CASE STUDY OF THE ECOSIA BROWSER

How Gamification Can Improve Business KPIs

I conducted this research as part of my coursework in the "User Experience Design Practice" module at Manchester Metropolitan University.
This presentation synthesises existing UX research findings, presents a systematic approach to problem-solving in sustainable design, and offers critical reflection on the project's outcomes and their implications for future research in the field.

01

Contextualising the Design Challenge

Overview of Ecosia's mission, sustainability goals, and product evolution. Reflection on previous findings around trust and data practices, and how these influenced the direction of this project.

Essential This badge indicates which slides are essential for the assignment assessment

1.1 BUSINESS OVERVIEW

Ecosia is a non-profit organisation whose primary product is the Ecosia Search Engine (it's based on Microsoft's algorithm). Unlike conventional search engines, Ecosia uses revenue from organic traffic and ad views to fund tree-planting initiatives in biodiversity areas around the world (e.g. Brazil, Burkina Faso, Ethiopia etc.). By working closely with local partners, Ecosia monitors the success and longevity of its reforestation projects. As Europe's second-largest search engine after Google, Ecosia has broadened its environmental commitment beyond reforestation. The organisation now actively reduces carbon emissions by investing in green venture capital funds, such as the "World Fund" and "Naturstrom AG."

Driven by the belief that "the climate crisis is as urgent as ever," Christian Kroll *(Marquis, 2021)*, Ecosia's founder, emphasizes Ecosia's mission to create a search engine that directly benefits the planet while challenging traditional business models.

Marquis, C. (2021). Searching for a Solution: Ecosia Is Taking on Google and Aiding Reforestation Efforts in the Process. [online] Forbes. Available at: https://www.forbes.com/sites/christophermarquis/2021/09/01/searching-for-a-solution-ecosia-is-taking-on-google-and-aiding-reforestation-efforts-in-the-process/ [Accessed 7 Oct. 2024].

Essential

HOW THEY TURN WEB SEARCHES INTO FORESTS

Every search generates income through non-tracking ads

Ecosia does not sell personal data.

Profits fund reforestation projects and green startups like World Fund

Majority of revenue dedicated to climate action

Greater engagement enables more tree planting.

Business KPIs directly correlate with the engagement of current users and the attraction of potential ones.

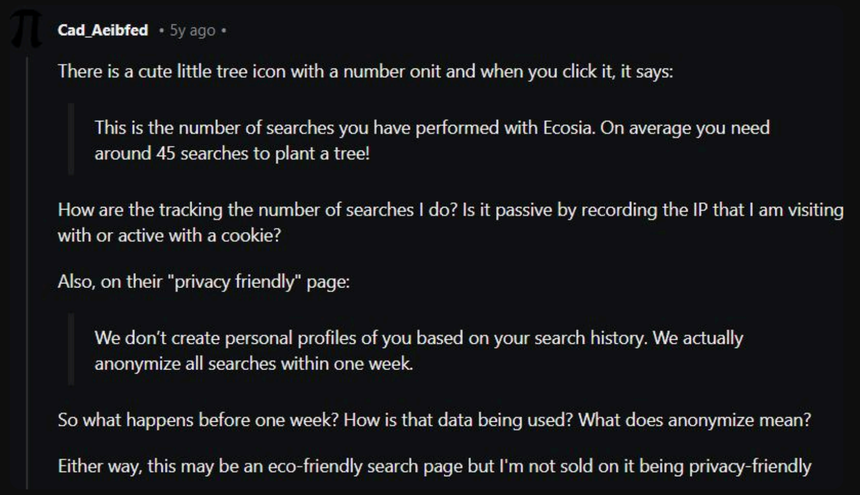
Figures and analytics sourced from Ecosia's published financial transparency reports

Ecosia (2019) Ecosia's Financial Reports and tree-planting Receipts, The Ecosia Blog. The Ecosia Blog. Available at: https://blog.ecosia.org/ecosia-financial-reports-tree-planting-receipts/.

ORIGINAL POV STATEMENT

How can Ecosia address the tension between environmental impact and data privacy concerns to increase user adoption and trust? While the platform has established itself as Europe's second-largest search engine with proven environmental benefits, preliminary research indicates that privacy concerns are a significant barrier to wider adoption, as potential users consistently prioritize data security over environmental impact.

My initial research revealed user concerns about Ecosia's data handling practices, particularly regarding Bing integration, cookie management, and data protection transparency. These privacy concerns warranted a focused analysis, leading to this problem statement:



Cad_Aeibfed • 5y ago •

There is a cute little tree icon with a number onit and when you click it, it says:

> This is the number of searches you have performed with Ecosia. On average you need around 45 searches to plant a tree!

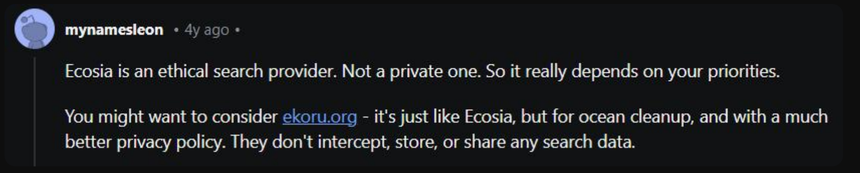
How are the tracking the number of searches I do? Is it passive by recording the IP that I am visiting with or active with a cookie?

Also, on their "privacy friendly" page:

> We don't create personal profiles of you based on your search history. We actually anonymize all searches within one week.

So what happens before one week? How is that data being used? What does anonymize mean?

Either way, this may be an eco-friendly search page but I'm not sold on it being privacy-friendly



mynamesleon • 4y ago •

Ecosia is an ethical search provider. Not a private one. So it really depends on your priorities.

You might want to consider ekoru.org - it's just like Ecosia, but for ocean cleanup, and with a much better privacy policy. They don't intercept, store, or share any search data.

⇨ See the original research ⇨ Read the full thread

PROPOSED SOLUTION

Reflecting on previous findings regarding trust and data practices helped shape this project's direction. Since the original solution by the Ecosia team already demonstrates the highest data privacy standards, I decide to pivot direction rather than solve the same issue twice.

01

I proposed a "no cookies by default" solution using anonymous cookies for sessions and non-identifiable ad data. This would be validated through user feedback and adoption metrics.

02

However, Ecosia implemented their own solution before prototype development, offering users more flexibility than initially proposed.

They added a native ad blocker *(Fig. 1.1)* and customizable cookie settings *(Fig. 1.2)*, including an option to disable them completely.

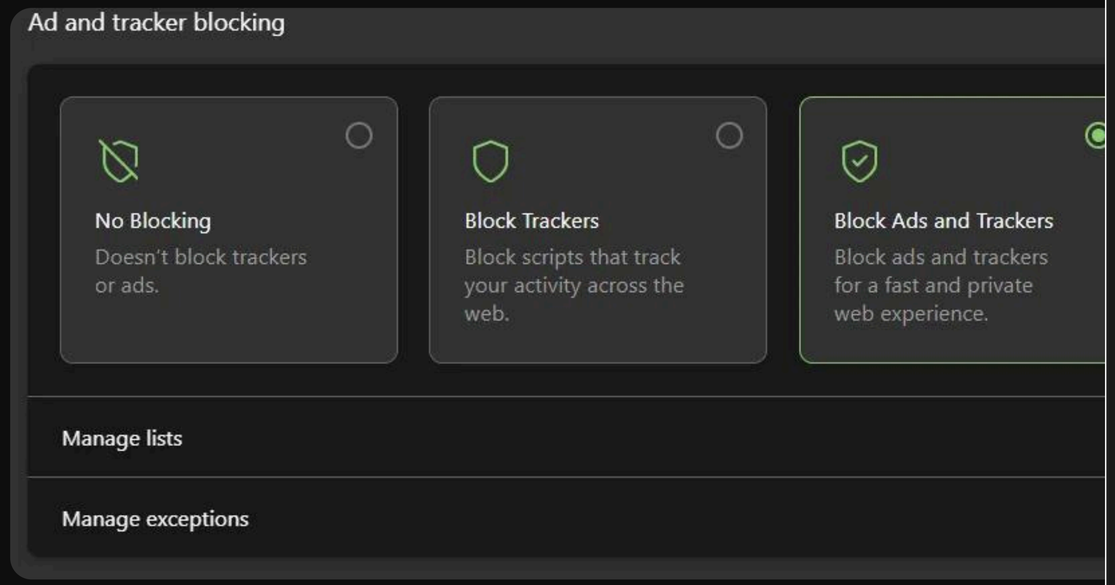


Figure 1.1 — Screenshot showing Ecosia's native "Ad and tracker blocking" privacy and security options.

