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Digital Conscience: An Intelligent Framework for App Usage Tracking and Productivity Enhancement

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***Abstract*— In today's digital age, the usage of smartphones and social media has increased a lot. The excessive use of smartphones has become a major concern among students and young professionals, leading to a reduction in productivity, poor time management and a decrease in mental well-being. Most of the existing screentime management apps just show a screen or block app, but they do not help in building a better habit of reducing the screen-time and encourage behavioural changes. This paper presents Digital Conscience, a gamified mobile application designed to improve your digital well-being by changing unproductive screen time to meaningful and productive engagement. The application tracks app usage with user consent and categorises the activities into social and productive time, and provides visual analytics to increase awareness. The application was developed using Flutter and Firebase, the system ensure real time data handling, secure authentication and cross-platform integration.**

***Keywords*— Digital Well-being, Screen Time Management, Gamification, Behaviour Change Technology, Flutter, Firebase, Focus Mode.**

I. Introduction

In the modern digital era, smartphones and social media have become essential tools for communication, education and entertainment. While these technologies have many advantages, excessive and unregulated usage of these technologies has led to growing concern regarding digital distractions and increased screen time, particularly among students and young professionals. Extended usage of social media, gaming, and streaming platforms often results in reduced productivity, poor time management and a reduction in focus on academic responsibilities.

Most of the existing screen-time management apps focus on monitoring usage statistics and blocking specific applications. Although these features don't encourage meaningful habit formation and behavioural change. When users feel the rules or limits are very strict, user gets irritated, and because of the frustration, they try to bypass the rules. Due to this, there is a need for a more engaging, motivational and productive approach that not only limits excessive usage but also promotes productive self-control.

Taking into account these challenges, our project Digital Consciences: From Time Wasted to Time Invested proposes a gamified mobile application designed to promote digital well-being through awareness, motivation and behaviour changes. Our application monitors app usage with user permission, categorises activities into social and productive time, and gives visual analytics to help users understand their digital habits. In this app, the user has to set app usage limits beforehand. Once the predefined time limit is reached, the system provides a warning and can temporarily block access to the distracting application.

Digital Conscience provides a reward-based mechanism that provides users with the feature of regaining the screentime for a short time by completing short, productive and cognitive activities such as quizzes, logical and mathematical problem-solving exercises. Features like daily goals, streak tracking and Focus mode encourage consistent improvement and positive behavioural changes.

The app is Android-based and developed using the Flutter framework with Firebase backend. The system ensures real-time data handling, secure user authentication and scalable cloud storage. Digital Consciences redefine screentime management by integrating productivity, gamification and habit psychology to promote a healthy digital lifestyle.

A. Contributions of This Work

- Productive screen-time regulation.
- Focus Mode for distraction-free productivity.
- Intelligent usage classification and analytics.
- Habit formation through goals, streaks, and motivation.
- Privacy-conscious and scalable system design.

II. Literature Review

Multiple research studies have explored strategies to reduce screen time and promote and build healthier digital habits through technological interventions. Gamification and logical exercises have come up as a strong approach in behaviour change systems.

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Studies on behaviour modifications suggest that reward-based mechanisms, feedback systems and progress tracking significantly improve user consistency in habit formation. By integrating points, a rewards application can motivate users to maintain positive patterns over an extended period.

According to behaviour change models, a consistent feedback system, small achievable goals, and motivating mechanisms help users build sustainable habits. Even with the availability of screen-time monitoring tools and digital detox application there remains a gap in the system that combines tracking and gamified reward, productive task integration and focus mode in one system framework.

III. Problem Statement

In the current digital environment, smartphones have become an inseparable tool for communication, learning and entertainment. But the excessive usage of social media platforms and gaming has led to distraction and an increase in the use of digital media. Current existing screen-time management tools focus on tracking usage or just blocking predefined applications. While tools provided awareness, they didn't provide any kind of motivation to actively stay away from digital distractions. They do not effectively encourage long-term behaviour changes.

Many users see strict blocking mechanisms as restrictive, which may lead to frustration and an attempt to bypass the control rather than following self-discipline. Most available systems lack integrated motivational mechanisms that actively transform wasted time into invested time and meaningful encouragement. There is a need for a smart and user-centric solution that not only monitors and restricts smartphone usage but also promotes positive digital habits through motivation and self-improvement strategies. The system should encourage users to consciously manage their behaviour, provide actionable feedback, support a focused work environment and convert wasted time into productive activities.

