliath
The University of Dublin

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Introduction & Project Team

Introduction

The following report builds upon the design of the EcoPlay application - an application designed to educate and promote sustainable actions through gamification. The design phase gave us a solid foundation and a comprehensive overview of the. It helped us outline things such as different possible user interaction and tasks, and across different user groups. This subsequent phase is prototyping of the EcoPlay application which is based on these requirements and constraints.

The report is structured as follows; First, we talk about the design implications for the EcoPlay application which are based upon the HTAs, and scenarios developed during the design of the application, in particular we talk about the salient design elements and features that need to be implemented in the application. The next section deals with 8 low-fidelity paper prototypes of the application, which highlight the most important screens and design implications of the application. This is accompanied by an interaction flow diagram and an in-depth analysis of these low-fidelity prototypes. We then design high-fidelity prototypes of the same 8 screens, and an analysis of the prototypes as well. Finally, we finish with a reflection on the overall design of the application, which talks about the strengths and weaknesses of EcoPlay and its potential impact in society.

Project Team & Contributions

Name	Student Number	Contribution
Ryan Idowu		Implications of Scenario & HTA 1 and Prototypes 2 & 3
Elliot Lyons		Implications of Scenario & HTA 3 and Prototypes 6 & 7
Daniel Madaghjian		Implications of Scenario & HTA 2 and Prototypes 4 & 5
Bhavesh Sood		Implications of Scenario & HTA 4 and Prototypes 1 & 8

Introductions, conclusions, and formatting of report was split evenly amongst all members. Each member contributed to all parts of the report that included their respective sections detailed above.

Design Implications from Scenarios & HTAs

In our last report, we outlined four scenarios and four HTAs that hold the utmost relevance to our application. This section reflects on this and delineates the design implications arising from the execution of these tasks while also assisting us in development of the prototyping of the application.

Scenario & HTA 1

Scenario and HTA 1 detailed the process of a user navigating through the EcoPlay application and playing a single player game. Both the scenario and HTA made mention of several design features that we must consider.

1.1 – First, HTA 1 made mention of a 'Tab Bar' at the bottom of the screen that handles navigation. The HTA also detailed one of the screens to be included on the tab bar, the 'Home' screen. However, the HTA didn't make mention of any other screens included on this bar. We found that it was important that we decided on the most appropriate screens to be represented on here. In addition to this we also found some importance in what screens this bar will be visible on.

1.2. – Secondly, both the HTA and Scenario included the use of pop-ups being used to nudge the user into action. The Scenario saw the persona, Ryan, being encouraged into the action of completing the daily challenge. However, in both the Scenario and HTA, it was not detailed as to how or when this pop-up would appear and what it might look like. We found that it was important that our design of this pop up not only fits the theme of our application but also is engaging to the user.

1.3. – Finally, both the HTA and Scenario covered sustainability-themed games and quizzes. As our whole application is rooted in sustainability, we believe it to be imperative that maintain a consistent theme throughout the whole application.

Scenario & HTA 2

Scenario and HTA 2, delve into the process of a user inviting their friends to play a quiz on the application. This undertaking yielded numerous insights and implications which were not apparent, until we analysed the process further.

2.1. – One design implication we found from the scenario was centred around the complexity in the process of a user inviting friends to a game lobby or joining a game lobby. We created the solution of providing step by step detailed instructions for both scenarios, assisting the user in their experience of the application.

2.2. – Another possible issue we identified was a user or their friends disconnecting before or during the game. In order to make users aware of these events, we aim to incorporate notifications for all players, notifying of any disconnections. In addition, before or during the game, we will warn users if a poor connection is detected through a pop-up on the screen.

2.3. – Finally, from the HTA we observed that users may desire continuous awareness of their accrued points throughout the application experience. Instead of isolating this statistic on a separate screen, we

aggregate and display the user's accumulated points in the top-right corner, regardless of what screen you're on, except the login page.

Scenario & HTA 3

Scenario and HTA 3 covered the act of moving one's business onto the EcoPlay platform. In Scenario 3 we detailed that Gary had to do this process on his laptop. After some deliberation and prototyping of the initial design, we then decided there to be no good reason as to why it can't be done on a mobile device. The act of digitalising one's business is not complex, thus to increase its accessibility we decided to create a mobile equivalent. This is present in the prototypes below.

3.1. – The Scenario and respective HTA highlighted the potential for inputting incorrect information in both the registration form and further pages. An implication for design here is that of the inclusion of a back button. This is an easy feature to implement and should overcome any potential errors in this field, errors that could have serious consequences.

3.2. – The HTA also shed light on the possible complex tasks. An implication for the design is the necessity of including pop-up help buttons and a resource folder where you can access assistance. As above, the process is relatively simple; we don't want to intrusively populate the screen with likely unnecessary information. That being said, some may find said tasks challenging. This demonstrates the need for easily accessible help buttons which we include in the prototypes below.

Scenario & HTA 4

Scenario and HTA 4 talks about redeeming a reward from the application at a local sustainable business. To facilitate the desired elements that were highlighted in this HTA, the following design features have been added to EcoPlay.

4.1. – From Scenario and HTA 4, one of the first things that needs to be addressed is easy access to the rewards page from the landing page. To facilitate this, the tab bar on the landing page has an option to go to the rewards tab.

4.2. – Then comes navigability and filtering of the reward itself, as highlighted in the frequent and complex tasks in the HTA. The rewards are presented on the screen in a list view. A search bar is included at the top, that allows users to filter the rewards by name. This extension allows users to refine their search outcomes according to their specific preferences to pinpoint what they're looking for amongst all the different rewards available.

4.3. – To further customise this list view, you can sort these by date ('Newest to Oldest' or 'Oldest to Newest'), or distance ('Nearest to Furthest' or 'Furthest to Nearest'). All of this is in the 'Available' tab. The user can also switch the tab to the 'Used' tab, to check for a history of all previous rewards that they have redeemed.

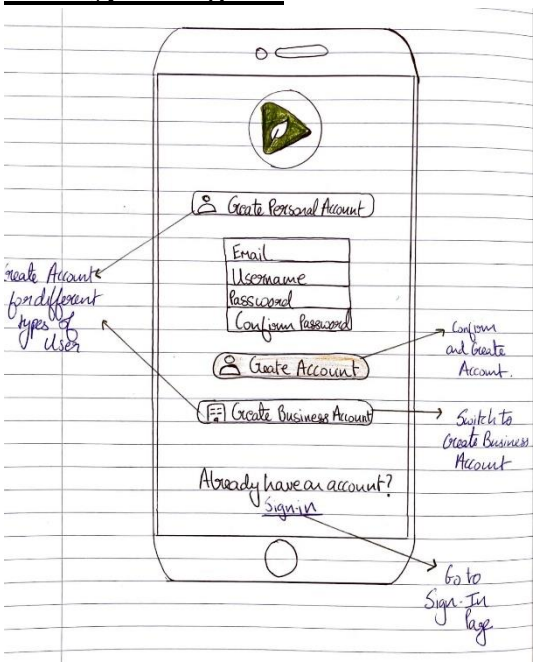
4.4. – Another feature highlighted by HTA 4 was clear instructions on rewards (what the reward is, what the benefits are and which business it relates to) and the procedure to redeem this reward. A 'Redeem' button is located on each reward; when pressed, it displays the QR code to redeem the reward. Clicking on the reward itself presents a pop up with more information on the rewards and business that is offering it.

