OpenPomo

A privacy-first habit tracker and pomodoro timer.

Katerina Sizova Hossam Khalifa Malek Azadegan Valentin Gornostaev Thomas Mejia

***Abstract*—In today's fast-paced world, productivity and habit-tracking tools play a big role for maintaining efficient and consistent routines. OpenPomo is a privacy-first Pomodoro timer and habit tracker designed to address privacy-related shortcomings in existing tools, such as server-side data storage. By implementing a client-only architecture, OpenPomo ensures complete data privacy, allowing users to securely transfer their data across devices using QR code/URL encoding. This app combines intuitive design, streak-based habit tracking, and systematic break management to improve user engagement and productivity while maintaining user privacy. Our study outlines the app's development process, design principles, and proposed evaluation methods, demonstrating our approach to empowering users with a tool that prioritizes both functionality and data security.**

***Index Terms*—productivity, pomodoro, privacy, development, evaluation**

I. Introduction

In today's fast-paced world where performance matters more than ever, being efficient and keeping good habits has become essential. Productivity and habit-tracking tools are now a big part of the daily lives of many, especially students and young professionals. These tools not only help users manage their time but also play a vital role in helping them create consistent routines and build positive long-term behaviors. Habit trackers, in particular, allow users to monitor their progress, find patterns, and stay motivated by celebrating the small wins. When combined with productivity techniques like the Pomodoro method, which divides work into short, intense sessions with scheduled breaks, these tools can significantly enhance focus and prevent burnout.

Despite their potential, digital Pomodoro timers and habit-tracking apps fail to address important issues such as user privacy, accessibility, and engagement. Many rely on server-side data storage, which raises privacy concerns and limits user control over their data. Additionally, existing tools tend to lack the features necessary to integrate habit tracking with productivity workflows, leaving users without the comprehensive support they need to stay on track. To empower users, a more thoughtful approach is needed, one that addresses these gaps while prioritizing both functionality and user experience.

This project tackles these challenges with an innovative approach: a client-only architecture that ensures data privacy by keeping all user information on the client side. Users can securely move or save their data across devices by encoding it into a QR code, which the web application can scan and process without involving any servers. Designed primarily for university students and young professionals concerned about data privacy, the application offers a straightforward yet effective combination of a Pomodoro timer and a habit tracker.

This implementation uses modern tools and technologies to deliver an intuitive and responsive user experience. The frontend was built using React and Tailwind CSS, with Bootstrap icons for a clean and recognizable interface. TypeScript was used to streamline the developer experience and keep the project maintainable, and Vite was the build tool of choice. This study addresses key gaps in existing productivity tools and demonstrates a novel solution that prioritizes user privacy, accessibility, and engagement.

A. Hypothesis

We believe that a Pomodoro timer app with client-only data storage and engaging features will increase the frequency of app interactions within a quarter. Combining users' trust using the app and its motivating features, will promote a more regular use. Over time, the consistent use of the app is likely to help users not only stay on track with their daily tasks but also build sustainable productivity habits. This combination of trust, motivation, and ease of use will empower users

to improve their overall productivity and achieve their goals more effectively.

B. Published Research and Motivation

1) Motivational Aspects of Self-Tracking Apps: Almalki et al. [1] highlight the positive impact of visual feedback and metrics on user motivation, showing that real-time progress tracking encourages users to stay engaged and productive. They state that "[Real-time] feedback motivates the student to do better and give more effort."

This insight supports the inclusion of visualized metrics in our app as a tool to keep users motivated throughout their productivity journey.

Similarly, Biwer et al. [2] compare the structured Pomodoro technique with self-regulated breaks, finding that systematic breaks improve concentration and make tasks seem less daunting. Their research concludes that "Systematic breaks might have helped to postpone distractions to the break, fostering concentration and motivation to start studying again."

This finding reinforces our decision to include systematic break management in our app, as it enhances user engagement and improves task endurance.

2) Privacy Concerns in Habit and Health Tracking: Wieczorek [3] examines user skepticism regarding how self-tracking apps handle data, stating that "Self-tracking devices function as a black box—some unknown amount and type of information is put inside, and a series of metrics and suggestions come out."