IV. Research Gap

Even though there are multiple applications and tools that can help users manage time and monitor digital consumption, there are also applications that can help users get a digital detox. But the existing applications just display usage statistics or enforce strict application blocking for a predefined time. While this system increases awareness, it fails to motivate and encourage sustainable habit changes. Many systems rely heavily on restriction-based control mechanisms without integrating any motivational strategies that actively guide users towards productive engagement.

As a result of such frustrating and strict rules, users may experience temporary compliance rather than building a sustainable habit.

Existing applications rarely combine usage analytics, a gamified reward system, educational task integration, and a focus environment within a single framework. This is the gap Digital Consciences application is trying to address and solve.

V. Methodology

The Digital Conscience system is developed as a gamified screen time monitoring mobile application using the Flutter framework for cross-platform development, that mean it is compatible with Android as well as Ios environment. And Firebase for the backend services, including authentication and cloud-based management, and real-time synchronisation. After a secure user login and authentication, the application requests permission to access device usage statistics through the Android Usage Statistics API. The app system monitors application usage in real time and classifies apps into social and productive categories. Users can set time limits for selected social media applications, and the system provides a warning notification as the limit approaches. Once the user crosses the predefined time limit set on that particular application, our application temporarily blocks access to distracting apps, ensuring controlled screen time regulation. User data is securely stored with a unique user id and only essential information, such as app name, category, and duration, is maintained to ensure privacy.

To promote positive behavioural and habit changes, the system integrates a gamified reward mechanism that allows users to regain screen time by completing short educational and cognitive activities, such as quizzes, reading tasks or logic-based challenges. We have integrated a reward system into our application. The rewards are allocated in the form of stars or time-based credits on activity completion and difficulty. Our application further improves and integrates discipline through daily goals, streak tracking, and progress comparison analytics(daily, weekly and monthly). Our application provides a dedicated focus mode that restricts all nonessential applications and permits only selected productive apps during a user-defined period of time. This creates a distraction-free environment for study or work. Through the integration of monitoring, controlled restrictions, gamification and motivational feedback, the methodology ensures a balanced and sustainable approach to digital well-being and mental health improvement.

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VI. System Architecture

The Digital Consciences system follows a modular client-server architecture consisting of a Flutter-based mobile application, Firebase Cloud Backend Services, and an Android native system integration for usage monitoring. The architecture is designed to ensure scalability, real-time synchronisation, secure data handling and efficient habit formation. The main reason for using Flutter and Firebase has a very smooth integration because both of them are from Google.

The System Architecture consists of five major components:

A. Frontend (UI)

The frontend of the system is developed using the Flutter Framework. The main reason behind using Flutter was that it has cross-platform support, which is very important for mobile application development with a single code base. And also, it has access to more than 100 prebuilt widgets from low-level (text) to complex UI elements for animation and layout. This component is responsible for all the UI components in this application. Which mainly consists of the following:-

1) User Authentication Interface: This is the login page of the application.
2) Timer Set-up and Configuration: This is for setting app timers and managing the blocked application.
3) Activity Challenge Display: This is for integrating activities into the application to gain rewards for increasing the screen time of a specific blocked application.
4) Reward and Star Tracking: This is for integrating the reward system into the application and tracking the rewarded stars for a particular activity.
5) Focus Mode Activation: This UI component is used to implement a very important feature of focus mode in our application.
6) Visual Analytics Dashboard: This helps in integrating the analytics into the application, which helps in tracking the trends of usage and blocking of the apps through graphs.

Flutter is a Google product used to make cross-platform applications. It is Dart based language based on OOP. It is a simple framework and easy to understand. It also supports hot reload that means we don't need to reload the whole application every time; we can just reload that particular component. Flutter has pre-built UI packs and better animations, and also has its own UI engine. That ensures high performance and a responsive UI rendering.

The interface is designed to be user-friendly and motivational, focusing on strengthening the behaviour rather than forcing users to follow strict restrictions.