Low-Fidelity Prototypes

Introduction

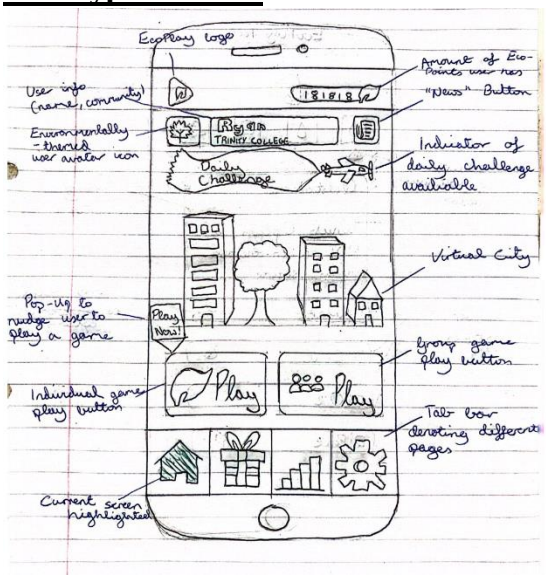
In this segment, we present eight screen mock-ups of our application that we consider crucial for providing readers with a comprehensive exploration of the overall functionality. Accompanying each mock-up is a concise explanation of the design choices, with consistent references to the integration of design implications outlined in the preceding section. These design implications are numbered in the previous section for ease of reference.

Prototype 1: Sign-In



This prototype shows the sign-in page of the Eco-Play application. There are 2 types of accounts; an individual user account (‘Create Personal Account’) and an account to register a business onto EcoPlay (‘Create Business Account’). Both sign-in buttons prompt the user to add details for the specific account. This is where they would also be able to set up 2-Factor authentication if needed. If the user already has an account, they can click ‘Sign-in’ and follow the standard instructions to login to their account.

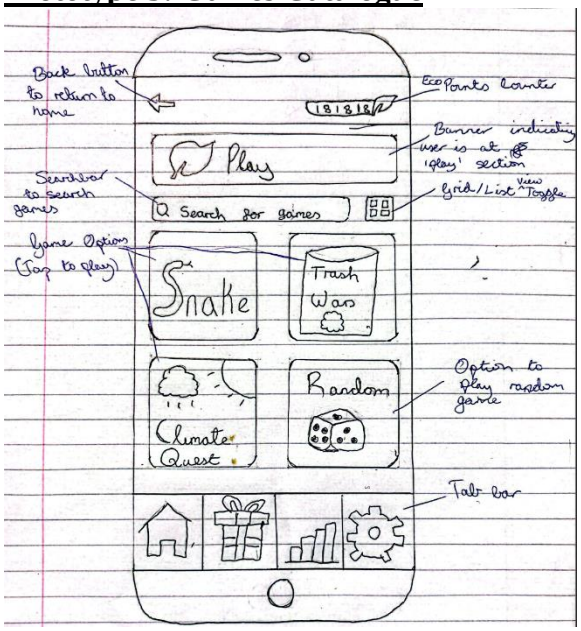
Prototype 2: Home



The ‘Home’ screen is the first screen the user sees when signing in and serves as a ‘Hub’ for the main functions of the application. As per design implication 1.1, the ‘Home’ screen, includes a navigation tab bar at the bottom. Similarly, the ‘Home’ and main pages display a header bar that contains the application logo as well as the user’s EcoPoints as per design implication 2.3. In addition to this, the home page contains aspects unique to each EcoPlay user. The header of the content section of home displays the user's avatar icon, the user's name, their community, and a button navigating to a ‘News’ page unique to the user's community. The user’s ‘Virtual City’ is the most evident feature of the page. Each user's ‘Virtual City’ grows and develops based on the number of points they accumulate. In this mock-up, as the user has accumulated a high amount of EcoPoints, their city is well developed. To

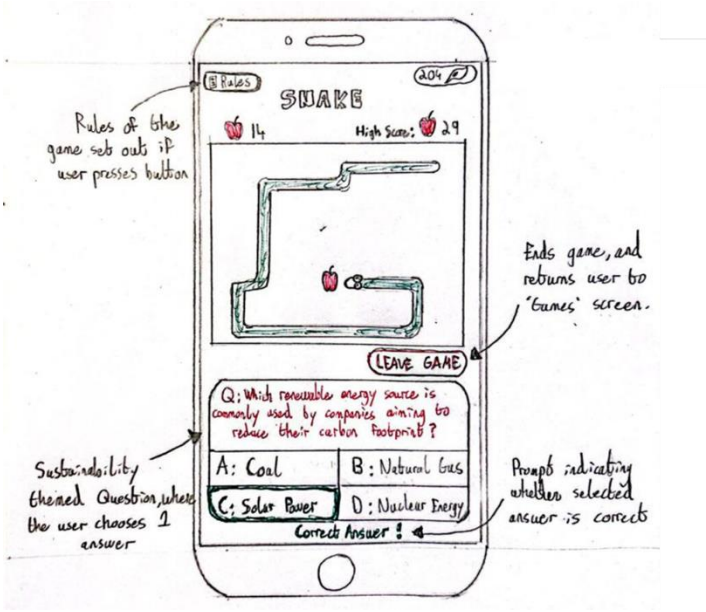
address design implication 1.2, An aeroplane flies above the user's city to notify the user when their daily challenge is ready. The home page also provides the user with the option to play both individual and multiplayer games. When either play button is pressed, the user is brought to a 'Games Catalogue' page, where they can choose which games they would like to play.

Prototype 3: Games Catalogue



The games catalogue page, which can be accessed by pressing the 'Play' button on the 'Home' screen, displays all the games available in the EcoPlay app. Fitting with design implication 1.3, all of the games displayed are 'Sustainability Focused'. Users can search for games by entering text into the search bar as well as change the layout of the games by toggling the grid view, list view buttons. Clicking on a game icon allows the user to play their chosen game. If users can't decide which game to play, a 'Random' option allows the user to play a game chosen at random.

