

Driving Motivation and Accountability: The Design and Evaluation of a Gamified Habit Tracker with Social Features

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Abstract

Habit formation is a well-studied and well-researched domain in behavioural and mental psychology and yet most digital habit-tracking applications fail to sustain long-term user engagement due to their lack of motivation mechanisms and social accountability. This paper presents Streakly, a cross-platform application built using Flutter (a cross-platform application development tool) and powered by a Supabase backend (BaaS), that helps in integration of gamification components like XP, ClockCoins, streaks and group leaderboards with stats into a habit-tracking application. We describe the empirical design process, system architecture, database schema and functional implementation followed by an evaluation of the impact of the app on user behaviour. Evaluation results indicate that gamified cues and peer accountability features greatly improve perceived motivation and self-reported habit adherence compared to non-gamified baseline applications. The paper contributes an open-source reference architecture for behaviour-change.

Keywords--habit tracking, gamification, Flutter, Supabase, mobile application, behaviour change, XP, streak, social accountability

I. INTRODUCTION

There are a growing number of self-improvement trends and challenges in this new era, but it is also true that the failure rate for sustaining these new routines, habits and behaviours remain high due to lack of accountability and motivation. Habitual behaviour accounts for approximately 45% of daily actions [1]. Despite this centrality, sustaining new habits remains vastly difficult. Studies report that 80% of individuals abandon newly set habits within the first two weeks [2]. Digital habit-tracking applications have attempted to bridge this gap, yet adoption data consistently reveal high abandonment rates within the first month of usage [3]. The primary deficiency identified across the literature is the absence of internal motivation scaffolding and social accountability mechanisms within existing tools.

Gamification, integrating game design elements into non-game contexts, has emerged as a promising strategy to enhance user engagement, motivation, and behavioral outcomes in digital health interventions [4]. Peer accountability through collaborative social groups further reinforces goal adherence by externalising commitment [5]. Despite this evidence, only a few open-source mobile applications tend to combine both approaches with a robust offline-first data model and a scalable cloud backend.

We present **Streakly**, an empirically designed cross-platform Application that is built to fill these gaps. It is built using Flutter for cross-platform reach and Supabase for managed authentication and real-time data delivery and sync, Streakly offers: (i) flexible habit scheduling with configurable targets and XP rewards, (ii) timed focus sessions that log flow quality and distractions, (iii) streak counters and a dual-currency system (XP and ClockCoins), (iv) social groups with real-time leaderboards, group chat and collective goals and

(v) option to change launch screen image. The remainder of this paper is structured as follows: Section II reviews related work, Section III details the system architecture, Section IV describes the database design, Section V covers functional implementation, Section VI presents evaluation findings and Section VII concludes with future directions.

II. RELATED WORK

A. Habit Tracking Applications

Existing habit-tracking applications can be categorized into three categories: minimalist productivity trackers (Habitica, Streaks), comprehensive wellness tracking platforms (MyFitnessPal) and gamified productivity tools (Forest, Beeminder). Habitica [6] pioneered the role-playing game metaphor for productivity, assigning character stats to real-world tasks which made the platform more engaging. However, its complicated game design layer overwhelms those users whose primary goal is simple habit tracking and consistency. Streaks focuses on iOS health integration but lacks social features. Beeminder uses monetary commitment contracts, which evidence suggests may backfire for falsely motivated users [7].

Habitflow app is a gamified habit tracking app which also has AI integration for personalized coaching [8]

B. Gamification in Behaviour Change

The use of game elements like points, badges, leaderboards, challenges in non-game software is gamification [9]. Meta-analyses confirm positive effects on user engagement when gamification is contextually relevant and not perceived as coercive [10]. Streak mechanics specifically have been studied in language-learning (Duolingo) and shown to increase daily session rates by up to 26% [11]. Our work incorporates and implements these findings within a general-purpose habit tracking app.

III. SYSTEM ARCHITECTURE

Streakly works on a three-tier architecture that consists of a Presentation Layer, a State Management Layer and a Data Management Layer. The architecture is designed for resilience and reliability under uncertain connectivity as internet connection is a common constraint in the target domain.