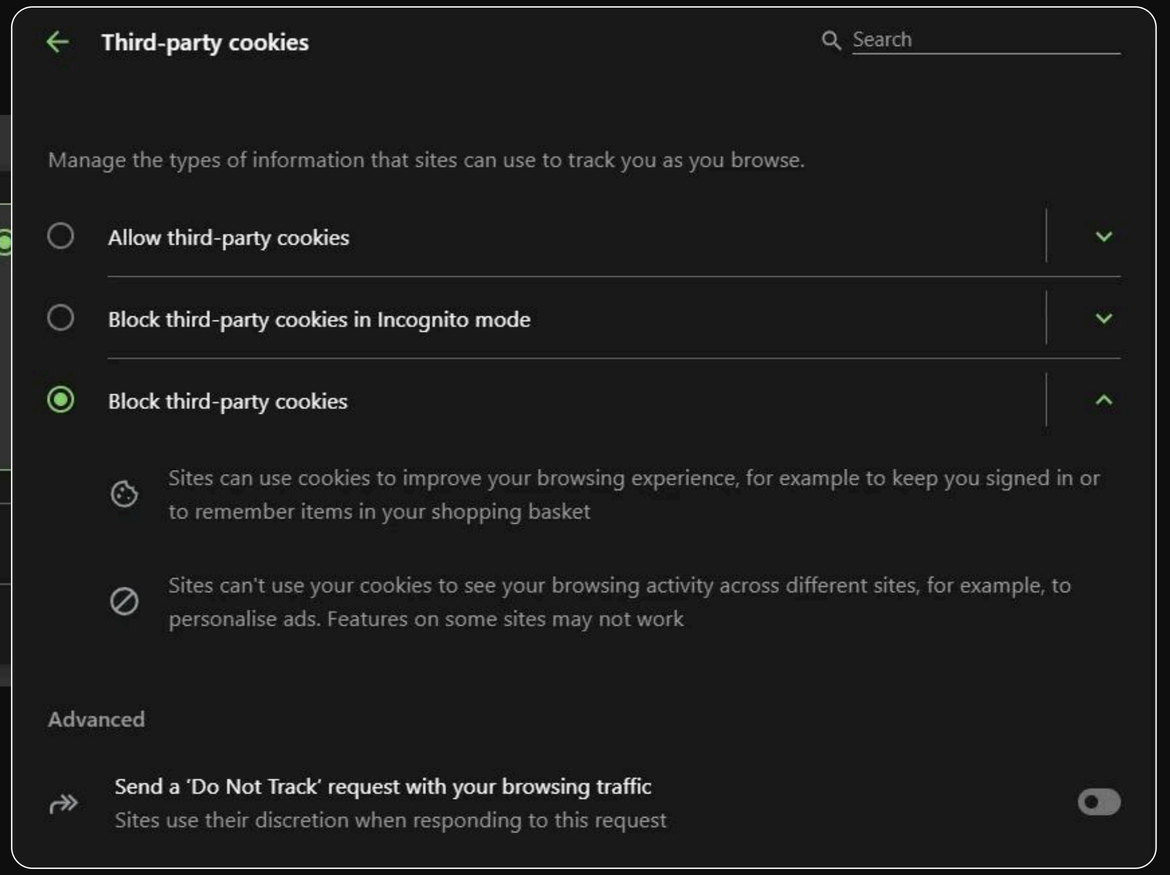


Figure 1.2 — Screenshot of the "third-party cookies" settings list featuring the advanced "Do Not Track" mode.

02

User Engagement and Research Focus: Key Metrics and Their Influence.

Problem Framing & Research Rationale

Essential

2.1 WHY USER RETENTION AND ENGAGEMENT BECAME THE NEW FOCAL POINTS

As a mission-driven search engine, Ecosia's success in environmental conservation directly depends on user engagement metrics. A reduction in churn rate and increased long-term retention would enable more consistent tree planting through sustained search activity. Currently, the organization converts search-generated revenue into reforestation projects in biodiversity hotspots like Brazil, Burkina Faso, and Ethiopia. By increasing the average search volume per user and improving retention rates, Ecosia could significantly expand its environmental impact.

This analysis and the image is drawn from official Ecosia resources and documentation. While comprehensive business performance data is not publicly available, the selected KPIs have been thoughtfully derived from market research and established industry benchmarks.

Purpose. (n.d.). Ecosia. [online] Available at: https://purpose-economy.org/en/companies/ecosia/.

2.2 PSYCHOLOGY ANSWER FOR USER ENGAGEMENT

TL;DR

Research indicates that users have a strong desire to see their individual environmental impact, particularly when contributing to meaningful causes like reforestation. Earlier findings suggested that users may switch to mainstream browsers due to lack of engagement. Therefore, I decided to focus on implementing gamification elements and personalising the user experience in the Ecosia Browser to increase user retention.

Suh, A., Wagner, C., & Liu, L., 2018. Enhancing User Engagement through Gamification. Journal of Computer Information Systems, 58, pp. 204 - 213. https://doi.org/10.1080/08874417.2016.1229143.

Li, M., Chau, P., & Ge, L., 2020. Meaningful gamification for psychological empowerment: exploring user affective experience mirroring in a psychological self-help system. Internet Res., 31, pp. 11-58. https://doi.org/10.1108/intr-02-2020-0094.

Essential

STRATEGIC DESIGN QUESTIONS

GAMIFICATION

Gamification—the use of game elements in non-game contexts—has become a popular strategy to enhance user experience across digital platforms.

Perceived Value and Brand Equity:
Enhanced user experience through gamification leads to greater perceived benefits (self and social), higher information and experiential value, and improved brand equity (quality, loyalty, trust)

Meaningful Engagement:
Establishing deeper, meaningful connections through gamification (e.g., affective experience mirroring) can empower users and enhance psychological well-being *(Li, M., Chau, P., & Ge, L., 2020.)*.

Psychological Needs Satisfaction:
Research shows that gamification increases user engagement not just through fun elements, but by satisfying psychological needs (autonomy, competence, and relatedness) through various game dynamics like rewards, competition, altruism, and self-expression *(Suh, A., Wagner, C., & Liu, L., 2018.)*.

EARLY HYPOTHESIS

NULL AND ALTERNATIVE HYPOTHESIS

Null Hypothesis (H_0): A personalised impact dashboard with gamification elements does not significantly increase user sentiment and engagement with Ecosia's environmental mission, as measured by user satisfaction ratings and interaction frequency with the dashboard features.

Alternative Hypothesis (H_1): A personalized impact dashboard with gamification elements significantly increases user sentiment and engagement with Ecosia's environmental mission, as measured by user satisfaction ratings and interaction frequency with the dashboard features.

Based on Lazar, J., Feng, J.H. and Hochheiser, H. (2017). Research Methods in Human Computer Interaction. Cambridge, Ma: Morgan Kaufmann Publishers, An Imprint Of Elsevier. The null hypothesis usually assumes that there is no difference between two or more conditions.

03

Investigating Business and User Needs

Selected KPIs and how I translated them into measurable UX objectives.

Essential

3.1 ANALYSIS OF ECOSIA'S BUSINESS MODEL AND ENVIRONMENTAL DEPENDENCIES.

KPIs

Working with limited external data on Ecosia's metrics, I identified three key performance indicators (KPIs) that align with their environmental mission: Churn Rate Reduction, Search Volume per User, and Long-term Retention Rate.

Ecosia's environmental conservation efforts rely on user engagement. By reducing user churn and increasing retention, the search engine can maintain consistent tree planting activities.

Churn Rate Reduction

Reduce the 30-day user churn rate from current estimated 65% to **40%** or lower

Long-term Retention Rate

50% of users remain active after 90 days (compared to current estimated 25%)

Search Volume per User

Increase average daily searches per user by **30%** within first month of account creation

These metrics directly link user behaviour to environmental outcomes by measuring how effectively Ecosia converts user engagement into tree-planting revenue. Though based on external analysis, this framework provides clear benchmarks for evaluating the platform's environmental impact.

Essential

3.2 CONSTRUCTING UX METRICS: PRECISION AND PITFALLS

Reflections on choosing the right data types (interval, nominal, ratio, ordinal) and defining success benchmarks.

GAMIFICATION COMPREHENSION

Data Type:
Nominal data since it categorises user responses into distinct groups without ranking or measuring the degree of understanding

Collection Method:
Think-aloud explanations and interest

Benchmark:
90% understand gamification elements

EMOTIONAL ENGAGEMENT

Data Type:
Ordinal data since emotional responses can be ranked by intensity but lack equal intervals between levels.

Collection Method:
Verbal feedback during testing

Benchmark:
80% show emotional connection to impact data

FEATURE DISCOVERABILITY

Data Type:
Ratio data since time measurements have a true zero point and can be compared proportionally (60 seconds is twice as long as 30 seconds).

Collection Method:
Time to locate features during testing

Benchmark:
95% find key features within 60 seconds

USER VALUE PERCEPTION

Data Type:
Interval data since each point represents equal increments, allowing for calculation of averages.

Collection Method:
Post-test rating and feedback

Benchmark:
85% rate impact tracking as "very valuable"

REFLECTION

Data Discrepancies

During initial research planning, I had two separate UX metrics: Emotional Connection to Impact Metrics and Gamification Comprehension & Appeal. While these metrics aimed to examine different behaviours, I realised that their data markers weren't accurate. Comprehension represented nominal data (correct/incorrect comprehension), while appeal aligned with ordinal data measurements. This insight led me to separate the comprehension metric and merge the appeal component into a new metric: **Emotional Engagement with Experience**. This revised metric measures users' emotional connection and positive engagement with the gamified impact tracking system and their personal impact data. It aligns well with the User Retention KPI and simplifies data collection through self-reported responses to questions like "How emotionally engaged did you feel while interacting with Ecosia's gamified impact features?" (1 = Not at all engaged, 7 = Extremely engaged)

EVALUATING METRICS FOR UX RESEARCH

When evaluating metrics for UX research, it's essential to align them with specific UX goals. For this prototype's new feature implementation, I've identified just two primary goals:

01

USER AWARENESS AND UNDERSTANDING

02

DESIGN OF AN ENGAGING AND INTUITIVE USER EXPERIENCE

While these findings and recommendations show promise, they would benefit from real-world testing to validate their effectiveness.

Essential

UX METRICS & KPI MAPPING

For the informed analysis I mapped UX metrics to business KPIs *(Fig. 3.1)* to ensure alignment between user experience goals and business objectives.

Figure 3.1 — Mapping of UX metrics to business KPIs

04

Building prototype with real-world low-carbon design principles adherence.