Prototype 4: Individual Game



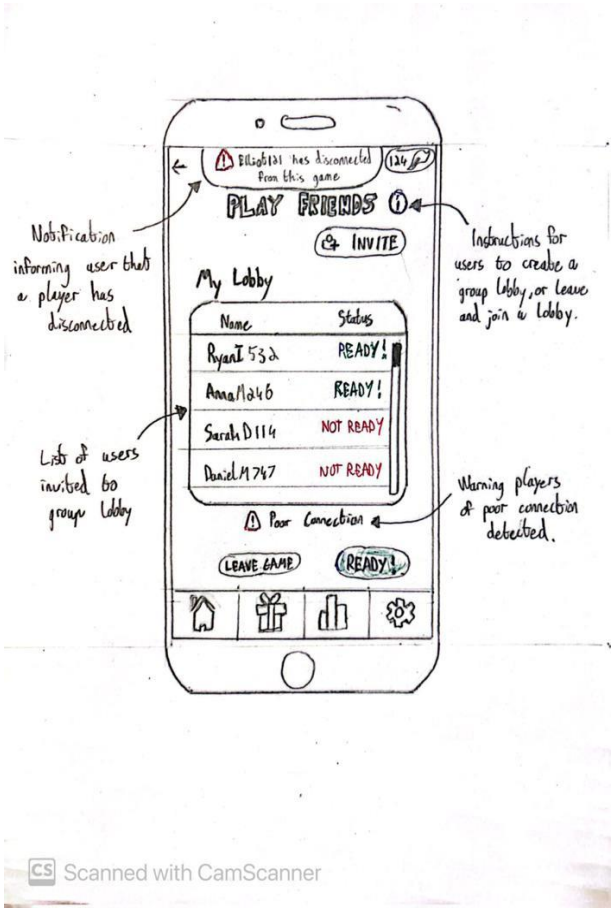
This screen mock-up illustrates a possible individual game the player may choose from the games catalogue. The game in focus, depicts the renowned game 'Snake', with a sustainability-orientated twist.

Players guide their snake to consume food, and as they prepare to eat, a sustainability-related question appears at the bottom of the screen. Correctly answering the question is necessary to proceed in the game. This adheres to our design implication 1.3, where we aim to incorporate a consistent sustainability theme in our games and quizzes.

Within the game, the user also has the option to view the general rules in the top left, providing comprehensive information to the player. In addition, we give them the option to leave the game and return to the games catalogue screen.

This is just one example of potential games the user may choose to play on the app. For instance, others may include Flappy Bird, Pac-Man and Tetris. Choosing well known games that people love, encourages them to engage with the games and learn more about sustainability.

Prototype 5: Group Lobby

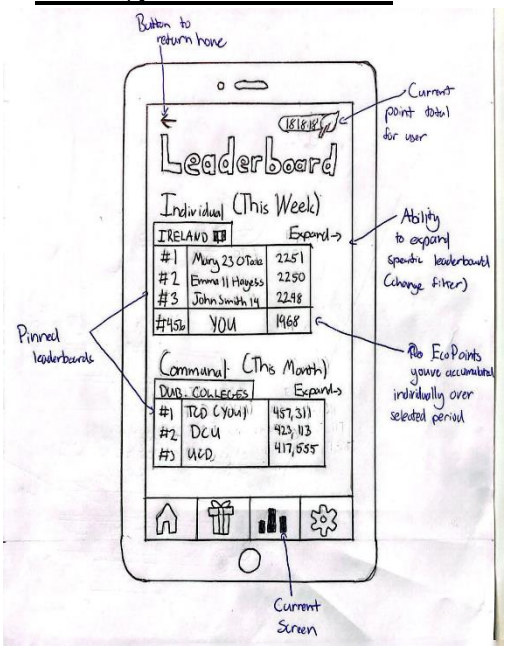


This screen is presented before the start of a group game session. Beside the heading 'Play Friends', we supply an information option. When it's pressed it opens up a tab, outlining step-by-step instructions as to how the user can create or join a group lobby. This incorporates design implication 2.1.

The primary focus of this screen is the roster of invited users for the game, occupying the majority of the display. Supplementary information, including each user's status, provides insight into the readiness of players.

Addressing design implication 2.2, we address the possible disconnections of players from the lobby. A notification appears at the top and disappears after 3 seconds. Moreover, in the case that a poor connection is detected, we notify the user underneath the lobby information as shown. We believe this information is vital for the user as it can influence their decision to play the game or quiz.

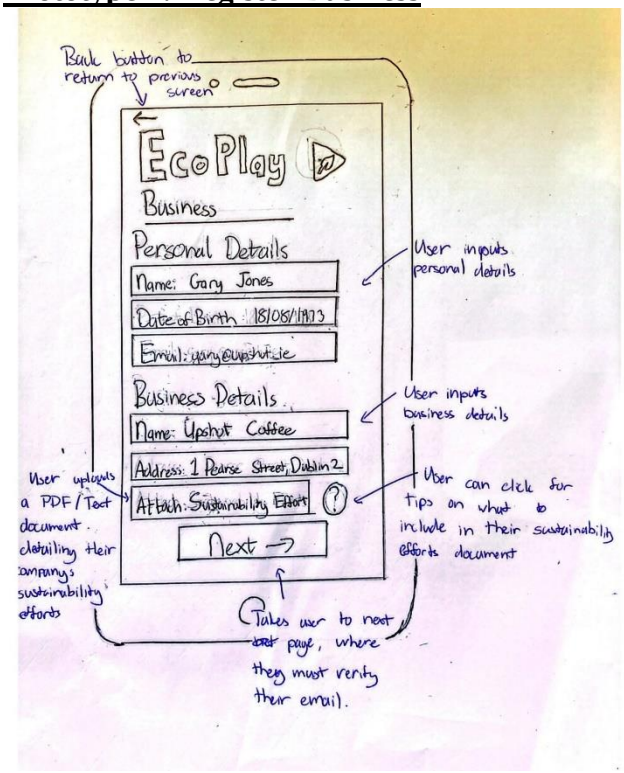
Prototype 6: Leaderboard



This screen is for users to compare their EcoPoints with others. You will notice there are two boards: one individual and one communal. This user has the pinned individual board set to national (Ireland) and their pinned community set to Dublin colleges. There is the option to expand either table. Here you can change what leaderboards are pinned. It will allow you to view other tables in which you are ranked. For example, a 'Friends League' (a league where you can invite and compete against friends) in 'Individual' and 'Kildare Towns' in 'Communal'. In the communal table it ranks where your community lies, but you can further expand that to see where you lie in that community.

This mock-up features a basic design that clearly details how many points you and your chosen community has. We didn't want to cluster this screen by including too many filters and options on this page. The implication for design here is that above functionality of being able to expand the tables. This offers more detail, as required. The screen above provides quick insights on progress and can be accessed by tapping the second-from-right button on the taskbar, to further help ease of access.