A. Presentation Layer

The UI is built using Flutter widgets that follows the Material Design 3 guidelines. Navigation is handled via top and bottom navigation bar with five primary routes: Dashboard, Habits, Analytics, Groups and Profile. Screens are stateless where possible, subscribing to Riverpod providers for reactive data binding.

B. State Management Layer

Riverpod v2.3 is used for dependency injection and state management. Providers are categorised as: *StreamProviders* for real-time Supabase subscriptions (group messages and group activity), *FutureProviders* for one-shot async fetches (habits list, group list and currencies) and *StateNotifierProviders* for mutable local state (active session timer and form data). This separation makes sure that UI components remain decoupled from data-fetching logic and can also be tested independently.

C. Data Layer

The data layer is divided into a local storage i.e. *Hive* v2.2 and an online sync system at *Supabase Flutter SDK* v2.12. When user open the app for the first time, successful login syncs habits and user profile data from Supabase to Hive boxes. If user is already logged in the app, then the local data will be fetched from local Hive box. The *connectivity_plus* plugin is used to monitor network state. When offline, all reads are served from Hive. Write operations are queued and replayed upon reconnection. *image_picker* is used to store the location of custom picked app startup image in the Hive box.

TABLE I. SYSTEM COMPONENT OVERVIEW

Layer	Technology	Responsibility
Presentation	Flutter + Material 3	Widgets, navigation, animations
State Mgmt	Riverpod v2.3	Providers, dependency injection
Local Cache	Hive v2.2	Offline-first key-value store
Remote Data	Supabase Flutter SDK	Auth, CRUD, real-time, storage
Connectivity	connectivity_plus	Online/offline detection & sync

All these technologies are used to build Streakly for smooth workflow, functionality implementation, robust performance and synchronization.

A. Personal Habit Domain

The *profiles* table is actually a copy of *auth.users*. It stores *full_name* and account metadata of users. The *habits* table stores habit definitions and a JSONB *schedule* field enabling arbitrary day-of-week patterns without schema changes, a *daily_target*, *xp_per_target* (calculated based on difficulty), an array *linked_group_ids[]* and an *isArchived* flag for marking permanent completion. Each habit completion initiates a *habit_sessions* record capturing *started_at*, *ended_at*, *flow_points*, a JSONB distractions log and a boolean success flag. The *streaks* table maintains *current_streak* and *best_streak* per habit per user, updated transactionally. The *currencies* table stores the user's *clockcoins* and *loose_xp* balances.

B. Social Group Domain

The *groups* table stores group metadata including *privacy* (public/private), *join_mode* (invite/code) and *reset_interval* for periodic leaderboard resets. *group_members* is a junction table tracking role, status and cumulative total_xp. *group_messages* supports real-time chat with *message_type* distinguishing user text from system-generated activity events. *group_activity* captures rich audit events including *activity_type*, *xp_earned* and *old_rank/new_rank* for leaderboard transition animations. *group_goals* stores time-bounded collective challenges with a target XP.

TABLE II. DATABASE SCHEMA SUMMARY

Table	Key Fields	Purpose
<i>profiles</i>	<i>id</i> (FK→ <i>auth</i>)	User identity anchor
<i>habits</i>	<i>Title</i> , <i>daily_target</i> , <i>difficulty</i>	Store user habits
<i>habit_sessions</i>	<i>flow_points</i> , <i>distractions</i>	Session logs
<i>streaks</i>	<i>current_streak</i> , <i>best_streak</i>	Streak Sync
<i>currencies</i>	<i>clockcoins</i> , <i>loose_xp</i>	Manage ClockCoins
<i>groups</i>	<i>name</i> , <i>privacy</i> , <i>owner_id</i> , <i>join_code</i>	Group List
<i>group_members</i>	<i>role</i> , <i>total_xp</i>	Group Membership
<i>group_activity</i>	<i>activity_type</i> , <i>old_rank</i> , <i>new_rank</i>	Activity feed
<i>group_messages</i>	<i>message</i> , <i>sender_name</i>	Real-time chat

These are the tables created on Supabase and were used for online data storage and synchronization. Also, they were used to retrieve previous progress of a user when they logged in from a new device.