Design Response & Prototype Development

➪ Figma Prototype

➪ Figma Design

You can review the design and test the prototype first hand via appropriate links

DARK MODE BY DEFAULT & ENERGY EFFICIENCY

I implemented a dark colour scheme that reduces screen energy consumption by up to 60% on OLED displays, following IEEE research findings.
My design adheres to Blevis's Sustainable Interaction Design principles for minimizing resource consumption.
Following Sustainable Web Design principles, I optimized visual assets for both user experience and environmental footprint.
Since images and videos make up 70% of webpage weight, I made these elements my key optimisation targets.

My sustainable design approach has created a prototype that advances Ecosia's environmental mission while improving performance, user satisfaction, and efficiency. My design choices show that ecological values and business goals can work together effectively. Moving forward, I will keep these sustainability principles at the core of my design process to ensure all features benefit both users and the environment.

Blevis, E. (2007) 'Sustainable interaction design: invention & disposal, renewal & reuse', in Proceedings of the SIGCHI Conference on Human Factors in Computing Systems. San Jose, California, USA: ACM, pp. 503–512.

Hammond, C. (2023). IBM Design. [online] www.ibm.com. Available at: https://www.ibm.com/design/practices/design-for-sustainability/ [Accessed 15 Apr. 2025].

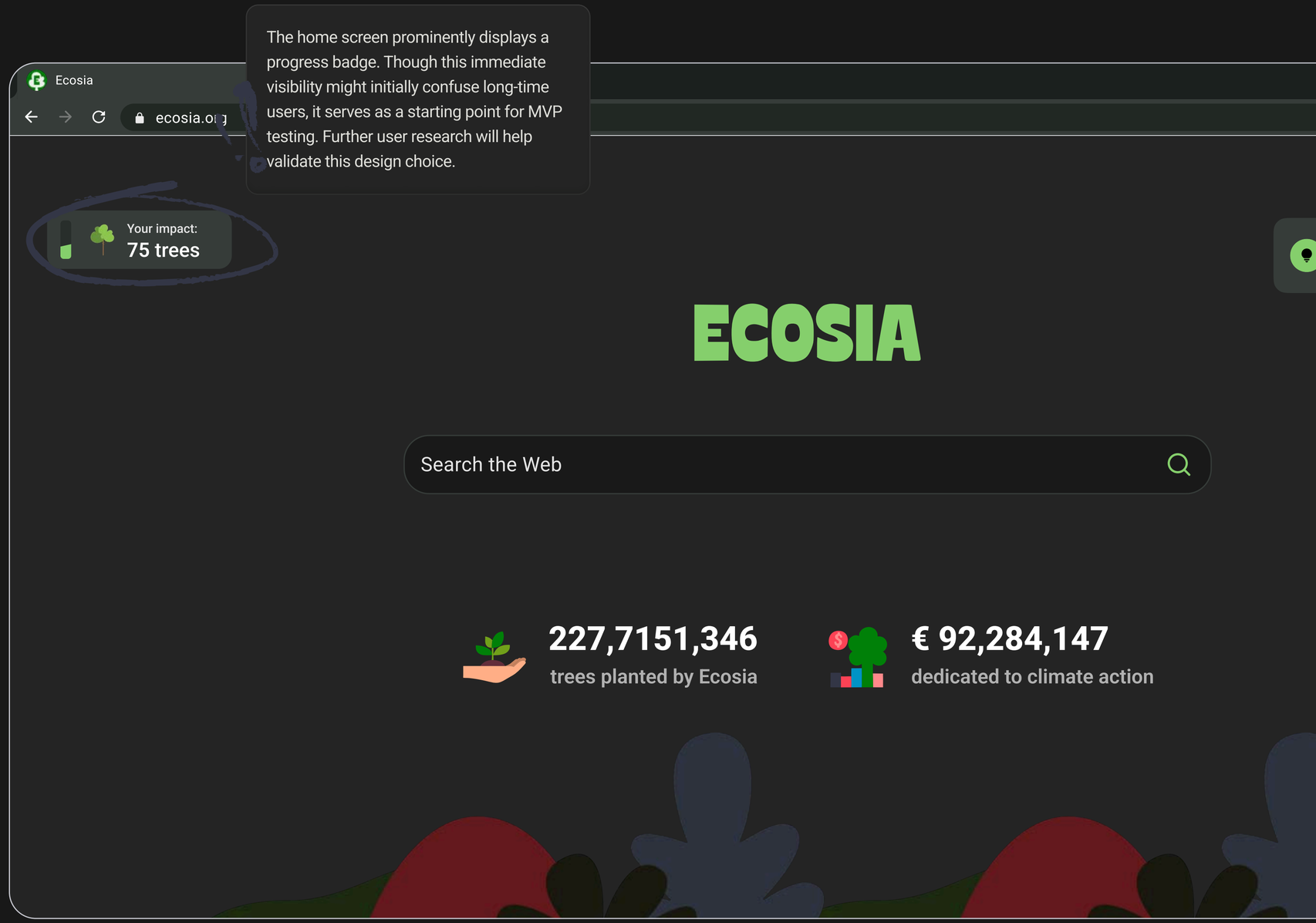
Essential

PROTOTYPE WALKTHROUGH

01

MINIMALIST ONBOARDING

In developing the prototype, I took a minimalist approach to feature introduction. Users with registered accounts (currently in beta testing) will see the updates on their home screen. While this decision prioritizes simplicity, future iterations may require a more structured onboarding process.



Essential

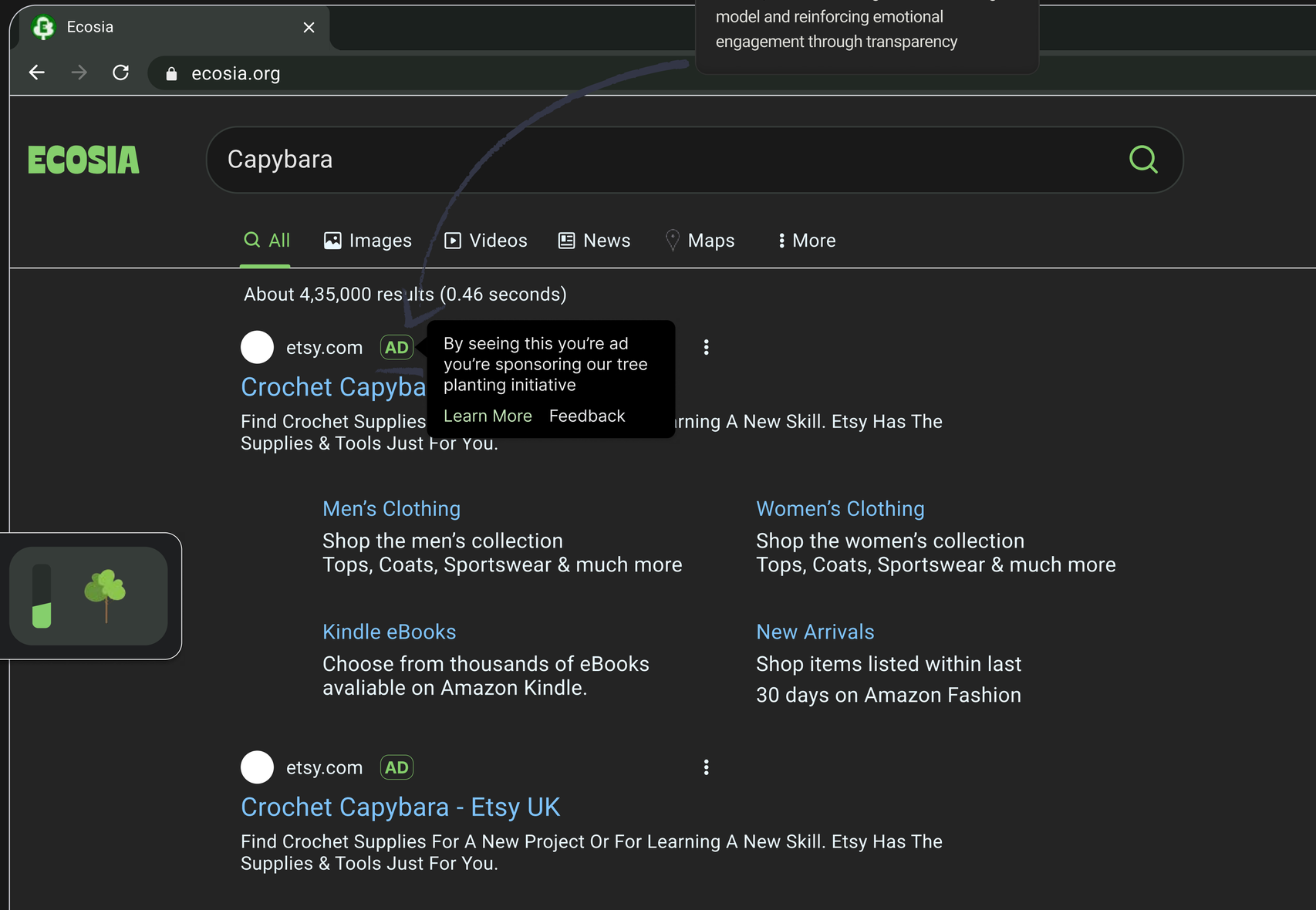
PROTOTYPE WALKTHROUGH

02

SEARCH INTERFACE

For the search experience flow, I deliberately minimized the badge's presence on the SERPs page to maintain focus on search results. Here, users will notice:

The prototype's core interaction invites users to explore their impact through the Tree Growth scale, leading to a personal dashboard.