Prototype 7: Register Business

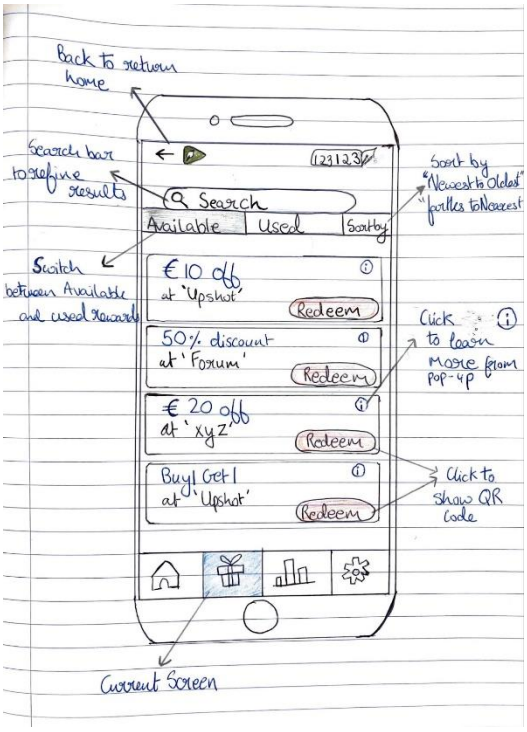


This screen is for registering a business for the first time. It is the first step in a relatively short process. The user has the option to return to the previous screen, by using the back button present in the top left corner (Design Implication 3.1).

The one potentially complex task is the uploading of the business' 'Sustainability Efforts'. Users may be unaware of what they have to submit here. The implication for design is addressed above (3.2). Upon clicking on the question mark button, the user is greeted with a simple pop-up. It details what their submission should include and will determine their eligibility for EcoPlay.

Users won't be allowed progress unless this form is completed. Submitting an already existing email or company will also reject this form from being submitted.

Prototype 8: Rewards



The rewards page is where the user redeems rewards. It can be accessed by pressing the present icon on the task bar at the bottom of the screen. This addresses 4.1 of the design implications.

As highlighted in the HTA and design implication 4.2, searching and redeeming rewards can be a complex task. The search bar provided at the top of the screen facilitates users to refine their results.

Just below that, the user is provided with additional features to filter their results even further. Switching between 'Available' and 'Used' tabs allows the user to look for currently available rewards and check for rewards previously used (Design Implication 4.3). The 'Sort By' button, which is located right beside this, then sorts the list of rewards on conditions such as 'Newest to Oldest' or 'Nearest to Farthest'.

Clicking the information sign on the reward creates a pop up with more information regarding the reward, addressing Design Implication 4.4.

Finally, to redeem a specific reward, the user needs to simply click 'Redeem' next to the reward that they want. This will display a QR Code on the screen which can then be scanned in said shop to redeem that particular reward.

Low-Fidelity Interaction Flow Diagram

Explanation of The Low-Fidelity Overall Design

To this point, the report highlights the design implications of our scenarios and HTAs, illustrations of eight paper mock-ups showcasing a low-fidelity prototype of the application, and an outline of the interaction process of a user through an interaction flow diagram.

The development of a low-fidelity prototype has proven to be very effective in the development of our overall design. It has allowed us to experiment with different designs and identify problems we have overlooked. It has provided early feedback which has shaped design iterations going forward. In this section we will provide an explanation of the overall design of the application we have constructed thus far.

First, it is important to detail a summary of the design implications of our scenarios and HTAs. It surfaced aspects of the design that were previously overlooked and underscored the necessity for their inclusion in the low-fidelity prototype. Among the key implications was the need for consistent features and themes across various screens, such as a tab bar, detailed instructions and informative prompts in areas requiring user assistance, and the implementation of filtering to enhance efficiency. We will now discuss how we incorporated this into our low-fidelity mock-ups, and provide an explanation of the design.

Drawing on the conceptual model, we designed our prototypes with the aim of ensuring users understand the system and process. Defining the application's functional components was crucial in achieving this goal. Screen 1 showcases the sign-in screen, offering users the choice to sign in/create an account either as a personal user or as a business owner. This segregation serves to distinctly identify the two primary user groups within the application.

The ‘Home’ screen of the application brings you to your virtual city, which acts as a way of navigating various features and screens on the application. This includes playing a game, playing with friends, daily challenges, and even news. The thought process behind having the virtual city in the home page is to provide that interactive element with the user, whilst adhering to the goal of illustrating the progress made by the user in learning about sustainability.

Users can access different pages of the application through both the ‘Home’ screen and the tab bar. The function of this is to enhance user navigation even more. The user can navigate to see their rewards, current leaderboard standing and settings. We believe these sections of the application would be most frequently visited, and therefore justify their inclusion on the tab bar.

On that note, in relation to the rewards screen, this lists different rewards on offer from local sustainable businesses, broken down by ‘Available’ and ‘Used’, alongside the option to sort the results. The function of this is to provide user freedom in how they search for their rewards.

Turning our attention to the leaderboard screen, this breaks down both the individual and community leaderboard. The user has the ability to filter the leaderboard by time, once again serving the function of ensuring user freedom once again. The purpose of integrating this feature of the application is that leaderboards can provide an incentive for patients to improve, as they give a sense of superiority or accomplishment (Chen and Pu, 2014). This ensures a competitive nature is established between users and communities on the application, resulting in increased engagement.

One pivotal part of the application is the games section. As illustrated in the ‘Games Catalogue’, users can search or browse games on the application. Each game incorporates an eco-friendly theme, as

shown by the ‘Individual Game’ prototype. This encompasses the main vision of the application, which is to educate and promote sustainable actions through gamification.

Another component of the conceptual model is analysing how these functions relate to each other. To visualise the functional connections, an interaction flow diagram demonstrates the relationship among the eight screen mock-ups. The user's journey starts at the ‘Sign-in’ screen, branching into paths for individual users and business owners. For business owners, the flow includes registering their business via the 'Register Business' screen, with additional screens for profile management, rewards, and a dashboard (not elaborated in this report due to the focus on 8 prototypes).

The other direction a user can go is to the individual user ‘Home’ screen. From here, the user can navigate to multiple screens including the tab bar options of rewards, leaderboards and settings. The tab bar allows for back-and-forth navigation. Moreover, the user has the option to navigate to the games section of the application. From here they can play an individual game or play a game/quiz with friends.