B. Application Logic Component

This component layer manages the core functionality of the system. It acts as a mediator or a bridge between the user interface and the backend services.

- Timer management and countdown execution.
- Triggering warning notifications before time limit expiry.
- Blocking selected applications when limits are exceeded.
- Managing reward calculation (stars to time conversion).
- Monitoring daily goals and streak continuity.
- Activating and deactivating Focus Mode.

This Logic make sure a smooth integration of the usage tracking, reward allocation, and productivity application.

C. Usage Monitoring Module

The usage monitoring module is a mechanism that is implemented using the Android UsageStatsManager API through the Flutter Android integration. In this module, the application is integrated with the digital well-being function of the mobile device. This module helps in implementing the usage monitoring feature for our application. Through this module, we take the screen time of the social media application and then monitor the usage of the specific app. This is all done with the permission of the user. The main features of this module are:-

1) Collects App Usage with the Consent of the User: The application take user's permission to access the usage time of the specified apps.

2) Identifies Foreground Application Activity: This helps in getting the information on the activity of the foreground applications and understanding the usage patterns.

3) Calculates Usage Time: This helps in calculating the usage time and differentiating the usage time into productive and social usage.

4) Categorises the Apps into Social and Productive: This feature helps in categorising the application into productive or social for ease of use for the user. All the apps get placed into the two categories according to the nature of the application.

The Usage monitoring Module is very helpful for user permission and it also ensures transparency in data access.

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D. Focus Mode Module

The focus mode module is a very important module to be implemented in our application. It provides a controlled environment for the user to focus on their work or studies. Focus mode mainly functions by:

1) Restricting Non-Essential Applications: This helps in restricting all the non-essential apps and helps users to focus on productive work or studies. It also motivates students to use these apps less.

2) *Allowing Only Productivity or Study Apps:* This feature allows only productivity apps that are essential for work or study. This also includes the apps the user chooses as productive.

3) Running for User-Defined Duration: Before using the focus mode, the user has to set a focus timer. The focus mode runs until the predefined time.

4) Temporarily Disabling Social Applications: Focus mode disables all the social media applications that are not useful for the task that is being performed.

E. Backend and Cloud Services Layer

The backend of the application is based on Firebase. It is a suite for building an app and managing infrastructure on top of Google Cloud.

It is a real-time database; it is a JSON database, and it uses documents instead of a rigid table format.

Firebase serves as the backend infrastructure and provides the following services:

1) Firebase Authentication: Firebase provide secure login and authentication. It also has user identity management in it. On login, the backend creates a unique user ID every time the user gets authenticated. The document with the unique ID stores all the user information.

2) Cloud Firestore / Realtime Database: This stores the user information and the user's usage statistics. This is a main feature of the backend. It is also used to provide the real-time data of the user. It also maintains all the progress made by the user and all the rewards earned by the user. It also maintains the daily streaks of the user. It is also used to sync the user settings.

3) Firebase Cloud Messaging: This feature of the backend is used to send reminder notifications and motivational messages to the user. It is also used to send alert notifications to the user when exceeding the set limits.

F. Data Flow Architecture

The system data flow follows this sequence:

1) Step 1: User logs in through Firebase Authentication.

2) Step 2: User sets screen-time limits.

3) Step 3: Usage monitoring module tracks application activity.

4) Step 4: Warning notification is issued when the usage limit approaches.

5) Step 5: Application blocking is triggered when the limit is exceeded.

6) Step 6: User completes an activity challenge.

7) Step 7: Reward system calculates stars and converts them into time credits.

8) Step 8: Updated data is stored in the Firebase database.

9) Step 9: Dashboard reflects analytics in real time.

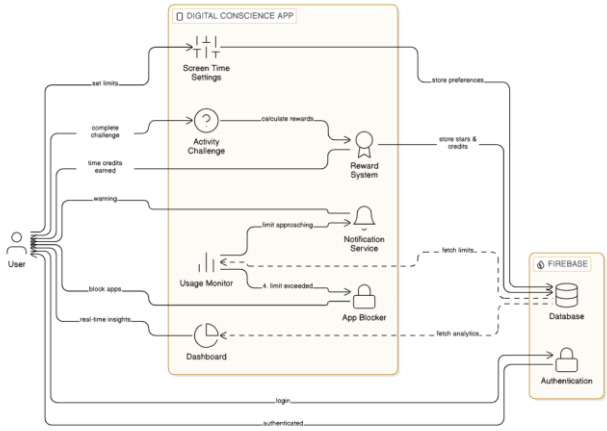

Figure I: System Architecture Diagram

G. Security and Privacy Considerations

The application follows a security- and privacy-focused design.