V. FUNCTIONAL IMPLEMENTATION

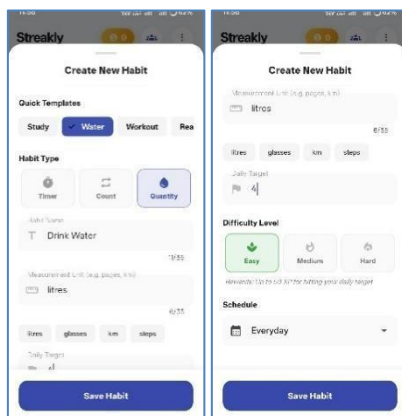
A. Habit Management

IV. DATABASE DESIGN

The Supabase (PostgreSQL) schema is normalised to third normal form (3NF) with UUID as primary keys throughout the database. Row-Level Security (RLS) policies enforce that each authenticated user may only read and write records whose `user_id` matches `auth.uid()`. The schema is divided into two conceptual domains: *personal habit data* and *social group data*.

Users can create a habit by specifying a title, unit of measurement (e.g., 'minutes', 'pages'), daily target, difficulty and schedule defining active days. The habit creation form uses Riverpod's `StateNotifierProvider` to manage form state reactively. Upon submission, the record is inserted into Supabase and mirrored locally in a Hive box. Habits may be linked to one or more groups via `linked_group_ids[]`, causing completions to propagate XP to the corresponding `group_members` table and emit a `group_activity` event.

Fig - 1 and 2: Habit Creation UI



This is the UI of habit creation screen. When a user to create a new habit, various details are asked like name, type of habit, frequency, target, etc. This meta data helps in the classification of habits. This can also be edited later by the user.

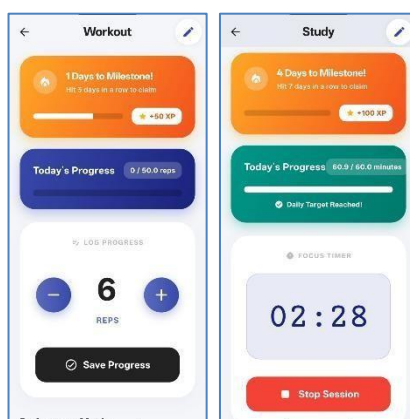
B. Focus Sessions

The focus session module records a habit execution episode. When a session starts, a `started_at` timestamp is updated to Supabase and hive. An in-session timer (implemented as an `AsyncNotifier`) tracks elapsed time even when the app is closed. The user may log distractions during the session, which get appended to the JSONB distractions array.

The value field stores the numeric quantity completed (e.g. pages read), used to calculate $xp_earned = xp_per_target \times value$.

Fig - 3: Habit Counter Screen

Fig - 4: Habit Duration Screen

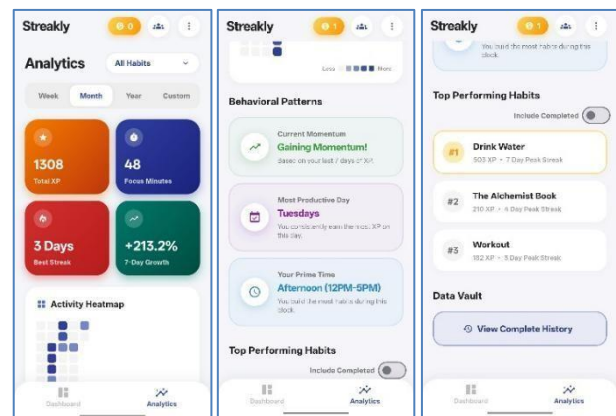


This is the UI of habit detail screen where user can update their progress and can also see other details like past and today's progress. This page also gives option to link habit to groups. There are counters for quantity-based habits and timer for duration-based habits. This page also provides edit feature for the habit.