This highlights a big concern: users are not sure where their data goes or how it is used. By implementing a client-only approach, our app avoids these issues by handling all data locally, ensuring users can track their habits without having to be concerned about others accessing it.

Additionally, Dong et al. [4] show that privacy concerns have gotten more intense since the overturning of Roe v. Wade, with users fearing that their sensitive data collected by tracking apps could be misused. Their study states "After Roe v. Wade was overturned, some users were no longer willing to use period tracking apps, especially those that store user information on the server-side, considering the security for themselves."

This highlights the importance of our client-only model, which removes all server-side risks and builds user trust by ensuring they have complete control over their data.

3) Commercial Systems and Their Shortcomings: Most commercial habit-tracking apps rely on server-side data storage, making them vulnerable to data leaks and potential legal compliance risks. For example:

- Flo, a women's health app, eventually introduced an anonymous mode to address privacy concerns. However, it still uses server-side storage, not fully eliminating privacy risks, as any server interaction opens pathways for others to access user data.
- Clue, another women's health app, requires account creation or social sign-in, raising concerns about linking personal information to private health data. Dong et al. [4] discuss the following comment made about the app: "Regardless of the privacy disclaimers, this app sends your data to a third-party server. Do not use any app that uses the cloud! Especially with the current political climate."

These examples show a significant gap in the market for privacy-first habit trackers. By adopting a client-side data handling approach with URL encoding for cross-device syncing, our app addresses this gap, offering users a solution that keeps their information entirely under their control.

II. Methods

A. Development Process

The development of the OpenPomo Pomodoro timer followed a streamlined process, mostly sticking to the initial plan with nearly no iterative work. A key change made during development was the adoption of a streak-based habit tracking model instead of a calendar/date-based system. This decision simplified development a lot, as it removed the need to build a complicated calendar interface. The streak-based model tracks button presses, functioning essentially as a "glorified button press counter," while still meeting the app's habit tracking goals. This change not only reduced the scope of development but also addressed technical constraints related to data storage and encoding, as discussed below.

B. Tools and Technologies

As planned, the frontend was built using React and styled with Tailwind CSS, both chosen for their flexibility and efficiency. React's popularity and rich ecosystem made it the ideal choice for this project, while Tailwind CSS provided fine-grained control over styling, which alternatives like Bootstrap and Materialize could not match.

To handle QR code generation, React's rich ecosystem came into play. The team used the QRCode.react library, which perfectly suited the project requirements with no competitive alternatives offering similar ease of

use. For clipboard functionality, the copy-to-clipboard npm package was integrated. While the team initially considered developing a custom clipboard solution, this package was chosen for its robustness in handling edge cases and various Chrome/Safari/Firefox quirks, saving development time and ensuring cross-browser reliability.

C. Addressing Challenges

The team faced limitations with URL encoding and local storage, as browsers have upper limits on the amount of data they can handle. For example, Chrome's URL length limit is approximately 2MB, and local storage capacities vary across browsers. Initially, these constraints were a concern for storing user data, particularly with the date-based habit tracking model we had originally envisioned, which required detailed records. However, the change to the streak-based model removed these limitations by reducing the amount of data that needed to be stored. Instead of tracking specific dates, the system now only records the streak length and the last maintained date, massively reducing the data footprint.

D. Deployment

The deployment process was effortless, using Vite as our build tool and Netlify as our hosting platform. Vite's compatibility with Netlify ensured a straightforward deployment process, allowing the app to go live with minimal effort.

E. Testing and Validation

The app was tested across different browsers and devices to ensure compatibility, responsiveness, and adherence to the project's privacy-first principles. These tests confirmed the functionality of local storage, QR code generation, and data transfer via URL encoding, validating the app's functionality.

III. Evaluation

While we were unable to gather participants for a formal study, we have outlined a clear plan for how we would evaluate the app to ensure it meets its goals. In alignment with our privacy-first principles, we would design the evaluation to avoid collecting any unnecessary user data. The study would involve a group of participants using the app for several days, during which we would gather insights on their engagement with the app, their perceived productivity, and how safe they felt using it.