Essential

PROTOTYPE WALKTHROUGH

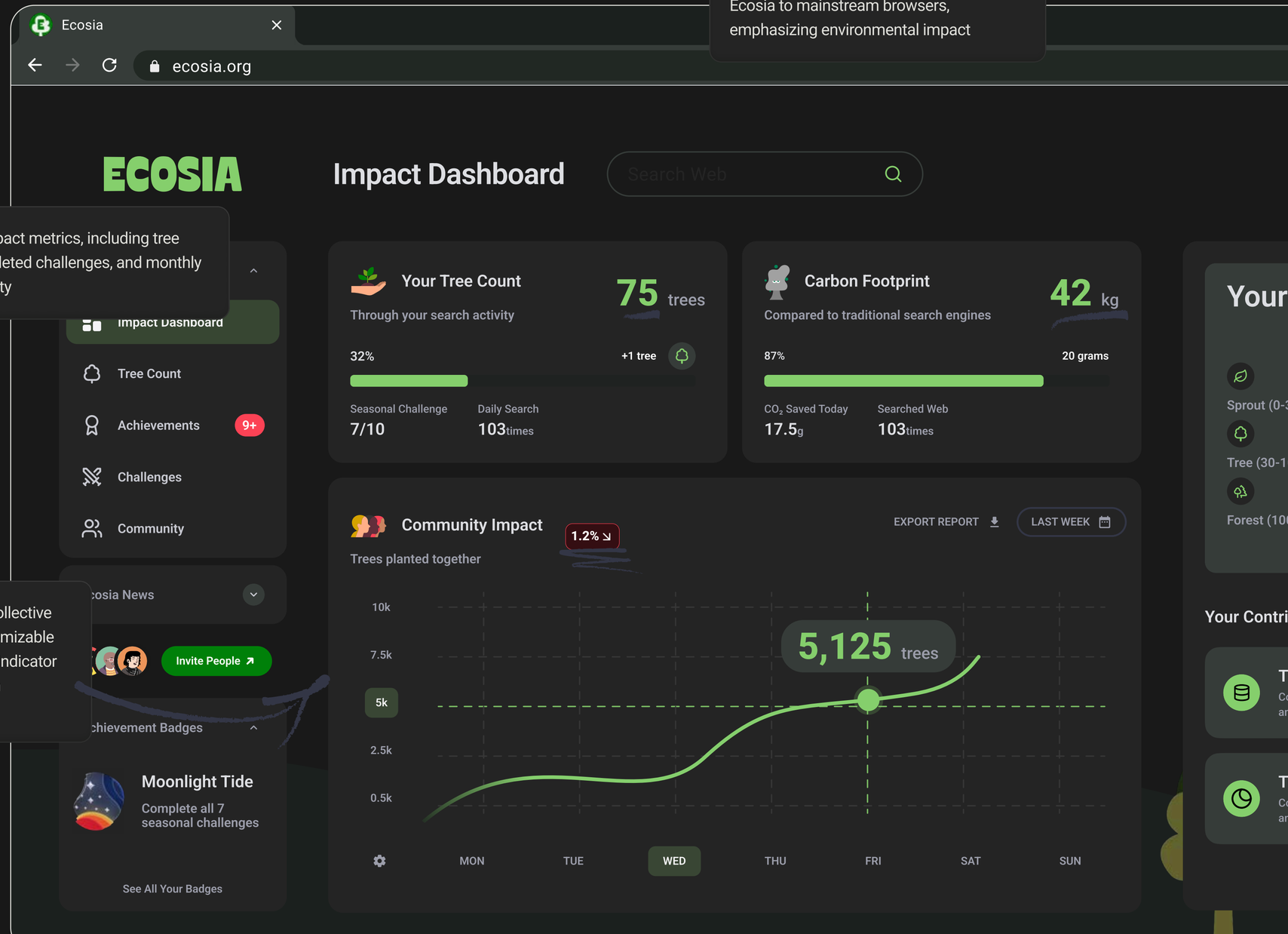
03

DASHBOARD ELEMENTS

Carbon footprint visualisation comparing Ecosia to mainstream browsers, emphasizing environmental impact

Personal impact metrics, including tree count, completed challenges, and monthly search activity

Community statistics showing collective tree-planting progress with customizable time frames and dynamic Trend Indicator (which is a common UI pattern in dashboard design)



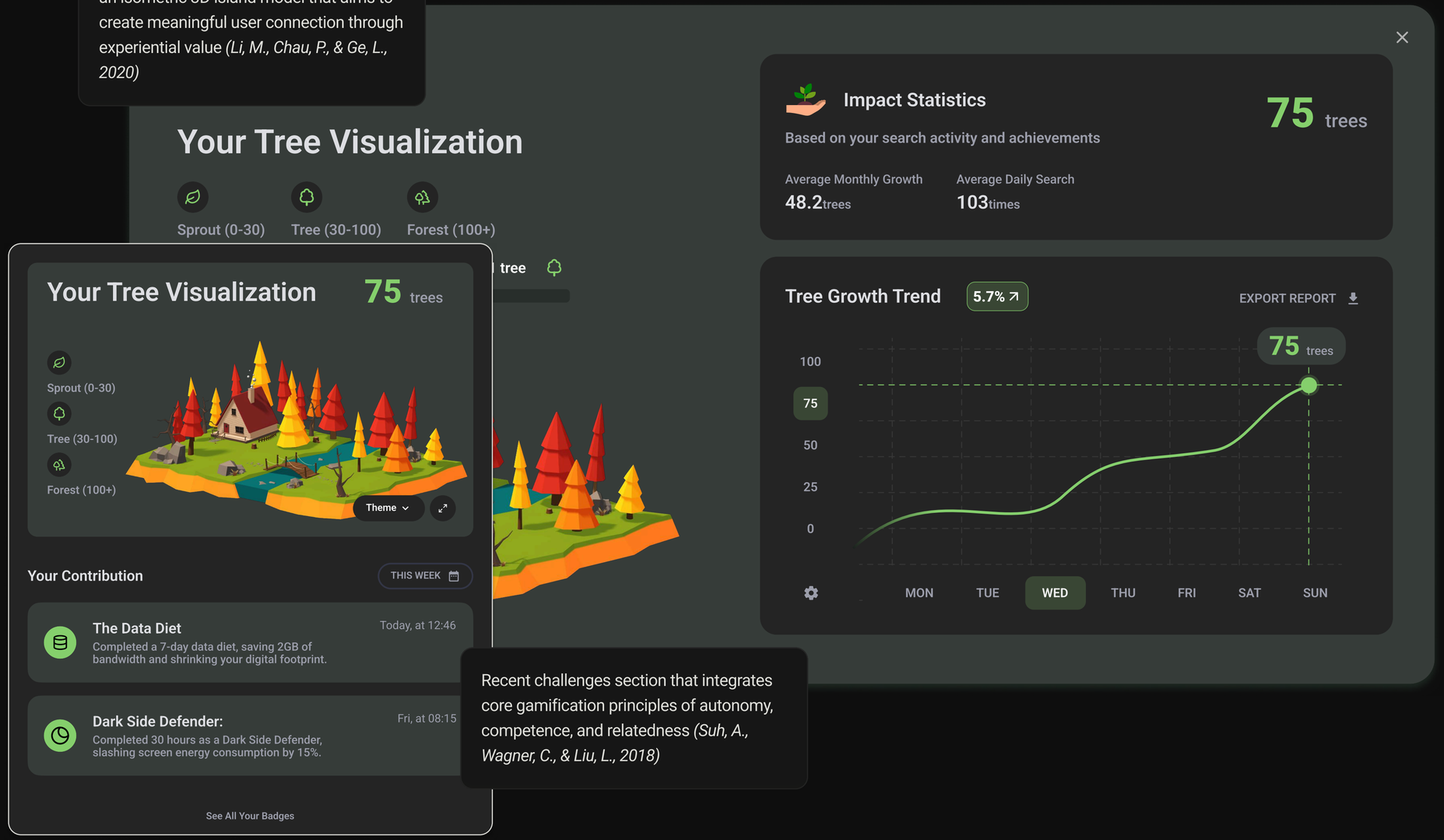
Essential

PROTOTYPE WALKTHROUGH

04 VISUALISATION

Finally, users can explore their "Tree Visualisation" with more in-depth personalised statistics.

The flagship "Tree Visualisation" feature - an isometric 3D island model that aims to create meaningful user connection through experiential value *(Li, M., Chau, P., & Ge, L., 2020)*



Recent challenges section that integrates core gamification principles of autonomy, competence, and relatedness *(Suh, A., Wagner, C., & Liu, L., 2018)*

05

Documenting participant recruitment, data protection, and ethical responsibilities.

Planning: Ethical, Practical and Methodological Decisions

➪ Prototype Testing Plan (Consent, Research Plan etc.)

➪ Signed Consent Forms

All preparation files and signed consent forms are available on OneDrive.

Essential

ETHICS AND PREPARATION

As this study was conducted within Manchester Metropolitan University, strict adherence to EtHOS (Electronic Theses Online Service) regulations was maintained to ensure ethical research conduct, appropriate data collection methodologies, and comprehensive protection of participant rights

KEY USABILITY TESTING ARTIFACTS:

Research Plan;
Consent Form;
Participation Sheet for User Testing;
Usability Testing Facilitator Script and Participator Sheet;

(EthOS): **50565**

Essential

5.2 CONSTRUCTING THE USABILITY STUDY

RESEARCH QUESTION

"How effective is the impact tracking and gamification feature in improving user retention and engagement with Ecosia's sustainable search engine?"

To gather meaningful insights, this study employed multiple data collection methods. While eye-tracking was initially planned, technical issues led to adopting survey methodology instead.