Analysis of Low-Fidelity Prototype

Heuristic Evaluation

Nielsen's Heuristcs	Violations	Recommendations	Severity
1. Visibility of system status	1. (Screen 4) - User is limited to their awareness of their progress during the game. Apart from knowing their current score, there is no visual indication of progress made or how many questions are remaining.	1. - During the game, a progress bar could be implemented acting as an indicator of the users progress, ensuring the user is consistently informed of how well they are doing. Moreover in the event of a user answering a question wrong, appropriate feedback needs to be provided in real time to the user.	1. - 2
2. Match between system and the real world	1. (Screen 6) - Terms 'Individual' and 'Communal' may be initially unclear to user. 2. (Screen 8) - The point of the search bar may be unclear to the user.	1. - First time user loads screen, highlight the difference in the two tables 2. - Add more information on the search bar for the type of search.	1. - 2 2. - 2
3. User control and freedom	1. (Screen 5) – When a user creates a group lobby, they have no way of removing players, thus violating user control. 2. (Screen 5) – Within the group lobby, a user does not have the option to 'unready', limiting their control of their current status in the lobby.	1. - Implement functionality for the admin of a group lobby to remove players 2. - Whenever a user presses 'Ready!', this button should be replaced for an 'Unready' option. This enhances the users control and freedom, if they decide they are not ready to play.	1. - 4 2. - 4
4. Consistency and standards	1. (Screen 1) - 'Sign-in' refers to both business and individual users. 2. (Screen 2) - No apparent distinction between 2 play buttons other than icons 3. (Screen 3) - The 'random' option looks like a game in itself which could confuse the user	1. - Make it clear that sign-in is the same for both types of users 2. - Consolidate play button into one button and make the distinction between multiplayer and single player clearly in games catalogue 3. - Design 'Random' option in a manner that is different from each 'Game' option	1. - 2 2. - 3 3. - 2
5. Error prevention	1. (Screen 7) - Potential for inputting wrong address that doesn't match input business 2. (Screen 4) - When a user is prompted mid game with a question, which they must answer to continue, the current system is ill-prepared to deal with the scenario where the user does not provide an answer. This will lead to the game stopping indefinitely.	1. - Search that business listed at input address resembles the input business name 2. - A recommendation to prevent this error occurring, is to deploy a timer for each question such as 5 seconds. When this runs out, the app continues with the user incorrectly answering the question.	1. - 5 2. - 4
6. Recognition rather than recall	1 (Screen 8) - Only option to find reward through search or scan through all items 2. (Screen 5) - When users join a game lobby, it is unclear as to what game they are going to play. They must rely on memory from previous action when they accepted the invite.	1. - Add a 'Saved' or 'Favourites' section to help with finding rewards. 2. - Minimise users memory load of remembering the game that will be played in the group lobby, by clearly stating the game at the top of the screen. Another possible feature is to incorporate a 'vote' option amongst the group members as to what game to play.	1. - 3 2. - 3
7. Flexibility and efficiency of use	1. (Screen 6) - Users must expand tables to view different ones	1. - Allow for a quick filter switch dropdown	1. - 1
8. Aesthetic and minimalist design	1. (Screen 6) - Aesthetic may be harmed by number of form entries	1. - Personal details and business details could be separate screens	1. - 2
9. Help users recognize, diagnose, and recover from errors	1. (Screen 5) - Whenever a poor connection is detected, or a player disconnects from a game, the app does not constructively suggest a solution to the issue.	1. - To enhance recovery from error, alongside the error or notification, it is important for the app to suggest a solution to resolve the problem. For instance, when a poor connection is detected, guided troubleshooting steps can be detailed to the user. In the case of a player disconnecting, detailed steps as to how to invite the user again, should be implemented.	1. - 3
10. Help and documentation	1. (Screen 2) - Potentially unclear as to what the growth of the virtual city implies 2. (Screen 6) - Potentially unclear as to what expand the tables means 3. (Screen 8) - Initially it might be unclear how the 'Redeem' action works 4. (Screen 4) - The first time the user plays a game, it might be difficult to understand how to play.	1. - On sign up display a message detailing how the virtual city's development is linked to the users progress 2. - Info button on first time opening of leaderboard tab 3. - Add a pop-up dialogue box on the first opening of the rewards page 4. - Alongside the rules button on the individual game screen, the first time a user plays a specific game, a quick tutorial of how to play should be illustrated to the user. This will help them develop a better mental model on how to use the app.	1. - 2 2. - 2 3. - 3 3. - 3

Reflection of Strengths & Weaknesses

Upon reviewing the design outlined in the low-fidelity prototype, we see it as a promising starting point for our prototyping phase, showcasing strengths but also vulnerabilities. In this section, we'll delve into these identified strengths and weaknesses, aiding our progress as we shift towards a more refined high-fidelity prototype.

Strengths

First, the application demonstrates a substantial amount of support and documentation for users. User experience is at the forefront of our design, and providing constant help and documentation will significantly contribute to achieving that goal. This strength is evident across a number of the screen mock-ups. For instance, Screen 4 which depicts a user playing an individual game, showcases help with a 'Rules' button, detailing step-by-step instructions aiding the user on how the game works. Building upon our heuristic evaluation, it became evident that, in order to develop the user's mental model, it may be beneficial to have a quick tutorial displayed the first time the user plays the specific game. This approach could extend to other areas of the application, such as business registration or reward redemption. Similarly, as seen in Screen 5, 7 and 8, information icons are illustrated detailing relevant further details the user may need if they are unsure with the functionality of the application.

Moreover, a major strength that we set out from the beginning of the design, was to ensure a minimalist design was incorporated, a crucial element in enhancing the user experience. By minimising design, not only does it focus on the essentials, but it also reduces the amount of memory needed for the user to process what is in front of them, promoting recognition over recall. Our motivation to fulfil this was through George Miller's Theory, which posits that the average human mind has a limited capacity for processing and retaining information in short term memory (Miller 1956). Drawing from our collective experiences, we resonated with this theory and adopted a simplistic approach in crafting our mock-ups. This principle is evident in Screens 2 and 3, where the interface predominantly communicates through icons and offers varied viewing options with a limited array of choices, curbing textual overload. Likewise in Screen 6, the leaderboards are not clustered with data, allowing users to easily determine rankings. Notably, Screen 8 emphasises recognition over recall by showcasing the rewards page. Here, we optimise two kinds of memory processes, including a search box and a history list of 'used' rewards, reducing the cognitive and memory load of the user.

As we develop our high-fidelity prototypes, we remain committed to uphold the strengths set out in this section.

Weaknesses

Shifting our focus to the weaknesses revealed in our low-fidelity prototypes, a recurring issue that emerged, was the presence of ambiguity in certain aspects of the application. While we've highlighted features offering continuous help and documentation to aid users in developing their mental model while navigating the application, there remains a potential divergence between user's initial perceptions of how to use the application and its intended usage. This disparity aligns with Donal A. Norman's concept of 'gulfs of evaluation and execution' (Norman, 1986). This weakness is present in Screen 2 of the app, which outlines the 'Home' Page. The screen welcomes the user to their 'Virtual City'; users might encounter confusion regarding its purpose and usage, thus widening the gap between the user's understanding and the system's design (gulf of execution). A similar challenge arises in Screen 8 of the prototype, where a user can search and redeem rewards. The 'Redeem' action may initially lack clarity to the users. It is unclear what they are redeeming, the rewards they could receive and the actions they must undertake. Our forthcoming objective is to bridge this gap between user's evaluation and execution to enhance clarity and usability.

