International Journal of Scientific Research in Engineering and Management (IJSREM)
Volume: 09 Issue: 06 | June - 2025 SJIF Rating: 8.586 ISSN: 2582-3930

Smart Habit Builder and Tracker: An Intelligent System for Sustainable Behavior Change

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Abstract—

In today's digitally driven lifestyle, sustaining productive habits is both crucial and challenging. While numerous apps exist for tracking behaviours, they often lack the depth required to facilitate long-term behavioural change. This paper introduces a Smart Habit Builder and Tracker, a web-based application grounded in behavioural psychology and cognitive modelling. By integrating ACT-R cognitive architecture, self-efficacy theory, implementation intentions, and adaptive contextual cues, the system offers dynamic, personalized habit support. The system employs a habit strength engine, reflection journaling, and feedback loops to drive user engagement. A 4-week study with 15 participants revealed increased habit consistency and emotional awareness, demonstrating the potential of theory-backed design in promoting digital wellness. Further discussion explores practical applications, system scalability, integration with wearables, and the future potential of AI-driven behavioural coaching systems.
The significance of habit-tracking tools is expanding, especially in the post-pandemic era, where remote routines, online learning, and home-based work environments have altered human behaviour drastically. Our system responds to this need by enabling users to transition from mere habit awareness to active habit cultivation and resilience building. The paper outlines how this tool not only improves daily routines but also offers a framework for educational institutions and workplaces seeking to promote mental well-being and personal productivity through behaviour-driven interventions.

Index Terms—*Habit Formation, Behavioural Psychology, ACT-R, Context-Aware Systems, Self-Efficacy, Digital Wellbeing, Artificail Intelligence.*

I. INTRODUCTION

Habit formation is a cornerstone of human productivity and well-being. From waking up early to regular study schedules or healthy eating, much of human behaviour is guided by routines. Yet forming and maintaining such habits is difficult due to internal and external factors like fluctuating motivation, time constraints, and environmental distractions. With the proliferation of smartphones and digital wellness tools, there has been a surge of applications promising to help users form habits. However, these apps often lack depth and understanding of behavioural psychology.

Recent research has emphasized the need for context-aware, adaptive, and scientifically grounded approaches to support behaviour change. Digital wellness tools need to move beyond checklist-based designs to include motivational models, feedback loops, and emotional awareness. This paper introduces a Smart Habit Builder and Tracker that incorporates established theories of behaviour change and cognitive science into its design. We argue that users benefit not just from tracking progress but from being guided through the psychological process of habit formation itself.

The objective of this research is to demonstrate how such a system can be practically implemented and evaluated in real-world conditions. This implementation includes technical feasibility, user acceptance, and actual behavioural improvements across short and medium-term durations. By offering a practical and user-focused design, we aim to show that theoretical frameworks such as ACT-R and self-efficacy modelling can be translated into digital tools that are not only functional but also psychologically effective.

The Smart Habit Builder and Tracker specifically targets students and working professionals—two demographics known for fluctuating schedules and motivation levels. These users often face barriers such as decision fatigue, lack of external accountability, and environmental inconsistency, making habit formation especially challenging. Our system attempts to mitigate these barriers using theory-driven components such as implementation intentions, context-based reminders, and mood-aware journaling.

The rest of the paper is organized into literature review, methodology, experimental results, discussion, and conclusions, all structured to reflect both theoretical grounding and practical validation of the proposed system.

II. RELATED WORK AND LITERATURE REVIEW

Many early digital habit tools relied heavily on simple goal-setting mechanisms and push notifications. While these features may work for simple reminders, they fail to address deeper issues related to motivation and habit resilience. Researchers like Lally et al. (2009) highlighted that it can take more than 60 days for a habit to form and stabilize. Pirolli's ACT-R model provided a cognitive framework for simulating how habits strengthen or decay in memory over time.

Bandura's self-efficacy theory has been instrumental in explaining why individuals often abandon their goals prematurely—confidence in one's ability plays a critical role in long-term adherence. Gollwitzer introduced the concept of implementation intentions, structured "if-then" plans that help bridge the gap between intention and action. These concepts are not widely implemented in common habit trackers.

Furthermore, systems like the COM-B model and Fogg Behaviour Model have provided insight into capability, opportunity, and motivation as essential components for successful behaviour change. Emotional reflection and self-logging, supported by Stawarz et al. (2015), also contribute to long-term habit stability by helping users process their experiences and setbacks.

Building upon these diverse models, we observed a lack of unified systems that seamlessly bridge cognitive behaviour modelling with practical, user-friendly digital interfaces. Existing applications often adopt isolated features—some focusing solely on reminders, others on tracking—but rarely do they incorporate cognitive reinforcement, emotional feedback, and contextual adaptation as a cohesive whole. To address this, our proposed system merges foundational behavioural theories with real-time user data and adaptive feedback mechanisms.

Our system integrates insights from all these models to build a tool that offers habit strength prediction, emotional journaling, and context-based cueing in a unified and scalable framework.