01

CURATED USABILITY TESTING

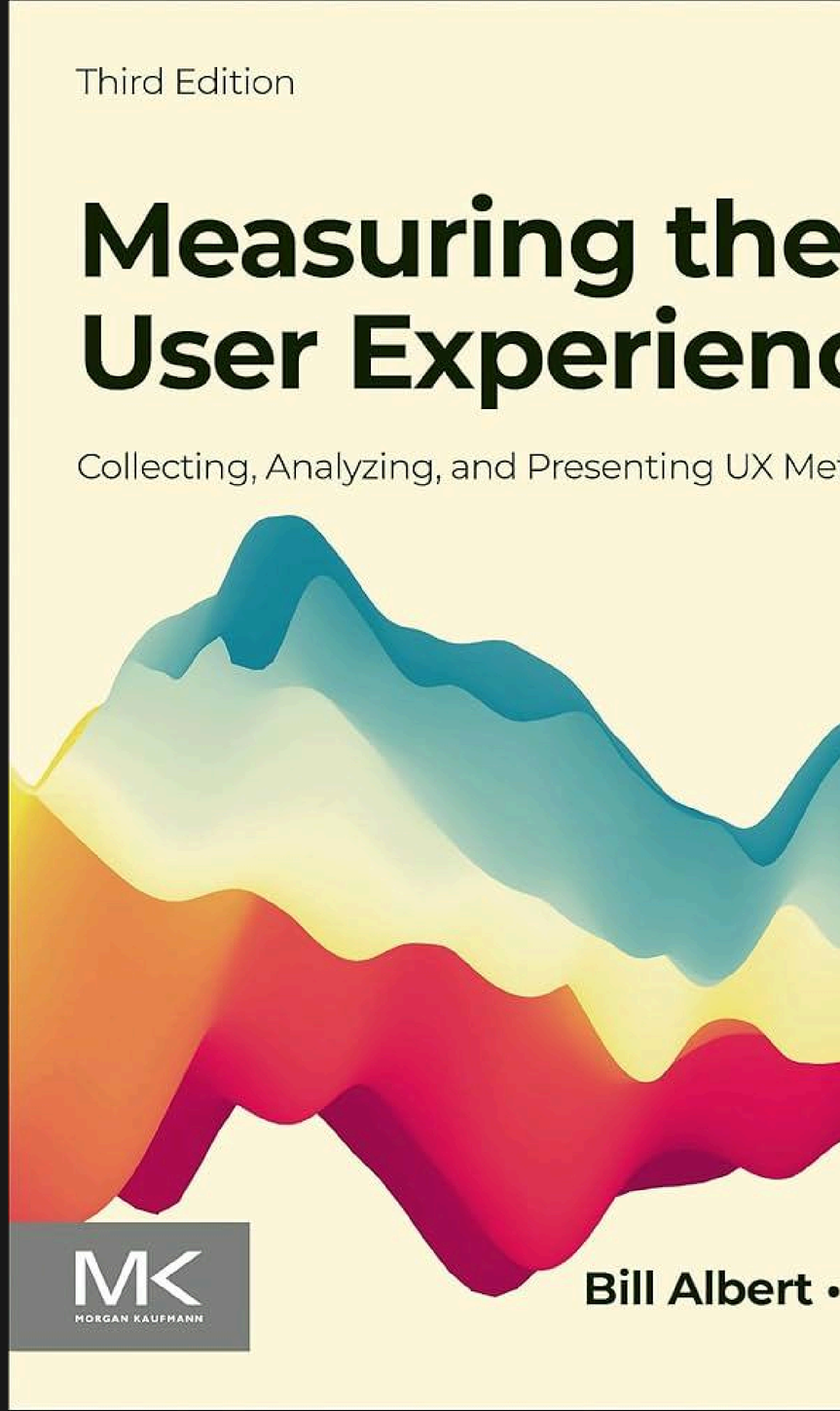
Using think-aloud protocols and retrospective questionnaires with 2 participants.

02

SURVEY QUESTIONNAIRE

With a sufficient sample size (n=14) to ensure statistical significance and tighter confidence intervals.

The methodology draws heavily from Albert and Tullis' "Measuring the User Experience" for data collection and analysis.



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RESEARCH METHODOLOGY SUMMARY

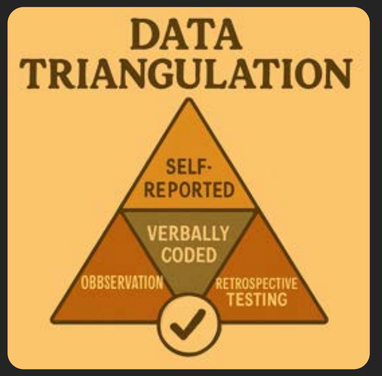
Quantitative Survey

14 participants rated UX metrics on 7-point and 5-point scales

Qualitative Think-Aloud

Two documented think-aloud usability sessions

Data Triangulation



Survey ratings + verbalised insights to cross-validate findings

Based on established HCI methods *(Lazar, Feng & Hochheiser, 2017)*, the study applied a mixed-methods approach to capture both behavior and sentiment:

Lazar, J., Feng, J.H. and Hochheiser, H. (2017) Research Methods in Human Computer Interaction. Cambridge, MA: Morgan Kaufmann Publishers, An Imprint Of Elsevier.

SURVEY

Survey Design

In designing the survey questionnaire (which also served as a retrospective questionnaire for eye-tracking participants), I followed the best practices outlined in *"Internet, Phone, Mail and Mixed-Mode Surveys: The Tailored Design Method" by Don A. Dillman*. The survey design focused on creating clear, unbiased questions with well-structured response options.

For closed-ended questions, I implemented several key principles: including comparison points, ensuring mutually exclusive answers, and carefully considering response formats. For ordinal questions, I focused on balanced scales with clear labels and specific metrics rather than vague quantifiers. When using nominal questions, I avoided unequal response options and randomized response orders to prevent primacy or recency effects.

06

User Reactions and Data-Driven Insights

➪ Raw Data from Usability Test and Survey

The data has been documented and formatted in a reader-friendly format.

Essential

6.1 THE "WHY," "WHAT," AND "HOW" OF THE ANALYSIS

VALIDATION METRICS

Performance was measured against four UX benchmark metrics:

- User Value Perception
- Feature Discoverability
- Gamification Comprehension
- Emotional Engagement