Another weakness we encountered was the lack of user control and freedom throughout the application. Upon thorough examination of each screen mock-up, we immersed ourselves in the user's perspective, aiming to uncover potential issues. Throughout this exploration, we observed instances where users faced challenges in executing specific actions. For instance, in Screen 5, as an admin of a group lobby, users lack the ability to remove players before the game commences. A similar lack of freedom can be seen in Screen 6 when a user is viewing the individual and community leaderboards. The user is restricted to only viewing one 'Pinned' leaderboard per category at a time.

Finally, we believe error prevention can be significantly improved across various aspects of the application. In Screen 4, the current system is ill-prepared in the event of a user not answering the sustainability question, thus leading to the game indefinitely halting. In addition, helping users recover from errors is an area in which we need to direct our focus. In Screen 5, we place a strong emphasis on notifying the user of any possible poor connections detected or players leaving or disconnecting from the game. However, the application falls short in providing potential solutions to resolve the problem. Without this, users are left wondering what they should do, and how they should diagnose and recover from the issue.

Our focus as we look towards the high-fidelity prototypes, is to rectify these weaknesses and implement the possible solutions outlined in our heuristic evaluation.

High-Fidelity Prototypes

Introduction

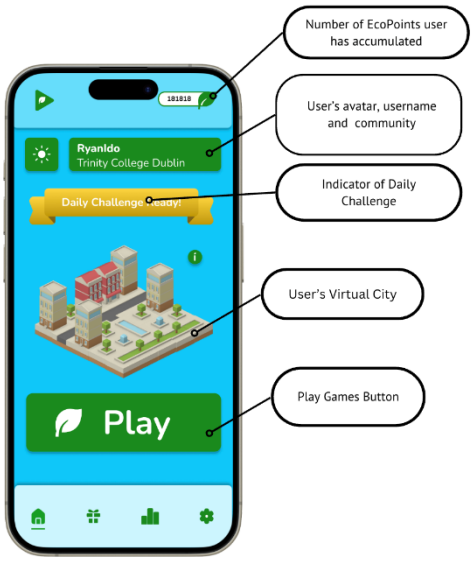
This section builds on the low-fidelity prototypes in the preceding section, by addressing the design issues uncovered in our heuristic evaluation. Accompanying each screen, we provide a brief explanation of the changes we have made.

Prototype 1: Sign-In

The sign-in page is in-line with the low fidelity prototype design. The user can sign up by creating an account depending on the type of account they desire.

We have also added more clarity on this page in regard to the 'Sign-in' button and how it's the same for both users.

Prototype 2: Home



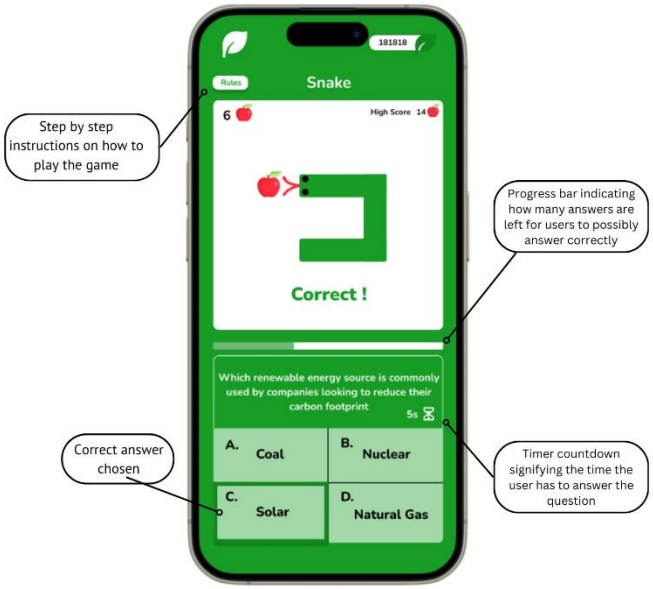
The high-fidelity rendition of the Home Screen bears quite a resemblance to its low-fidelity counterpart. It contains many of the design elements we had previously displayed: the user's avatar, username and community, the points indicator on the header and the user's virtual city that develops with the accumulation of these points. In response to our heuristic analysis, we also make a few changes to this page. One of the main changes we made was consolidating the 'Play' button and 'Group Play' button into one button. We found that our low-fidelity design would cause confusion within the user and that this direction would prevent this confusion. Another change we made was in relation to the 'Daily Challenge Ready' message. We found that in our low fidelity prototype the use of an aeroplane did echo the eco-friendly message of our application. Hence, we changed the indicator to be an eye-catching and engaging golden ribbon.

Prototype 3: Games Catalogue

After identifying the main weaknesses of the low-fidelity prototype of Screen 3 we decided to make a few changes to the high-fidelity rendition of the screen. First and foremost, we agreed to move the option to play with friends to this page rather than in the home page. We found that this change allows for the games catalogue to be a centralised location for any type of games users might want to play. The other main change we made to this page was in regard to the location of the random button.

The random option is now the first option in the games catalogue and contains a different background colour to distinguish it from the other games. The rest of the prototype is functionally identical to the low-fidelity prototype. It contains the search bar, the list/grid view toggle option and the games options.

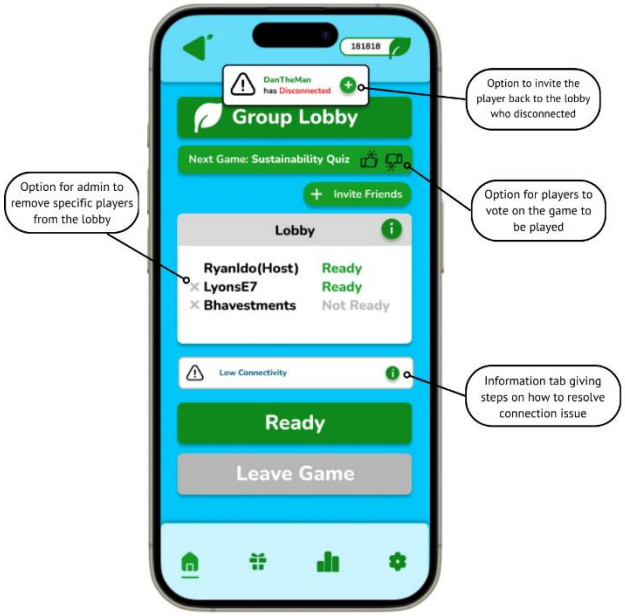
Prototype 4: Individual Game



Following the identification of the weaknesses from our heuristic evaluation of the low fidelity prototype, we have incorporated the solutions proposed for this screen design. First, we decided to keep the rules tab on the top left as the importance of help and documentation for the user cannot be understated. It must be noted that a further development is the inclusion of a tutorial to pop up on the screen on how to play, the first time the user plays the game. We also continued our mission in achieving a minimalist design by including just two main components at a time: the snake and the question.

Addressing the weakness of error prevention, any question asked to the user now has a timer as illustrated. This prevents the possibility of the user not answering the question, thus halting the application indefinitely. Moreover, we found that the user is limited to their awareness of their progress during the game. We provide a visual indication to resolve this issue, as shown by the progress bar in the design.