1) Collecting Only Essential Usage Information: The application stores only app name, category, and usage duration with the user's permission.

2) Avoiding Personal Content Collection: The system does not access personal messages, media, or unrelated private content.

3) Using Secure Firebase Authentication: Authentication and cloud services are secured through Firebase-based access control.

The system emphasizes ethical handling of user data and protects user privacy through limited data collection and secure authentication.

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VII. Evaluation And Results

To understand the effectiveness of the Digital Consciences application, the system was tested through real-world usage scenarios. The application was actively used by our development team during daily smartphone activity to observe its impact on screen-time management, productivity and habit change. The evaluation led to measuring the application's ability to monitor app usage accurately, enforce time limits, motivate users through gamified rewards, and also support distraction-free study or work sessions through Focus mode.

During testing of the application, the user set a time limit for commonly used social media applications and entertainment platforms. The system successfully tracked application usage using the Android Usage Statistics API and generates visual analytics showing daily and weekly usage trends. When the preset usage time limit is approached, the application sends warning notifications to alert the users. If the time limit is exceeded, the system automatically restricts the user from using the selected application until the next day.

The gamification part of the application played a huge and significant role in encouraging the users to restrict their screen usage. But users were also able to regain screen time in an emergency situation by completing simple and cognitive tasks and short activities such as quizzes, reading tasks or logical questions. Based on the difficulty and completion of the task, the user is rewarded with stars that will be converted into additional screen time credits. The reward-based approach encouraged the user to be productive and reduce the usage of the screens rather than attempting to bypass the restrictions.

The focus mode feature was also tested and evaluated during study sessions. All the non-essential apps were restricted successfully and effectively, allowing the user to focus on their work or study session.

The evaluation result indicates that the application has effectively helped in increasing the user awareness of digital habits and reducing unproductive screen usage. The users reportedly improved in disciplining themselves and also improved in managing smartphone usage due to the combination of monitoring, motivational rewards and controlled restrictions.

Overall, the results demonstrated that the Digital Consciences system provides an effective and practical solution for promoting digital well-being. The application successfully transformed unproductive digital habits into productive habit-building and meaningful engagement with the smartphone.

VIII. Future Scope

Although the Digital Consciences provides an effective solution for managing screen time and promoting digital discipline, there are many opportunities for future improvement and enhancements. Future versions of our application can implement artificial intelligence and machine learning techniques to analyse user patterns and behaviour, and provide personalised productivity recommendations. By studying usage trends, the application may suggest an optimal screen time limit for the user, the application would identify distraction patterns, and deliver customised motivation feedback. The system can also be upgraded with new collaborative community and interactive features, like leaderboard community challenges, and peer productivity group tp\o motivate users. Integration of wearable IOT devices or health monitoring systems could also provide better insights into the relationship between screen usage and mental health and well-being, and productivity. These are a few future scopes of the current system that we can develop. There are a lot more possibilities and future scope that are to be discovered

IX. Conclusion

The Digital Conscience project addresses the growing challenge of excessive smartphone usage and digital distraction among students and young professionals. By combining usage monitoring, gamification, motivational feedback, and Focus Mode, the system provides a balanced approach to managing screen time while encouraging productive engagement. Unlike traditional applications that rely only on monitoring or blocking mechanisms, the proposed system motivates users to regain screen time through educational and cognitive activities, transforming digital discipline into an engaging and rewarding experience.

Developed using Flutter and Firebase, the application provides a scalable, secure, and responsive architecture capable of handling real-time usage analytics and cloud-based data synchronization. Through real-world testing and daily use, the system demonstrated its ability to increase user awareness, reduce unproductive screen time, and support better focus during academic or professional tasks. Overall, Digital Conscience presents a practical and innovative solution for promoting digital well-being and helping users convert wasted time into meaningful personal growth.

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