Rather than collecting telemetry data, participants would be asked to share their feedback through qualitative methods such as interviews and Likert scale surveys. Responses would be collected both before and after participants used the app to measure changes in their satisfaction, productivity, and perceptions of privacy. This combination of qualitative feedback would allow us to evaluate the app's usability and its impact on user behavior without compromising our commitment to privacy.

A. Success Metrics

We can measure success through the following:

- Learnability: Does the time it takes for participants to perform tasks on the app decrease over time? Instead of telemetry data, participants could self-report their task completion times or describe their ease of navigating the app during interviews or surveys. These insights would help identify learning curves and any issues they may have faced with usability.
- User Satisfaction: At the end of the study, do participants report being satisfied with the app's privacy features, their productivity, and their overall experience? Does the lack of server-related features ruin the user experience? Qualitative feedback through Likert scale surveys and interviews would help gauge user satisfaction levels. Participants could also compare their productivity and comfort with privacy before and after using the app.
- Consistency: Do participants maintain streaks consistently? What is the average length of their streaks? Without telemetry data, participants would be asked to track their streaks manually or provide qualitative feedback on how the app influenced their habits and streak maintenance. Insights on engagement trends could also be inferred from these reports.

This combination of self-reported data and qualitative feedback would allow us to evaluate the app's usability and its impact on productivity and privacy perceptions. While the absence of telemetry data limits the usefulness of the evaluation, this outlined approach remains a valuable way to assess the app's effectiveness and user satisfaction.

IV. Results

A. Learnability - Task Completion Over Time

The following chart shows what we might expect task completion times to look like for a learnable task. The would be decreasing over the period of time the study ran, indicating that participants are learning and becoming more efficient in using the app. The steady decline in

task completion times reflects the app's intuitive design and ease of use, showing a learning curve that reflects an improvement in the performance of the user.

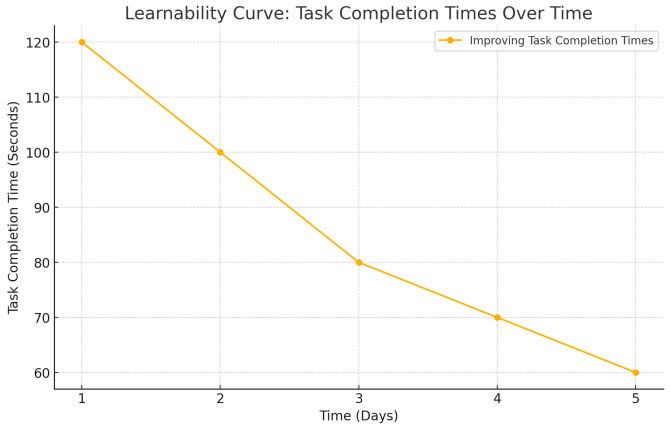


Fig. 1. Learnability Curve: Task Completion Times Over Time for Intuitive UI.

A chart with a horizontal learnability curve shows consistent task completion times over the period of the study, suggesting that participants did not experience an improvement in efficiency while using the app. The lack of a learning curve indicates that the app may not be intuitive or that tasks do not become easier with repeated use, highlighting potential areas for improvement in usability or design.

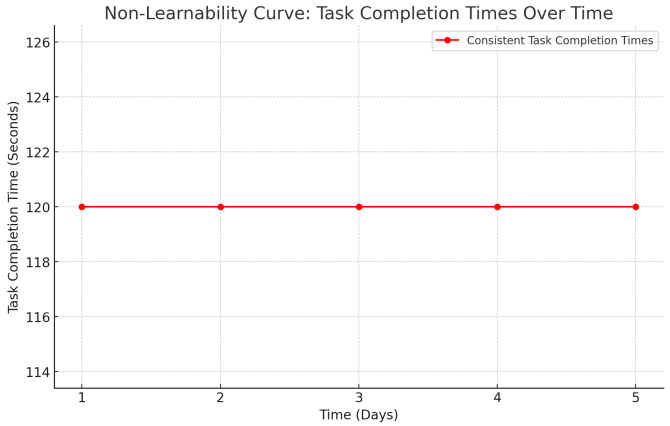


Fig. 2. Learnability Curve: Task Completion Times Over Time for Unintuitive UI.