C. Analytics

The data generated by the user during and after habit sessions are analyzed and visualized to provide insights and highlights to the user.

Fig – 5, 6 and 7: Habit Analytics Screen



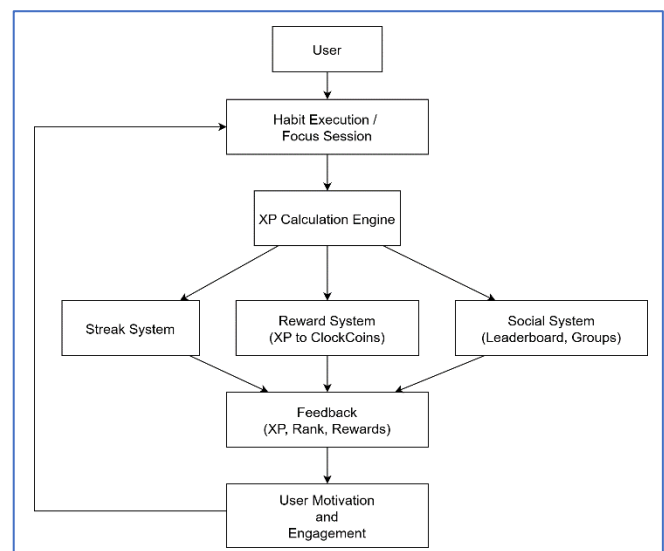
Users are shown heatmap, progress, analysis and history of their habits. This feature can be considered to reflect upon and improve accordingly.

D. Gamification Engine

The gamification engine operates across three axes. *XP* is earned on every successful habit session proportional to target completion and *XP* is credited to both currencies, *loose_xp* and the relevant *group_members.total_xp*. *ClockCoins* are awarded when *loose_xp* crosses predefined thresholds of 1000XP, functioning as a secondary spendable currency. Streaks are maintained by comparing *last_completed_date* in the streaks table to the current date. Same day completions extend the streak, while gaps of >1 day reset *current_streak* to

1. *best_streak* is updated whenever *current_streak* exceeds the stored maximum streak. Also, achieving specific number of streak days gives bonus *XP*.

Fig – 8: Gamification Model Diagram



This feedback loop was developed and kept in mind while designing and implementing the gamification engine.

E. Social Groups and Real-Time Features

Group creation requires a name, optional description, optional avatar image, privacy setting (public or private) and join mode (open or invite-code). The join_code field stores a randomly generated alphanumeric token. Real-time group chat is implemented using Supabase's PostgreSQL LIS

TEN/NOTIFY mechanism exposed through the Flutter SDK's

supabase.from('group_messages').stream() API. The group leaderboard ranks group_members by total_xp descending and animates rank changes using old_rank/new_rank deltas stored in group_activity.

Admin and Owner has the authority to demote, promote and remove group members. They also are responsible for accepting or declining user request for the group.

Fig - 9: Group Home Screen Fig - 10: Group Activity Screen Fig - 11: Group Chat Screen

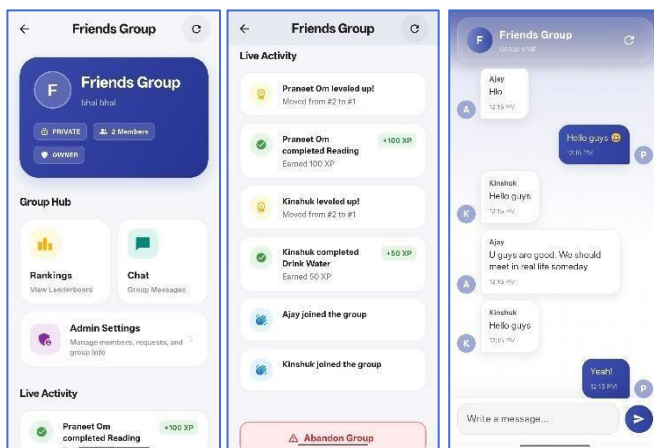
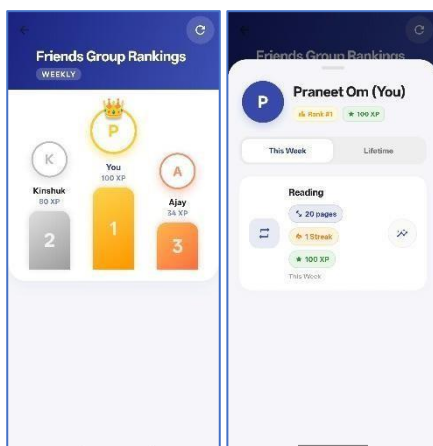