Prototype 5: Group Lobby



This low-fidelity design proved to be a solid foundation for the development of this screen design, however it was prone to weaknesses. The high-fidelity design as illustrated, aims to solve these weaknesses.

One feature we acknowledged in the low-fidelity prototype, was ensuring transparency in the visibility of the system status. This is portrayed through the popups which notify the user of the potential of a player disconnecting from the game or a poor connection being detected. However, we felt we could extend this, and help users diagnose and recover from the errors. In the case of a low connectivity popup, we provide an information tab offering steps on how the user can resolve such an issue.

Similarly, when a player disconnects from the game, we offer the option to invite the player back to the lobby. Another issue we encountered was the user lacking control and freedom, in particular when the group admin wishes to remove players from the game. We now implemented the option for the admin to remove any specific player, by pressing the 'X' next to the player's name.

Finally, a drawback of the low fidelity prototype we identified: it was not clear as to what game was being played next. We now state the game title at the top, whilst also offering an additional feature of all players in the lobby being able to vote on the game to be played.

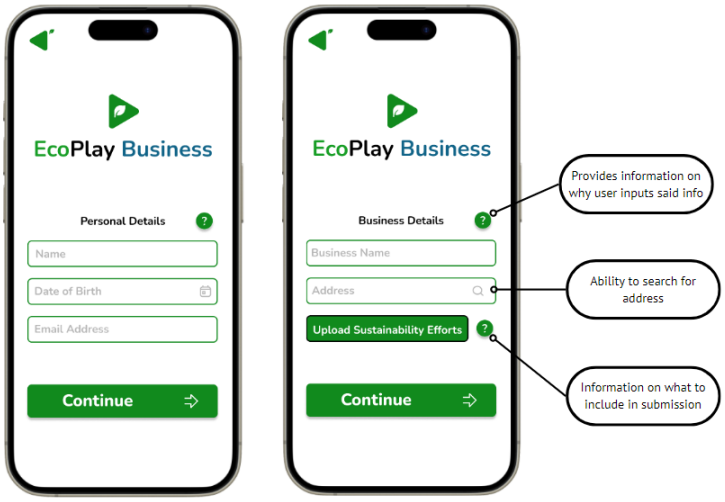
Prototype 6: Leaderboard

Our final leaderboard screen improved the presentability of the low-fidelity prototype. We implemented a few changes to achieve this. First, we decided to add a 'Weekly/Monthly' button. This will change both leaderboards to represent the selected period. We did this as we realised the confusion our initial prototype may have caused; having the ability to set separate time periods to both tables. This presents a cleaner solution.

We also added the ability to change the pinned leaderboard without having to expand it. We did so in a way that will benefit both experienced and novice users. Another change is the ability to see movement in the leaderboard rankings, indicated by the arrows beside one's EcoPoints Again these decisions were implemented with presentation in mind. We also added an information button as we recognised there may be potential confusion on this page. On pressing this button, similar annotations to the ones present above will appear to aid the user.

This offers more detail, as required. The screen above provides quick insights on progress and can be accessed by tapping the second-from-right button on the taskbar, to further help ease of access.

Prototype 7: Register Business



There were minimal changes implemented in the high-fidelity prototype. The biggest change was the separation of personal and business details into two screens. One now enters their personal details and clicks continue to proceed to the 'Business Information' screen. We also added information buttons on both screens to inform the user on why we needed the information they were inputting. Another minor change is the ability to search for an address in the 'Business Details' screen. This is an attempt to overcome the aforementioned issue of potentially inputting false information. We also made the EcoPlay Business logo far more prominent, in order to overcome the potential problem of unsuspecting users landing on this page unintentionally. A user should now be able to identify they're on the wrong page after seeing the 'Business' logo, if they desire the personal side of the application.

Prototype 8: Rewards

As with the previous screens, the high-fidelity prototype of Screen 8 also addresses the issues raised for this particular screen in the heuristic evaluation. Other elements have not changed significantly from the low-fidelity designs, and we focus on the gradual refinement of the screen.

First, to reduce the memory load of the user, a tab has been added to access the rewards the user has favourited. We have also added additional documentation and help for the user to understand the rewards process in the form of an information button ('?'). This pop-up describes to the user how to redeem a reward, as it may be unclear initially.

Finally, the search bar was fixed to clarify its purpose. This was mentioned in Neilsen's second heuristic, in an attempt to limit user confusion.

High-Fidelity Interaction Flow Diagram

Explanation of The High-Fidelity Overall Design

Up to this point, the report has initially outlined the structure of our low-fidelity prototype for the application, followed by a detailed examination of its strengths and weaknesses. This guided our transition from low-fidelity to high-fidelity prototypes, which is the core focus of this section. Assessing the entire design process as we progress is critical, and this segment aims to achieve precisely that.

Developing both the low-fidelity and high-fidelity prototypes proves highly beneficial during the design process when utilised together (Rudd, Stern et al.,1996). Developing the high-fidelity prototype has proven very beneficial, in not only developing application appearance, but also in determining what exactly it is we want to achieve. Not only does it provide a more accurate and detailed representation of the application, but this process also allows for more useful user interaction enabling a better feel for the team of the different user interactions.

The high-fidelity prototype's design was built upon the groundwork laid by the low-fidelity design as noted. This foundation allowed us to address the weaknesses identified in the low-fidelity prototype, integrating improvements into our refined design. Throughout this section, we will provide an overview of these changes, offering explanations to enhance the reader's comprehension of the overall design.

The design of the application now places a strong focus on mitigating the divergence between the user's initial perceptions of how to use the app and its intended usage. This was addressed in our analysis of the low-fidelity prototype. Our improved design takes this into account. First, we have broken down the business registration screens, by personal and business details, providing extra transparency for the user. Turning our attention to the user signing into their personal account, the home page now possesses more clarity. The consolidation of the individual and group play buttons into one aims to alleviate previous user ambiguities.

Our pursuit to mitigate ambiguity continues in the 'Rewards' screen. The updated design now provides an information tab offering more help to the users on how to redeem the rewards on the application. Additional enhancements to help the user in their experience includes providing a quick tutorial on the steps on how to complete the task of redeeming a reward. This appears the first time the user visits the 'Rewards' screen. This approach extends to other aspects of the application, including when a user plays a new game they have not played before (Screen 4), or when they wish to create a group lobby and invite friends for the first time (Screen 5). This approach stems from the necessity of aligning user's perceptions of app functionality with its intended use.

Another identified issue in the prior design revolved around the lack of user control and freedom. Our new design addresses this. For example, we now provide more control for admins in a group lobby (Screen 5), giving them the ability to remove players from a group lobby. On that note, more control is granted to all the players in each group lobby, through the implementation of a 'vote' option, as to what game should be played next. This allows users to have a say, enhancing user freedom. This approach is evident also in the leaderboard screen. One issue we found with this screen was the lack of flexibility the user has in navigating and filtering the leaderboards. Our new design addresses this by empowering users to filter by weekly and monthly. We have placed a strong emphasis on these features as they contribute to improving user control and freedom.