1) User Satisfaction: Likert Scale: The following chart shows participants' satisfaction levels across three key points: privacy features, productivity, and overall experience. The high scores across all dimensions suggest an app that balances its privacy-first design with usability and productivity features. Participants rated privacy features especially highly, reflecting the app's commitment to data security and user trust. Results such as these would indicate that the app successfully delivers an intuitive and satisfying user experience.

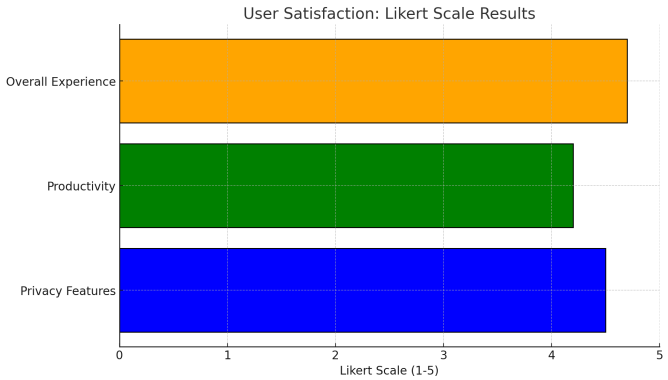


Fig. 3. User Satisfaction: Likert Scale Results for Well-Balanced Application

In contrast, the following chart demonstrates an app where participants acknowledge its strong privacy features, but this focus negatively impacts overall productivity and user experience. The lower scores for productivity and overall experience suggest that prioritizing privacy came at the expense of usability or functionality. These results would underscore the importance of finding a balance between privacy and other essential features to maintain user satisfaction across all dimensions.

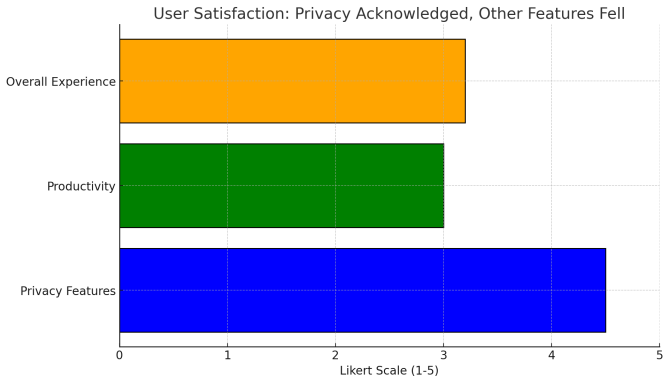


Fig. 4. User Satisfaction: Likert Scale Results for Ill-Balanced Application

2) Consistency: Streak Maintenance: The following pie chart illustrates a scenario of high consistency in streak maintenance, with the majority of participants achieving longer streaks. This distribution reflects an app that successfully encourages users to stay consistent with their productivity goals over a long period.

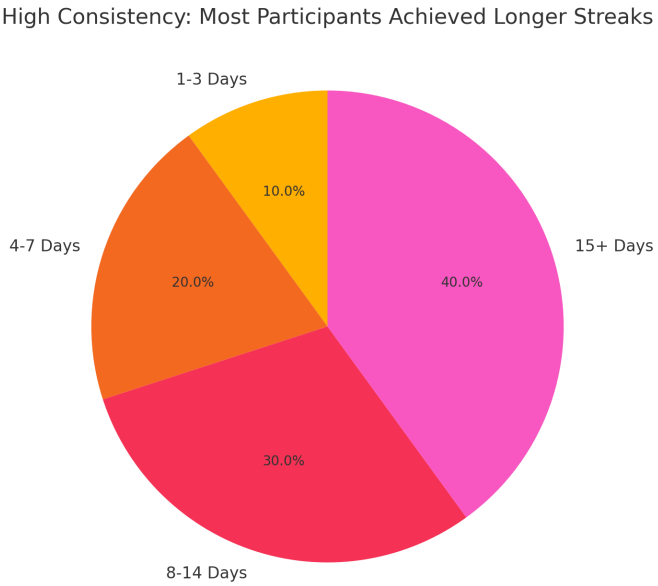


Fig. 5. High Consistency: Most Participants Achieved Longer Streaks

In contrast, the next pie chart depicts a scenario of low consistency, where most participants maintained shorter streaks. This outcome suggests that the app might not provide sufficient motivation or tools to sustain user engagement, highlighting potential areas for improvement in streak-based habit tracking.