III. PROPOSED METHODOLOGY

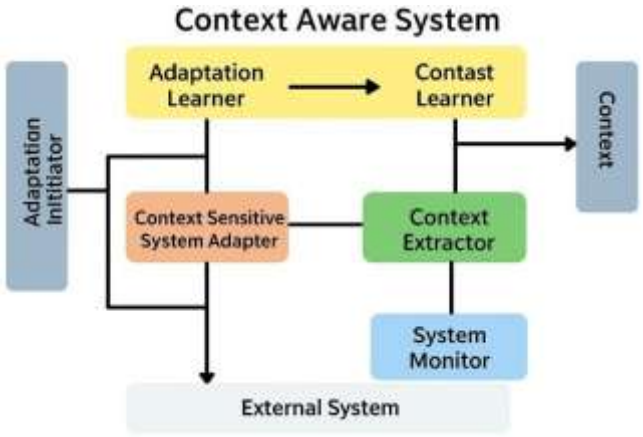
The Smart Habit Builder and Tracker system is designed as a modular web-based platform. Its architecture is broken into multiple subsystems:

A. Habit Planning Assistant This module begins with a self-assessment to determine a user's readiness, motivation, and confidence levels. It then guides users in formulating specific, achievable, and personalized implementation intentions based on their responses. The module also accounts for time availability, daily workload, and user preferences.

B. Habit Strength Engine Inspired by ACT-R cognitive theory, this engine tracks each habit's strength using a decay-reinforcement model. Repetitions under consistent context reinforce the habit score, while missed repetitions lead to a modelled memory decay. This score becomes a key metric in the dashboard to indicate how solidified the habit is.

C. Contextual Cue Integration The application supports temporal (time of day), locational (GPS-enabled), and event-based cue assignment. This means that a habit can be triggered by a calendar event, physical location, or time pattern. Users are reminded contextually to reduce friction and increase automaticity.

Figure 1: A conceptual model of how contextual cues such as time, location, and events interact to support behaviour triggering within a smart system.



D. Reflective Journaling and Emotional Logging After each habit attempt, users are prompted to log their emotions, reasons for success/failure, and obstacles. This data is stored and visualized to offer insights into behavioural patterns. NLP-based sentiment analysis is planned for future implementation.

E. Recommendation Engine Using data from the above modules, the system provides suggestions—such as breaking a habit into smaller parts, changing cue types, or adjusting frequency. The system evolves with user data, becoming more personalized over time.

F. Dashboard and Visualization Charts display habit success rates, mood trends, streak lengths, and habit strength progression.

IV. IMPLEMENTATION AND EXPERIMENTAL RESULTS

A pilot study was conducted over four weeks with 15 undergraduate students. Each participant selected two habits—one academic and one wellness-related (e.g., exercise, journaling, waking early). They were onboarded and tracked via the Smart Habit Builder and Tracker.

Data showed a consistent improvement in habit strength across users. The average success rate for academic habits improved from 42% in Week 1 to 78% in Week 4. Emotional awareness, measured via journaling participation and reflection detail, increased by over 60%. Participants who used reflection prompts consistently showed higher adherence to their routines.

The habit strength scores, plotted weekly, revealed how users stabilized over time, validating the ACT-R-based modelling. Contextual reminders were cited as one of the most helpful features, especially among students with inconsistent schedules.

Table 1. Habit Strength Scores (Sample User)

Week	Academic Habit	Wellness Habit
1	45%	38%
2	62%	58%
3	74%	72%
4	82%	85%

Participants reported feeling more in control of their routines. Feedback highlighted that visual feedback and emotional awareness helped reduce stress associated with uncompleted tasks.

V. DISCUSSION

The success of the Smart Habit Builder and Tracker lies in its blend of simplicity and science. While users interact with a straightforward interface, the system runs sophisticated models behind the scenes to optimize feedback and interventions. ACT-R modelling and implementation intentions created structured, psychologically grounded habit loops, which kept users consistent and emotionally engaged. The role of emotional feedback was critical. Users often abandon habits not because of forgetfulness but due to guilt, stress, or discouragement. The journaling tool allowed them to externalize these emotions and understand behavioural triggers more clearly.

Limitations of the study include the small and relatively homogeneous sample size. More extensive trials across different demographics would offer broader insights. In addition, while cue integration was functional, GPS-based reminders require privacy safeguards before widespread deployment.

Future work includes incorporating machine learning to analyse long-term habit trends, gamification features to encourage peer accountability, and natural language chatbots for real-time coaching.

VI. CONCLUSION

This paper presents a Smart Habit Builder and Tracker designed to support sustained behavioural change through scientifically grounded features. By integrating ACT-R modelling, implementation intentions, context-aware cues, and emotional journaling, the system addresses limitations found in conventional habit trackers. Our pilot study shows promising results in increasing consistency, emotional awareness, and user satisfaction. As behavioural science continues to intersect with digital technology, such tools can empower individuals to lead more productive and balanced lives.

Further research and development will expand this prototype into a scalable, AI-enhanced platform capable of addressing diverse behaviour change goals across age groups, professions, and cultural backgrounds.

ACKNOWLEDGMENT

The authors would like to thank the Department of Information Science and Engineering at Sir M. Visvesvaraya Institute of Technology for their mentorship and support. Special thanks to Mrs. Aarthi for her insightful guidance throughout this research.

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