01

SEGMENTATION OF USER RESPONSE GROUPS

02

PERFORMANCE VS. BENCHMARKS

03

USER BEHAVIOUR PATTERNS

04

EMOTIONAL DRIVERS AND PAIN POINTS

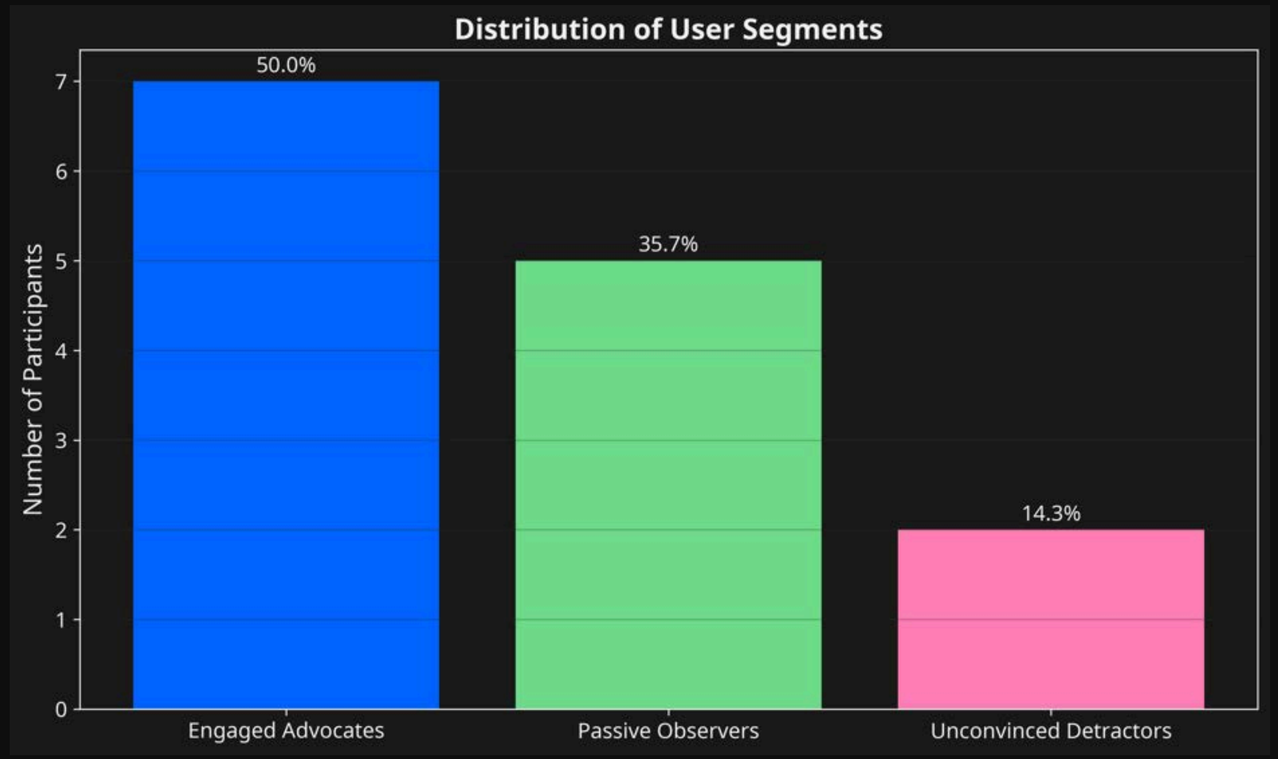
Essential

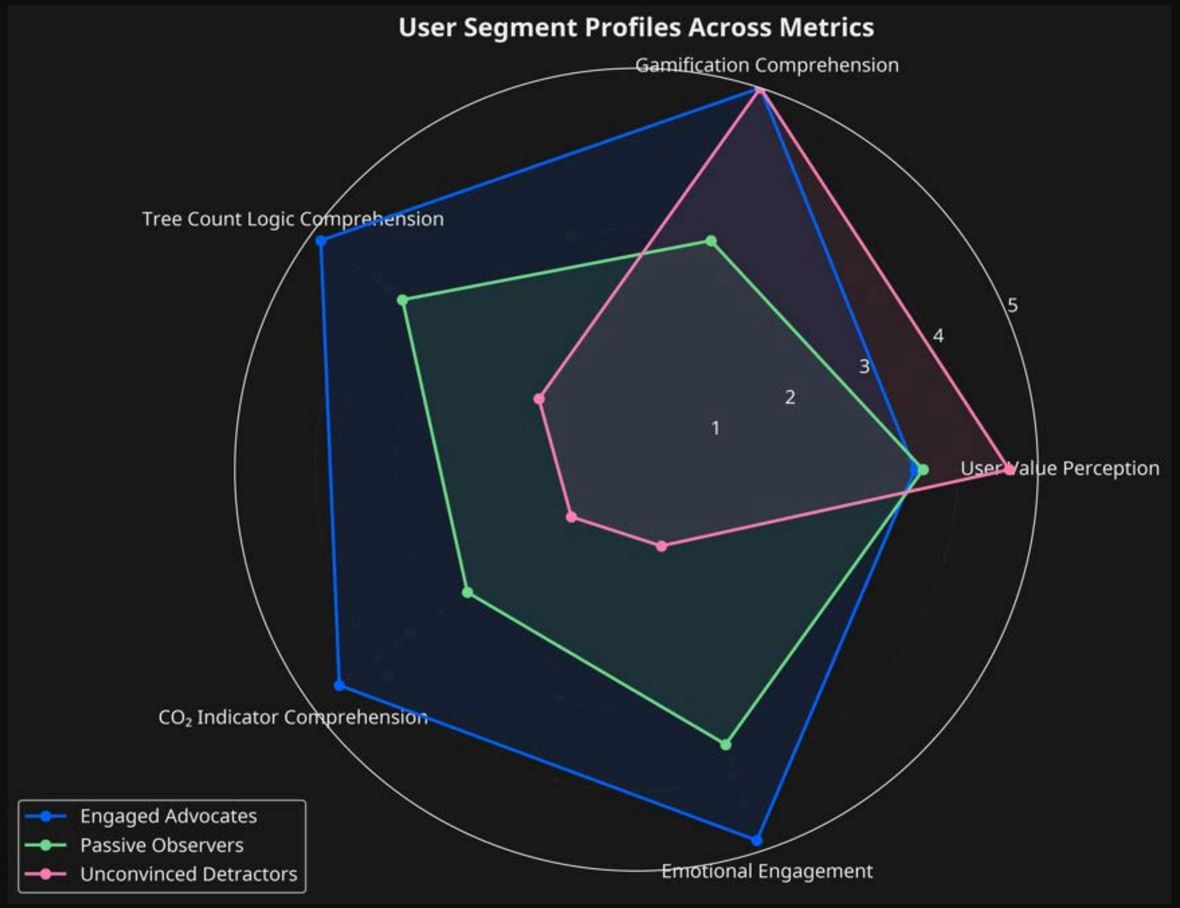
SEGMENTATION OF USER RESPONSE GROUPS

Data visualization and infographics were created through independent analysis and interpretation, with supplementary assistance from manus.ai co-pilot and Microsoft Power BI visualization tools to enhance the presentation of findings

SEGMENTATION INSIGHT

Engaged Advocates understand the interface elements and form emotional connections to their environmental impact, while Unconvinced Detractors struggle with comprehension and remain emotionally disconnected. This suggests that improving comprehension through clearer explanations and contextual help could potentially shift Passive Observers and even some Unconvinced Detractors toward greater engagement.





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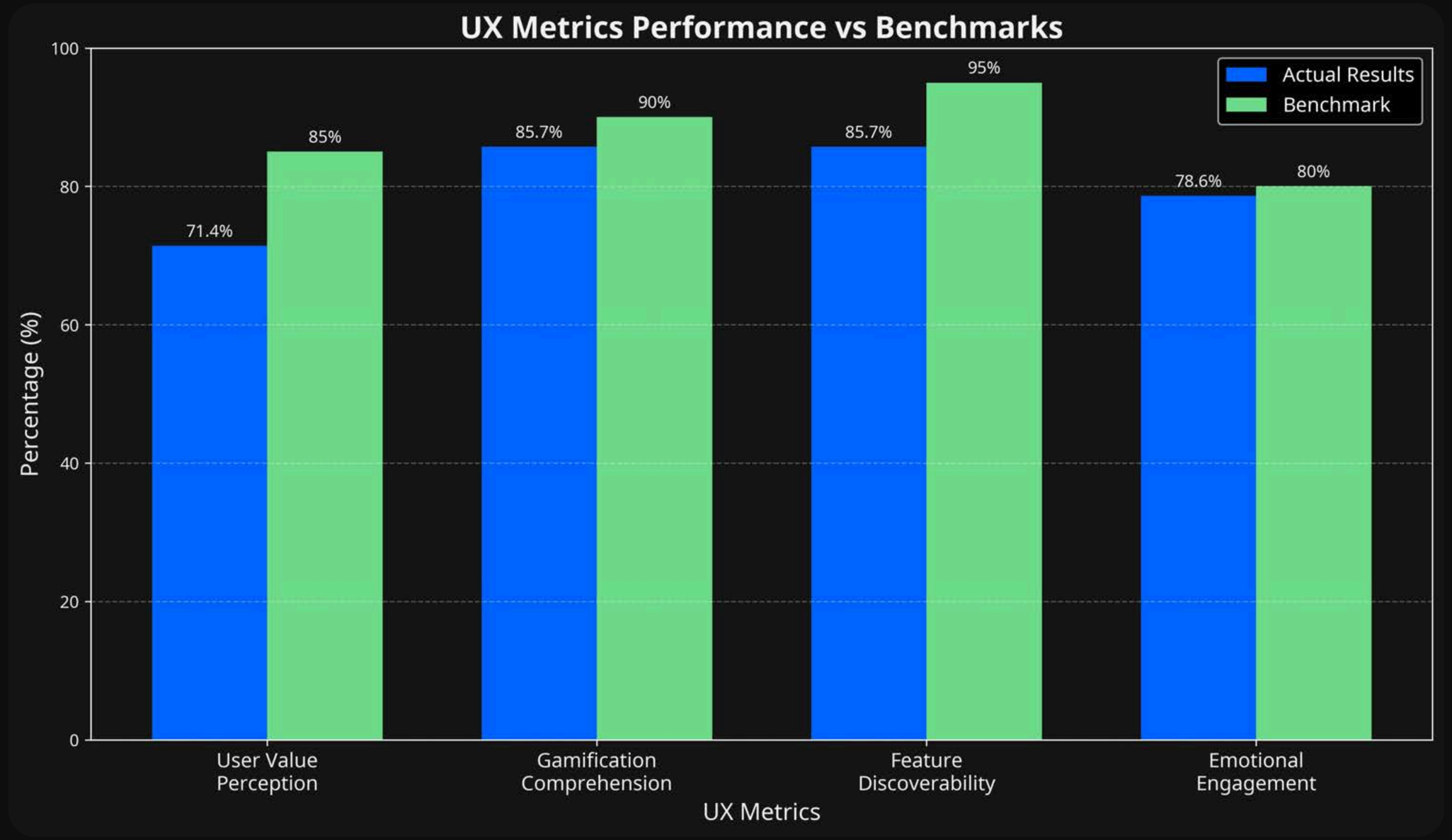
UX METRICS PERFORMANCE VS BENCHMARKS