Fig. 6. Low Consistency: Most Participants Achieved Shorter Streaks

3) Streak Progression Over Time: The following bar chart illustrates a positive engagement trend, where participants' average streak lengths increase steadily over the study period. Starting at an average of 3 days in the first week and growing to 9 days by the fourth week, this progression would reflect consistent user engagement and the app's ability to encourage habit formation. The steady increase would suggest that the app's design successfully motivates users to maintain their streaks and achieve longer-term productivity goals.

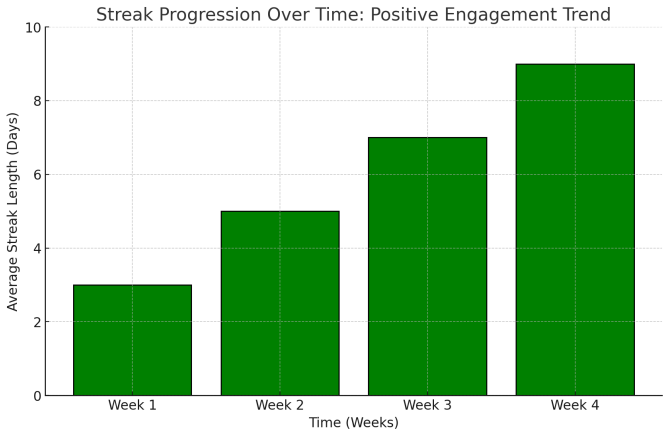


Fig. 7. Streak Progression: Positive Engagement Trend

In contrast, the next bar chart shows a flat engagement trend, where participants' average streak lengths remain unchanged at 3 days across all four weeks. This lack of progression would indicate that users did not increase their commitment to maintaining streaks over time, suggesting that the app may not be effective at supporting long-term engagement/habit formation.

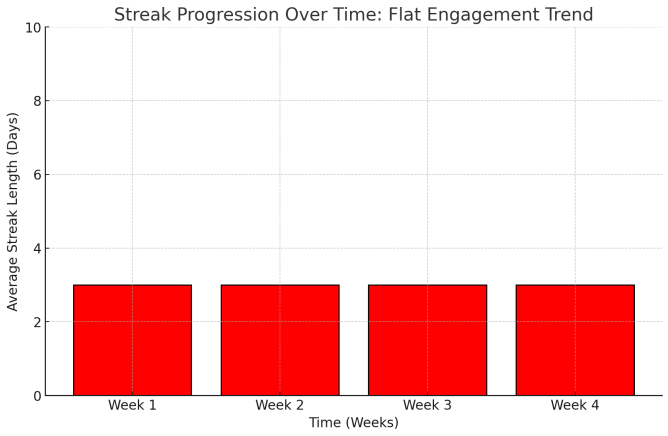


Fig. 8. Stream Progression: Flat Engagement Trend

V. Discussion

The principal idea behind the OpenPomo app was a commitment to preserving user privacy, which in-

troduced some challenges while evaluating the app's effectiveness.

While we were unable to secure participants to test the prototype, in the previous section we discuss a detailed plan for analyzing the qualitative data that could have been gathered had participants been available. This plan emphasizes collecting feedback before, during, and after the study period to measure the impact of the app on user productivity, satisfaction, and engagement, aligning with principles we studied in class for analyzing qualitative data.

One limitation that is due to the private nature of our app is the inability to track user behavior seamlessly, as no data can be collected on our end because OpenPomo doesn't have a backend. This privacy-preserving design is a core feature of OpenPomo, but it complicates the evaluation process. In theory, a version of the app could be created that collects telemetry data for testing purposes, but this would interfere with the app's intended function. If users are aware their telemetry data is being gathered, it could influence their behavior, thus invalidating the results of our study.