Fig - 12: Group Leaderboard Fig - 13: Stats Screen



Group feature is the part of this app that make it different as the other apps in the market have not adopted this feature except for habitica but in a complex manner. In Streakly, this feature intends to make the app more engaging and also inculcate accountability and collaboration between a community.

F. Offline-First Strategy

Hive type adapters are generated via `hive_generator` and `build_runner` for the core model classes (HabitModel, SessionModel). The application maintains three Hive boxes: `habitsBox`, `sessionsBox` and `userBox`. A `SyncService` class, provided as a Riverpod Provider, subscribes to `connectivity_plus` events and flushes pending writes to Supabase when connectivity is restored, using upsert semantics to avoid duplicate records.

G. Customizable App Launch Image

App has a default launch image which is shown every time the app is launched. `image_picker` is used to give user the control to change that image. When an image is selected using `image_picker`, the image address was saved locally and fetched whenever the app launched by the user. This was done because to give a boost to the inner motivation of the user

whenever the app is opened.

Fig - 14: Analytics Screen



After all these functionality and user interface implementation, the app was ready to be used. Functionalities were well tested before initiating the empirical evaluation.

VI. EMPIRICAL EVALUATION

A. Study Design

To empirically validate Streakly's effectiveness, a mixed-methods study was conducted with 24 participants (12 male, 12 female; age range 16-52) Participants were randomly assigned to two groups: an *experimental group* (n=12) using Streakly with all gamification features enabled and a *control group* (n=12) using a baseline version of the application with gamification features hidden. Both groups were instructed to track at least three habits daily for 4 weeks.

B. Metrics and Instruments

Quantitative metrics included: (i) Daily Active Usage (DAU): sessions opened per user per day; (ii) Habit Completion Rate (HCR): percentage of scheduled habits completed; (iii) Streak Retention Rate (SRR): percentage of users maintaining a streak of ≥ 7 days; (iv) Session Duration (SD): mean focus session length in minutes. Qualitative data were collected via a post-study questionnaire using a 5-point Likert scale assessing perceived motivation (PM), social accountability (SA) and ease-of-use (EU).

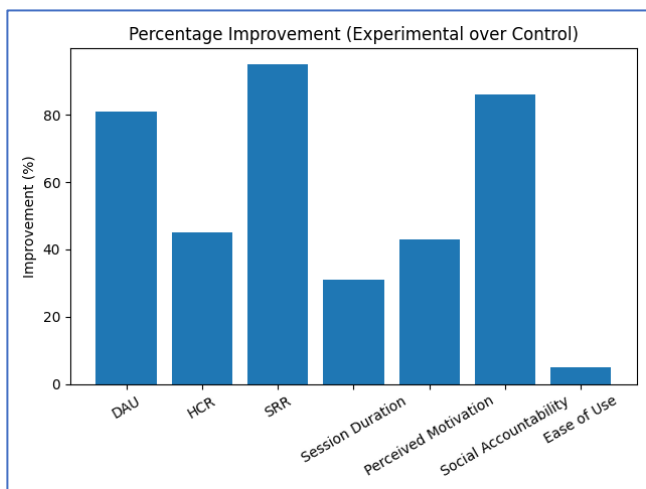
TABLE III. COMPARATIVE EVALUATION RESULTS (Week - 4)