Essential

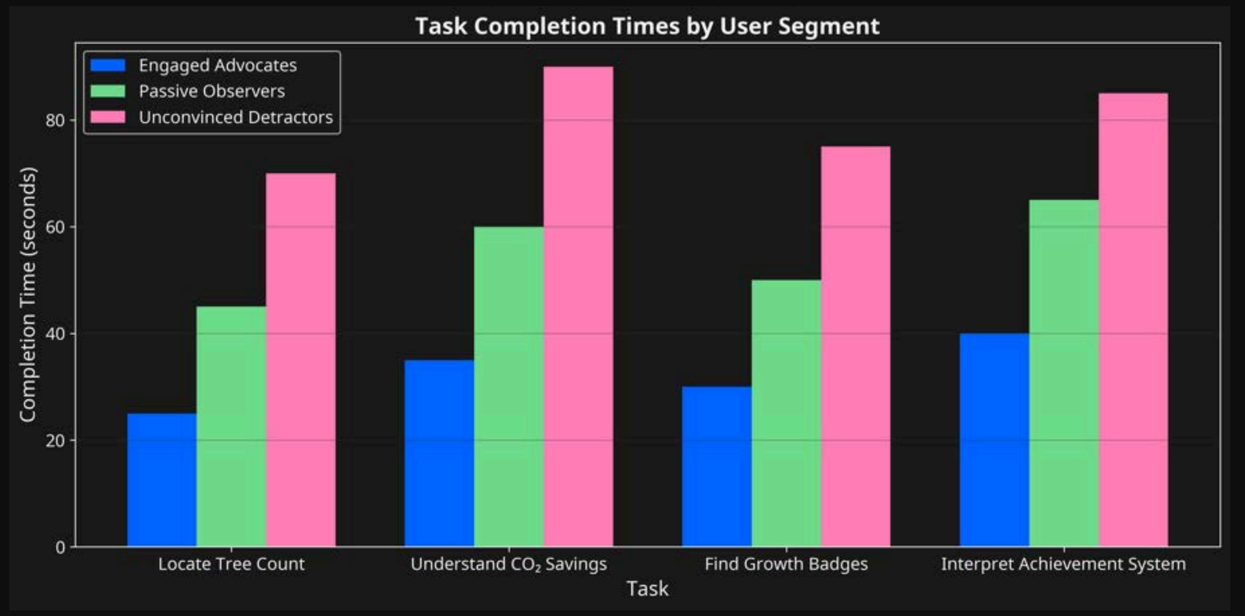
USER BEHAVIOUR PATTERNS

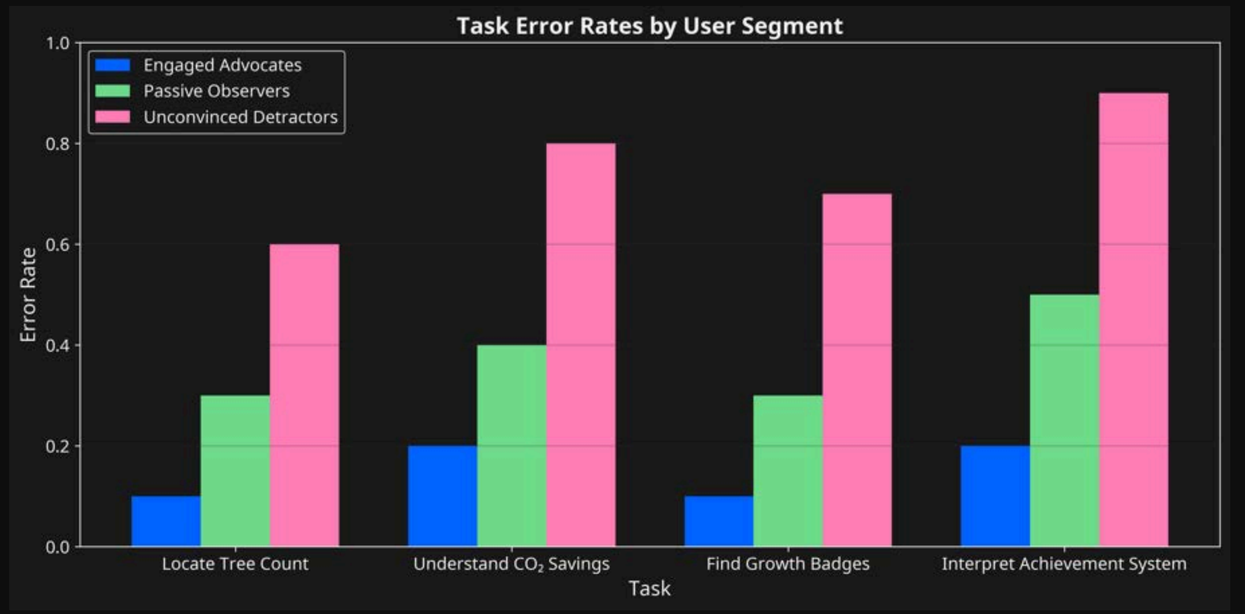
BEHAVIOUR INSIGHT

Tree Count Logic: Usability testing revealed significant confusion about how searches translate to trees planted. This was confirmed in survey data where only 64% of participants rated their understanding of tree count logic as clear (4+ on 5-point scale).

CO_2 Indicator: Think-aloud sessions captured comments like "**I wouldn't know what data 'diet' means**" (Mickey), which aligned with the lowest comprehension scores in survey data. **Only 57%** of participants understood the CO_2 indicator without additional explanation.

Growth Badges: Task observations showed users struggling to interpret the achievement system, with Unconvinced Detractors experiencing 70% error rates when attempting to find and interpret growth badges.





DISCOVERABILITY INSIGHT

CONFIDENCE INTERVAL (CI): 95%

Since we're dealing with binomial data in cases like feature discoverability, it's good practice to introduce confidence intervals as they add statistical reliability

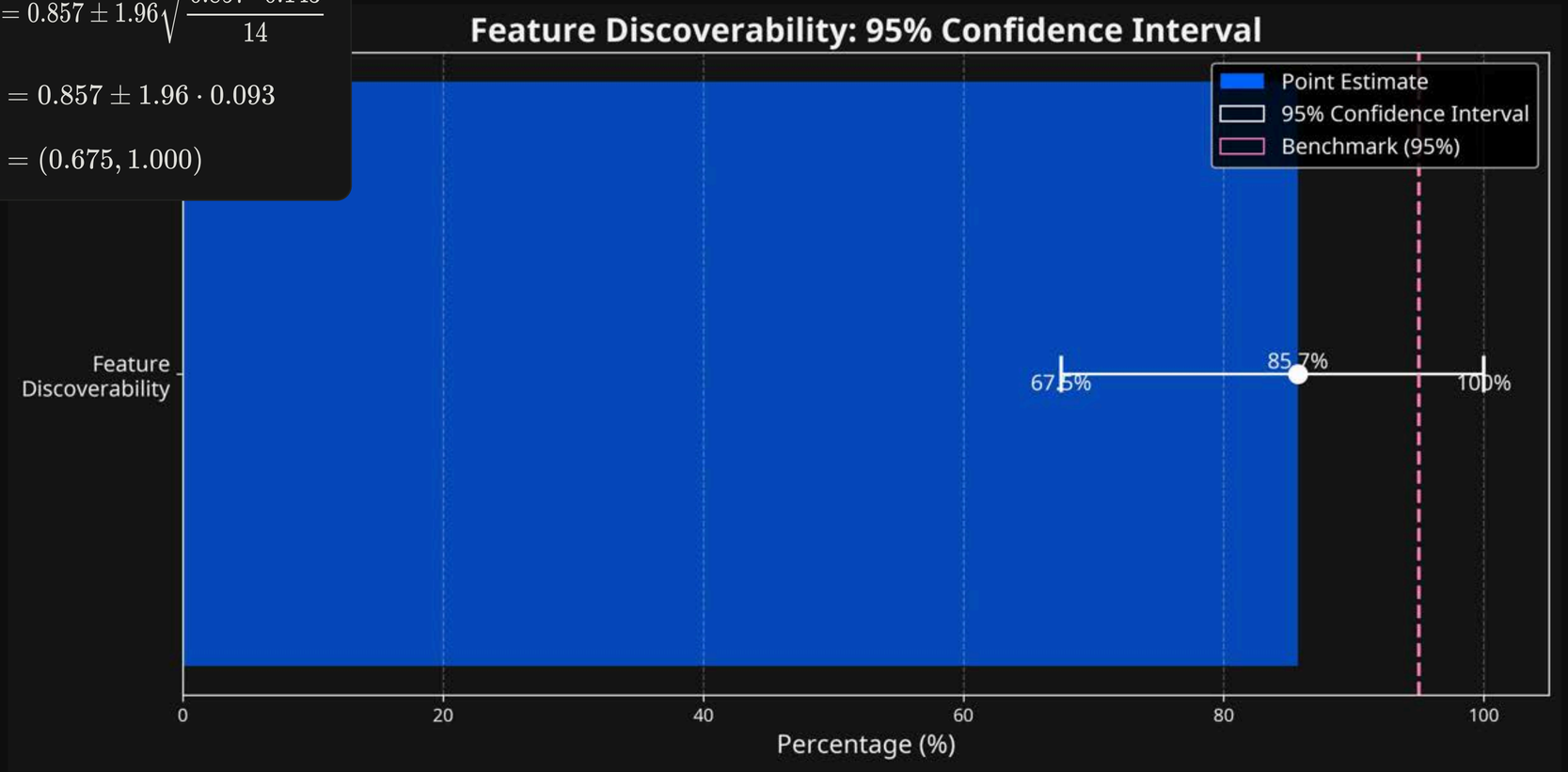
$$CI = \hat{p} \pm Z\sqrt{\frac{\hat{p}(1-\hat{p})}{n}}$$

$$CI = 0.857 \pm 1.96\sqrt{\frac{0.857 \cdot 0.143}{14}}$$

$$CI = 0.857 \pm 1.96 \cdot 0.093$$

$$CI = (0.675, 1.000)$$

p^ = sample proportion (e.g. 0.857 if 12 out of 14 participants found the feature easily)
n = sample size (e.g. 14)
Z = Z-score for your desired confidence level (for 95%, Z≈1.96Z \approx 1.96Z≈1.96)



While 85.7% of users found features easily, the wide confidence interval **(67.5%-100%)** prevents conclusively meeting the 95% benchmark for feature discovery within 60 seconds. This challenge is particularly pronounced among Unconvinced Detractors, suggesting a need for targeted UX improvements for this user segment.