A qualitative approach is effective in assessing user perceptions and high-level trends, but it is also limited in its ability to provide granular insights into user interactions with the app. For example, quantitative telemetry data could provide useful metrics on task completion times, feature usage, and engagement patterns. This granularity may be impossible for users to provide through interviews alone.

To keep user engagement during breaks, we integrated a hangman game into the Pomodoro timer that starts when the break starts. This feature provides a fun and relaxing activity for users, encouraging them to fully use their break time in a lighthearted and mentally stimulating way. In the future, this functionality could be expanded to include more games, similar to the New York Times-style puzzle games, to cater to a wider range of interests. These games could make the app more engaging, adding a twist to the typical Pomodoro experience while keeping focus on productivity.

In conclusion, while the private nature of OpenPomo introduces limitations in the tools we can use to evaluate its effectiveness, it also bolsters the app's relevance and unique contribution to the productivity app market. Future work could explore hybrid methods of evaluation, such as anonymized data collection during testing phases, while continuing to adhere to the app's privacy-first principles. These limitations and considerations highlight the importance of balancing usability, privacy, effective/ethical user testing while designing and testing tools like OpenPomo.

VI. Conclusion

In this report, we discussed the design and development process of OpenPomo, a privacy-first Pomodoro timer and habit tracker aimed at privacy-related shortcomings in existing productivity tools. By employing a client-only architecture, QR code/URL encoding for data transfer, and a streak-based habit tracking model, OpenPomo enforces complete data privacy while maintaining a lightweight, responsive and efficient user experience. The app was built using modern tools like React, Tailwind CSS, and Vite.

While we were unable to conduct a formal user study, we outlined a comprehensive plan for evaluating the app using qualitative methods, including surveys and interviews. These methods align with our commitment to privacy and ensure that the evaluation process remains consistent with the app's core principles. Although qualitative approaches limit how specific the insights we can get are, they still provide valuable feedback on user satisfaction and engagement trends.

The main takeaway from this work is that it is possible to design a productivity tool that prioritizes user privacy without sacrificing usability or functionality. OpenPomo offers a unique solution for individuals who value control over their data, filling a critical gap in the market as highlighted by the literature.

Future work could explore methods to enhance the evaluation process, such as displaying telemetry data to users during testing phases and allowing them to delete the data whenever they want (even before we can see it), maintaining the app's privacy-first ethos. Additionally, expanding the app's features, such as integrating more games or advanced visuals, could further enhance engagement and appeal. OpenPomo shows that productivity tools can be both effective and privacy-first.

References

[1] K. Almalki, O. Alharbi, W. Al-Ahmadi, and M. Aljohani, "Anti-procrastination Online Tool for Graduate Students Based on the Pomodoro Technique," in *Learning and Collaboration Technologies. Human and Technology Ecosystems. HCII 2020*, P. Zaphiris and A. Ioannou, Eds. Cham: Springer, 2020, vol. 12206, Lecture Notes in Computer Science. [Online]. Available: https://doi.org/10.1007/978-3-030-50506-6_10.

[2] F. Biwer, W. Wiradhany, M. G. A. oude Egbrink, and A. B. H. de Bruin, "Understanding effort regulation: Comparing 'Pomodoro' breaks and self-regulated breaks," *British Journal of Educational Psychology*, vol. 00, pp. 1–15, 2023. [Online]. Available: https://doi.org/10.1111/bjep.12593.

[3] M. Wieczorek, "Would John Dewey Wear a Fitbit? A Pragmatist Analysis of Self-Tracking Technologies' Impact on Habit Formation," *Philosophy & Technology*, vol. 37, no. 5, 2024. [Online]. Available: https://doi.org/10.1007/s13347-024-00695-2.

[4] Z. Dong, L. Wang, H. Xie, G. Xu, and H. Wang, "Privacy Analysis of Period Tracking Mobile Apps in the Post-Roe v. Wade Era," in *Proceedings of the 37th IEEE/ACM International Conference on Automated Software Engineering (ASE '22)*. New York, NY, USA: Association for Computing Machinery, 2023.