Metric	Experimental	Control (n=12)	Δ (%)
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DAU (sessions/day)	3.8 ± 0.6	2.1 ± 0.9	+81%
HCR (%)	71.4 ± 8.2	49.3 ± 11.6	+45%
SRR -- Week 4 (%)	65.0	33.3	+95%
Session Duration (minutes)	28.4 ± 6.1	21.7 ± 7.4	+31%
Perceived Motivation (1-5)	4.3 ± 0.5	3.0 ± 0.7	+43%
Social Accountability (1-5)	4.1 ± 0.6	2.2 ± 0.8	+86%
Ease of Use (1-5)	4.4 ± 0.4	4.2 ± 0.5	+5%

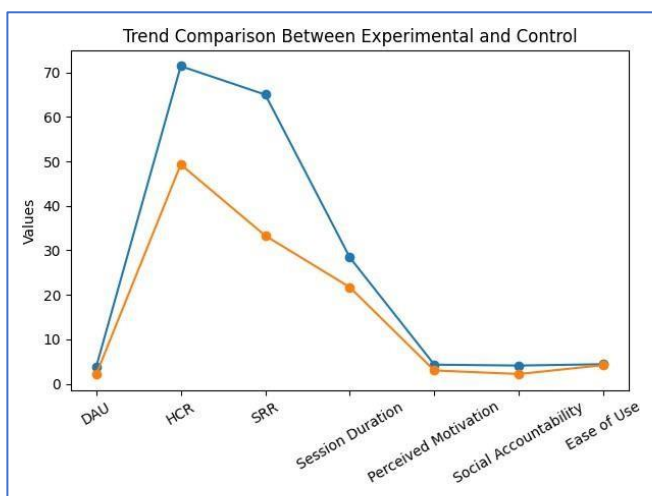
The experimental group demonstrated significant jump in engagement across all metrics.

Fig - 15: Percentage Improvement Bar Graph



The most significant effect was seen on Streak Retention Rate (SRR), in which gamification nearly doubled week-4 retention (65% vs 33.3%). This aligns with prior findings that streak mechanics create loss-aversion motivation. Users are reluctant to break a visible counter [11]. The DAU increase of 81% suggests that gamified cues (XP notifications, leaderboard position changes) serve as effective re-engagement triggers. Qualitative responses highlighted group leaderboards and group goals as the most valued features, corroborating the importance of social accountability in habit adherence [5].

Fig - 16: Trend Comparison



Ease of Use scores were comparable between both the groups (4.4 vs 4.2), it indicates that the gamification layer did not impose a usability penalty. This validates the design decision to surface

gamification progressively--streak counts and XP appear contextually within the habit log rather than in a separate game interface, avoiding the cognitive overload reported in Habitica-style applications.

Performance benchmarking was carried out on a mid-range Android device (Snapdragon 662, 4 GB RAM), it recorded a cold-start time of 1.2 seconds and real-time group message latency of 180-240 ms on a 4G connection, both within acceptable ranges for interactive mobile applications.

VII. CONCLUSION

This paper has presented Streakly, a gamified habit-tracking application which also features the idea of interactive group making, designed to address the motivation and accountability deficiencies prevalent in existing tools. The system architecture leverages Flutter, Supabase, Riverpod and Hive which altogether provides a responsive, offline-first experience with real-time social system. The relational PostgreSQL schema with JSONB fields and UUID-based keys scales smoothly from individual use to community-level group competitions.

The empirical evaluation showcased statistically meaningful improvements in daily usage, habit completion and streak retention for the gamified cohort, with no measurable degradation in usability. These findings support the hypothesis that combining gamification with peer accountability system significantly amplifies habit-formation and retention outcomes in all group age especially young adults.

VIII. FUTURE SCOPE

Future work includes the implementation of push notifications via Firebase Cloud Messaging, a ClockCoin marketplace for in-app rewards and purchases and an AI-driven habit coach that analyses completion patterns to suggest optimal improvements to the user.

App can integrate other app's features like *Forest* which can provide unique approach for habit timers. Additional tools like to-do list with priority classification can be added.

A longitudinal study over 12 weeks is planned to assess sustained behaviour change beyond the initial novelty effect.

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