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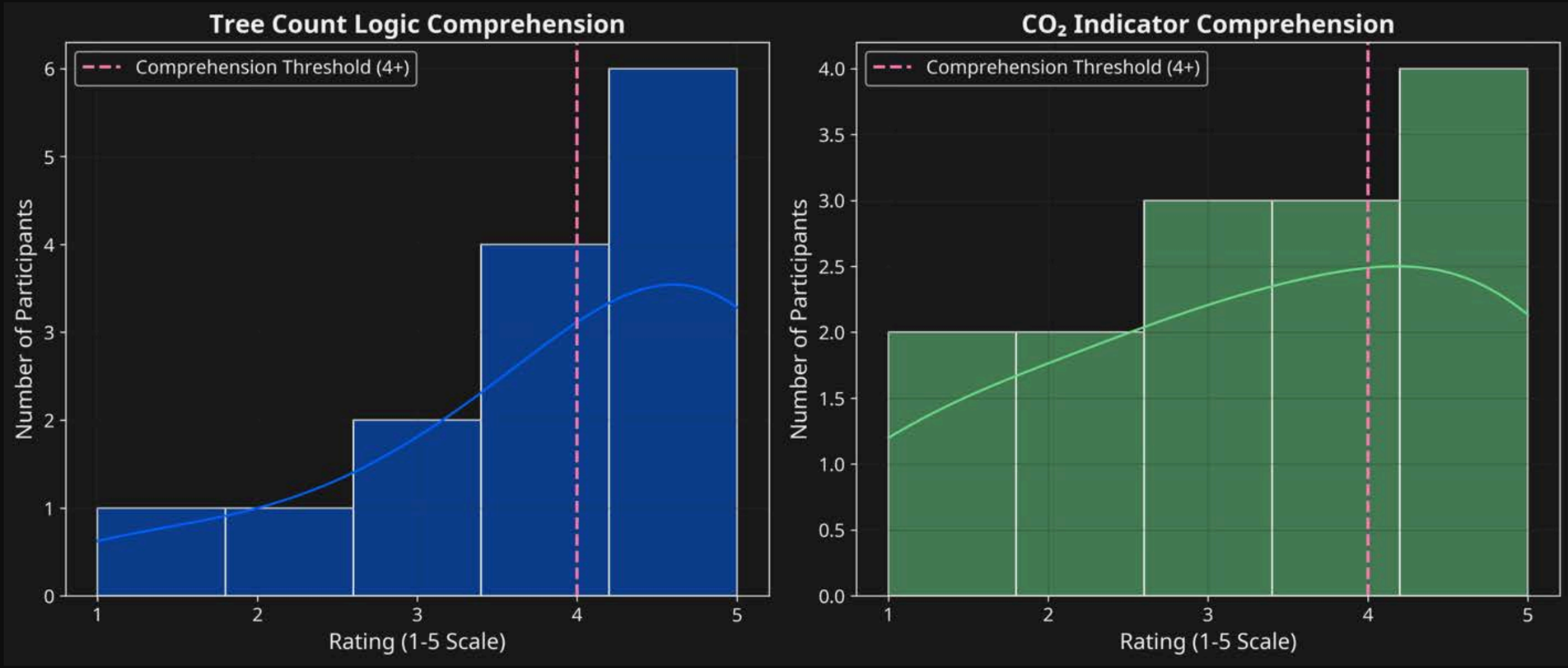
USER BEHAVIOUR PATTERNS

COMPREHENSION INSIGHT

Users struggled to understand environmental metrics, with only **60%** comprehending tree planting and CO_2 data without help. Complex terminology and unclear search-to-tree conversion rates hindered engagement. Simpler explanations and contextual help would benefit less environmentally-aware users.



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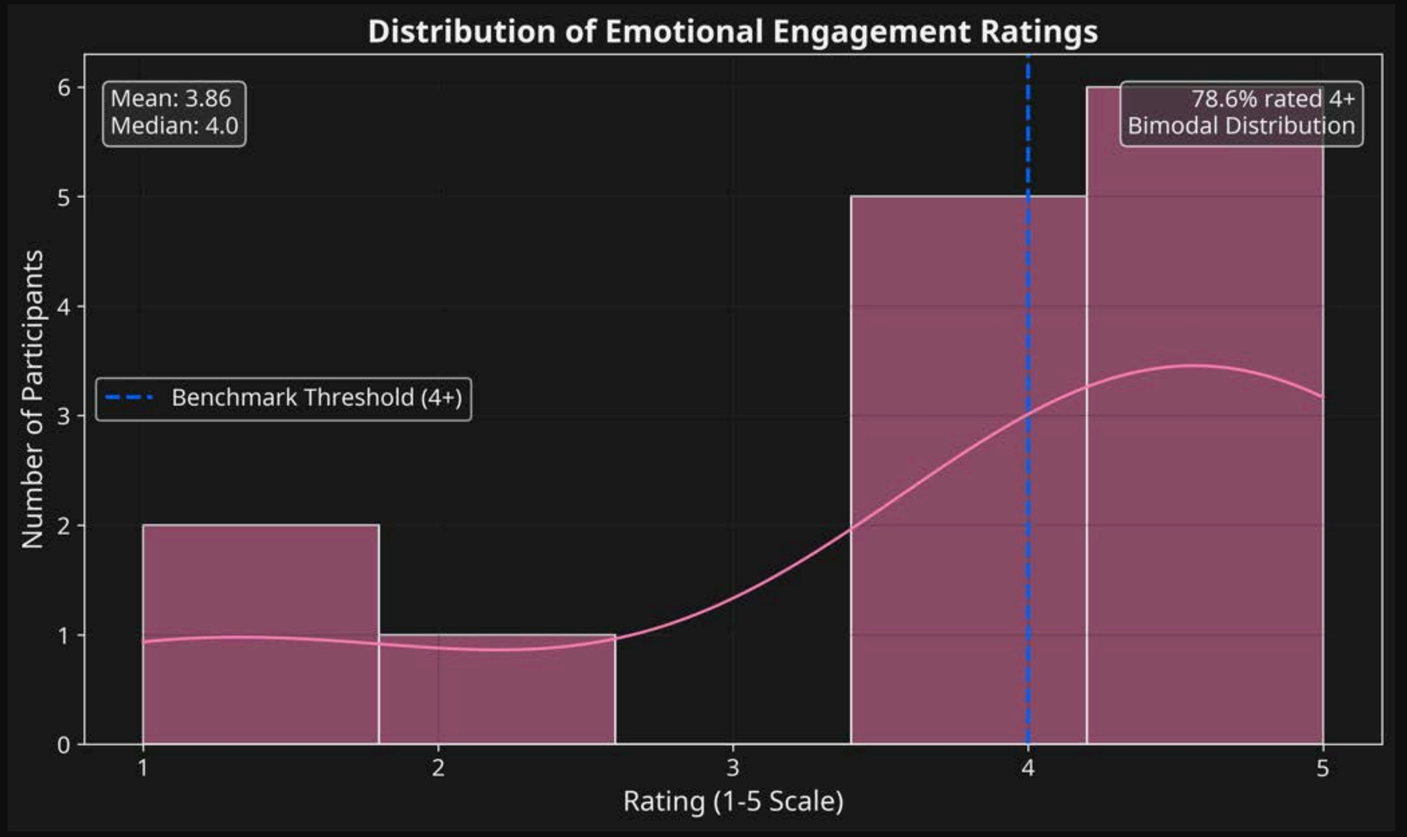
EMOTIONAL DRIVERS AND PAIN POINTS

EMOTIONAL INSIGHTS:

Positive Emotions: The forest visualization created strong positive emotional connections, with think-aloud comments like "**It's really sweet and wholesome**" (Chloe) and "**It feels like I'm building my little island**" (Chloe). Survey data confirmed this with **78.6%** showing strong emotional connection to impact data.

Negative Emotions: Confusion and frustration were primarily associated with technical terminology and unclear explanations.

Gamification Impact: While gamification elements drove increased engagement among 64.3% of users, the response was notably split between Engaged Advocates who embraced the achievement system and Unconvinced Detractors who remained sceptical of this approach.



When analysing rating scales, I have considered the distribution of responses, as the median alone may mask polarized opinions where users either strongly liked or disliked the feature. In such cases, segment respondents to better understand user preferences.

Essential

EMOTIONAL DRIVERS AND PAIN POINTS

QUALITATIVE INSIGHTS

This qualitative analysis of speak-aloud sessions revealed key insights about user perceptions and experiences.

Chloe (Enthusiastic Advocate)

Strengths:

1. Visual elements create strong first impressions
2. Gaming-inspired visuals create positive associations
3. Interface familiarity provides comfort
4. Statistics provide meaningful differentiation

"IT'S REALLY SWEET AND WHOLESOME" (Chloe)

"IT FEELS LIKE I'M BUILDING MY LITTLE ISLAND" (Chloe)

Mickey (Sceptical Observer)

Pain Points:

1. Technical terminology creates barriers
2. Environmental concepts need clearer explanations
3. Transparency about impact calculation is lacking
4. Gamification elements require more intuitive labelling

"CARBON FOOTPRINT MEASUREMENT NEEDS EXPLANATION" (Mickey)

"VISUALISATION WAS THE FIRST ELEMENT TO CATCH ATTENTION" (Mickey)

Essential

REFLECTION

Recommendations

My analysis reveals that improving user comprehension and engagement requires a dual approach: simplifying the technical aspects of environmental impact tracking while personalizing the experience across user segments. Key improvements should focus on making tree-planting metrics more intuitive through contextual explanations and relatable comparisons, while implementing progressive feature disclosure to accommodate varying levels of user expertise. This strategy directly addresses the observed 36% confusion rate in impact tracking comprehension while building on positive feedback from engaged users who connected emotionally with personalized visualizations.

Essential

Post-Study Analysis and Conclusions

07 Summary and References

The Ecosia Impact Dashboard and gamification implementation provided valuable insights, despite not meeting all initial benchmarks. The most significant learning came from observing how users formed unexpected but meaningful connections with personalized impact visualizations.

This research demonstrated that successful sustainable technology design requires adaptability and continuous iteration. While feature comprehension and discovery presented challenges, these setbacks offered crucial lessons about balancing environmental metrics with intuitive UX design. On a personal level, I've gained invaluable experience in conducting this type of study—making my share of mistakes but gaining even more insights that I will apply in my practice.

Essential

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