Additionally, we placed marked attention on improving error prevention and user recovery from errors across various screens. Screen 4, which illustrates a user playing an individual game, now has a timer for each question asked, solving the issue of the app halting indefinitely in the case where a user

does not answer the question. The group lobby screen (Screen 5) faced the problem of limiting a user's knowledge of how to recover from potential issues. Alongside notifying the user of any issues, we now provide a step-by-step guide on how to recover from or solve the issue, such as in the case of a poor connection being detected. Similarly, when a player disconnects, we allow ease of use for the group admin to invite the user straight back again. This is achieved through an 'invite' option directly beside the notification. The implementation of these features proves vital in our overall design, in not only mitigating errors, but also helping the user recover from certain errors which are inevitable to occur.

The preceding section of the report outlines the interaction flow diagram of our high-fidelity prototype. This provides a general overview of the step-by-step process of the user as they navigate through the application, aiding the reader's comprehension of the overall design. Analysing this flow diagram reveals close resemblance to its low-fidelity equivalent, albeit with minor adjustments. The user still begins at the sign-in page, deciding between a personal or business account. We maintained the landing page for the personal account (Screen 2), which brings the user to their virtual city. We believe this is essential for the user as it keeps them up to date with their progress, offers a visually appealing welcoming to the application, and also acts as a location to navigate to various other aspects of the app. One of these main aspects includes playing a game. Through the 'Play' button, the user navigates to the 'Games Catalogue' screen. From here the user can play individual games or play games with their friends. This flow was modified in the updated design. In the previous design, the user could play with friends from the home page. However, we believe we should maintain all the playing options within one separate screen, and simply encourage the user to press the large 'Play' button from their virtual city. The subsequent flow aligns closely with the previous diagram.

Reflection on the High-Fidelity Design

The high-fidelity prototypes were built following up on the design of the low fidelity prototypes, considering the strengths and weaknesses that were highlighted in those prototypes. This process provided a robust groundwork for shaping the design implications for the application's high-fidelity prototypes.

Strengths

Continuing from our low-fidelity prototypes, we prioritised maintaining the strengths of that design by directly translating them into our high-fidelity prototypes. We acknowledged the importance of help and documentation alongside consistently adhering to a minimalist design.

While acknowledging these strengths, our extensive analysis revealed several weaknesses that prompted us to devise solutions incorporated into our high-fidelity prototypes. Primarily, we aimed to eliminate the discrepancy between user's initial perceptions on how to use the application and its intended usage. For instance, on Screen 2, our challenge was bridging the gap between user's understanding and execution of the 'Redeem' action. To tackle this, we introduced an information button to guide users through the redeeming process.

Various additional issues have been addressed, focusing on error prevention, error recovery, and emphasising user control and freedom. Introducing a timer on screen 4 ensures a consistent flow of questions, while the information button on screen 5 offers users potential solutions to address connectivity problems. Collectively, these enhancements contribute to a more user-friendly experience.

Incorporating functionality such as the option to remove players from a group once a game starts (Screen 5) and the ability to add items to favourites within the rewards section (Screen 8) offers users increased flexibility and reduces their cognitive load, enhancing overall usability.

Weaknesses

Despite the team's diligent efforts to identify and mitigate weaknesses and potential flaws in the design elements of EcoPlay, we acknowledge that the application might not achieve perfection in terms of usability. The design evaluation utilised is based on an in-depth heuristic evaluation proposed by Nielsen and Molich, to see if there are any usability criteria that have been violated. However, the design of the application could benefit from other types of evaluation methods that involve actual users of EcoPlay, to check to see if the system is actually usable as intended. This would involve carrying out applied experimentation in controlled and natural settings. It would also include, but not be limited to, think aloud protocols, co-operative evaluation, post-task walkthroughs and interviews, to ensure that we can integrate the application with user feedback in order to maximise their satisfaction, which is one of the major aims of EcoPlay.

Societal Implications

This brings us to the mission of EcoPlay, which is to promote eco-conscious behaviour across individuals and communities.

The first societal implication of EcoPlay revolves around the impact it has on teaching users about sustainability. The app leverages gamification to inspire users to delve into sustainability by framing it as an engaging and competitive experience. Points and games become a unique driving force, igniting curiosity and incentivizing users to explore and understand sustainable practices. Numerous studies

have pointed to how gamification can help enhance engagement of the learner and stimulate more active participation with the material (Barata et al., 2013). All games are designed with an integration of sustainability in mind, constantly acting as a learning curve for the users as they enjoy the app experience. The use of the virtual city serves as a visual progress tracker, showing users how their actions contribute to a sustainable impact, further motivating them to continue.

On top of that, an even bigger impact the app has, is motivating users to actively participate in sustainability. The reward system achieves this. By earning rewards within the app, which can be redeemed at local sustainable businesses, the app fosters a direct link between learning and practical application. This fosters eco-conscious behaviour and cultivates sustainable habits among its users.

Moreover, EcoPlay has more positive societal implications beyond the user themselves. By allowing businesses to partner with the app, they not only tap into a larger customer base but also receive support and recognition for adapting to sustainable practices. This relationship encourages businesses to align their operations with environmentally friendly approaches, which we believe will have a knock-on effect of competitors adapting the same approach.

Lastly, EcoPlay facilitates community involvement through various means. Firstly, group collaboration strengthens community bonds. The app facilitates users to invite and play with friends across the app. The application also facilitates a sharing option, where users can share results with friends and across social media. This can yield several implications such as inspiring others to join in and participate in sustainable activities, forming a ripple effect of positive change. Moreover, integrating community leaderboards in EcoPlay sparks healthy competition amongst users and communities. This fosters a sense of community, as each community collaborates towards a common sustainability goal.

Conclusion

In this report, we initially addressed the design implications from our scenarios and HTAs, allowing us to construct our low-fidelity prototype. This initial model effectively gathered early feedback for the team, identifying issues that shaped subsequent design iterations.

Subsequently, a thorough analysis of the low-fidelity prototype was conducted, employing a heuristic evaluation to pinpoint shortcomings in each screen. This evaluation was instrumental in recognising the drawbacks of the interface.

Building upon these insights, we developed a high-fidelity prototype of the application. Following this development phase, we conducted a reflective analysis of the design's strengths and weaknesses whilst simultaneously outlining the societal implications.

Reflecting on the progress thus far, we believe that the development of our prototypes has been pivotal in shaping this application's design phase. Looking forward, while acknowledging the necessity for ongoing improvements, we stress the significance of prioritising user feedback. This will be instrumental in comprehending user interactions within the app, pinpointing crucial areas for future refinement and enhancement.

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