Designing Multi-Modal Rewards for Positive Habit Formation Systems

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I hereby declare that this dissertation is all my own work,
except as indicated in the text:

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Executive Summary

Testing lallys study results again with positive reinforcement / rewards, how does this affect things after 66 days? Different types of rewards.

Building a Habit Formation app that focuses on Rewards. Current Habit Formation apps are not grounded in habit formation/behaviour change theory, so when people stop using them, they don't continue with the habit. [Reward theory is mainly based on a single modality,] Using Kathys research I will test several theories [that use multiple modalities] in an implementation to test their effectiveness. Resulting in an app that assists you with habit formation, for 18 to 254 days to create the habit, and has the ability to give you different type of rewards based on different theories. When the app is removed, you will continue to do the habit. I will run [x] studies for (18 to 254) + 7 days, to test the [x] reward system implementations, and see if the habit is continued for a week after.

Contents

1 Introduction

Where is the computer science in this?

What is a Habit

Habits are actions that are triggered automatically in response to a contextual cue. Associating the cue with performance and grounding the process with a reward encourages regular repetition, leading to automatic behaviour. For example, automatically washing your hands (action) after using the toilet (contextual cue) accomplish clean hands (reward). Once initiation of the action is transferred to external cues, dependence on concious attention or motivational processes is reduced. [cite : Experiences of habit formation: a qualitative study. Lally P, Wardle J, Gardner B. Psychol Health Med. 2011 Aug; 16(4):484-9. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3505409/b10]

Positive Habits

Focus on Positive Habits

Literature shows us the health principles with forming positive habits.[cite 2. Lally P, Gardner B. Promoting habit formation. Health Psychol Rev. In press: DOI: 10.1080/17437199.2011.603640. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3505409/b12] But this process of creating a habit takes on average 66 days [cite 66 day person] of repetitive use, and requires a methodical process, starting with a trigger and ending with a reward.

What are Habit Rewards

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What has technology got to do with this?

Technology can change peoples behaviour and encourage them to form a habit by guiding users through a series of experiences. Trigger, Action and Reward. Theories have explored different methods of providing people with rewards, however, literature shows that these implementations are never as affective as the theory states.

What are some of the techniques technology uses?

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Gamification

Succeed better w gamification, look at dependancy w other things, clash royale Technology can support habit formation. Gamification is a popular technique to accomplish this. [cite : Gamification Definition, http://gamification-research.org/wp-content/uploads/2011/04/01-Deterding-Sicart-Nacke-OHara-Dixon.pdf]

More modalities

TODO find reason why this should be here

Current state of technology usage

A recent review of current technology suggest that the implementations differ from the theory as all fail to support development of automaticity. [cite : Kathys, Beyond self-tracking and reminders, designing smartphone apps that support habit formation.] - Dependency on systems - Event based cues are better!

Why Build a System / Contributions / Added value

- And focus on reward delivery [cite kathys study, wasnt affective] This project aims to use technology to develop a habit forming system that provides the ability to perform a positive habit as if it was as automatic as washing your hands after using the toilet. // This project focuses on habit reward systems and how theoretical methods of sustaining habits are put into practice. This project aims to implement different types of reward deliveries through different modalities and also provides a set of design recommendation for building habit forming systems.

Summary

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Motivation

Maintaining habit behaviour when the system is removed is difficult! We try to counter this and we can feasibly find a way for people to adopt a habit without relying on a system.

Project Type

In this paper, we propose and evaluate three configurations for habit adoption. The proposed project is split 40/60 between researching different configurations and implementing three configurations.

Aims and Objectives

The aim is to achieve habit adoption when a configuration is removed.

Methodology

Prior research into different habit adoption systems will refine the design requirements for three system configurations. System A, B and C.
Will use design requirements from [1]. These systems will be constructed using a staggered approach to optimise the use of time. After testing of each system configuration, each individual system will be evaluated and the results will be compared to produce a set of implications for the design of a system.

Deliverables

Three evaluated systems to adopt habits. Design requirements from the results of testing these three systems.

Added Value

Results of studies and design requirements.

Old

Old: Systems to assist with habit adoption are intended to start new behaviours and try to maintain the same behaviour even when users disengage with the system. Existing systems aimed at improving habit adoption use single modality constructs to enforce habit behaviour, like visual cues or vibrating alarm reminders. However, prior research has established a dependency between on-going habit adoption system use and lasting change. In this paper, we propose and evaluate three systems that use different modality configurations for habit adoption in conjunction with gamification. The aim is for users to keep engaged with the habit adoption when the system is removed. A 30 day user study will be conducted to evaluate the use of each system and test how users compliance with conducting the habit improves when the system is in place and then again when the system is removed. We conclude with an implementation and evaluation of the three proposed systems for habit adoption and present a set of implications for the design of a system in this domain.

2 Habit Formation

What is a habit? :
:
:
How are they formed? :
:
Rewards! :
Technology and rewards :
:

2.1 Rewards

Why do we need them? :
:
What are they? :
:
Whats the current state? :
:

2.2 Current Systems

Dependency on these systems, dependency on the actual reward :
:
Techniuqes for sustaining habit adoption :
:
Alternatives, multi-modal cross modal interaction, Single Modality Impact on Habit Adoption Techniques :
:

3 Multi-Modal Interaction

How these techniques can be applied to habit formation? How modalities affect habit adoption?
:
:

3.1 Mobile Technology

Why might this be better? More interaction? We could fail! :
:

3.2 Techniques

To increase chance of succeeding,,, gamification? And another reason! :

4 Gamification & Habits

Why Games? :
:
What elements in games can we use to make people adopt habits? :

4.1 Existing Systems

:
:
Impact on habit formation

4.2 Gamification Elements

Impact on Habits? :
:
Impact on Multi-Modal Interaction? :
:

Habit formation, Don't Kick the Habit [2], stopping the behaviour when one stops using behaviour change apps.
Measuring Habit strength [3] [4].

Multi-Modal interaction, using multiple modalities for habit formation [], using wearable devices, such as a Fitbit device is plausible for a study [5].

Gamification elements [6], can we use any elements from Free-To-Play games?

5 Design Considerations

List of Habit forming methods :
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Categories

:
:

6 Evaluation

7 Conclusion

Will this be a successful project?
Can we obtain the value that this project adds?

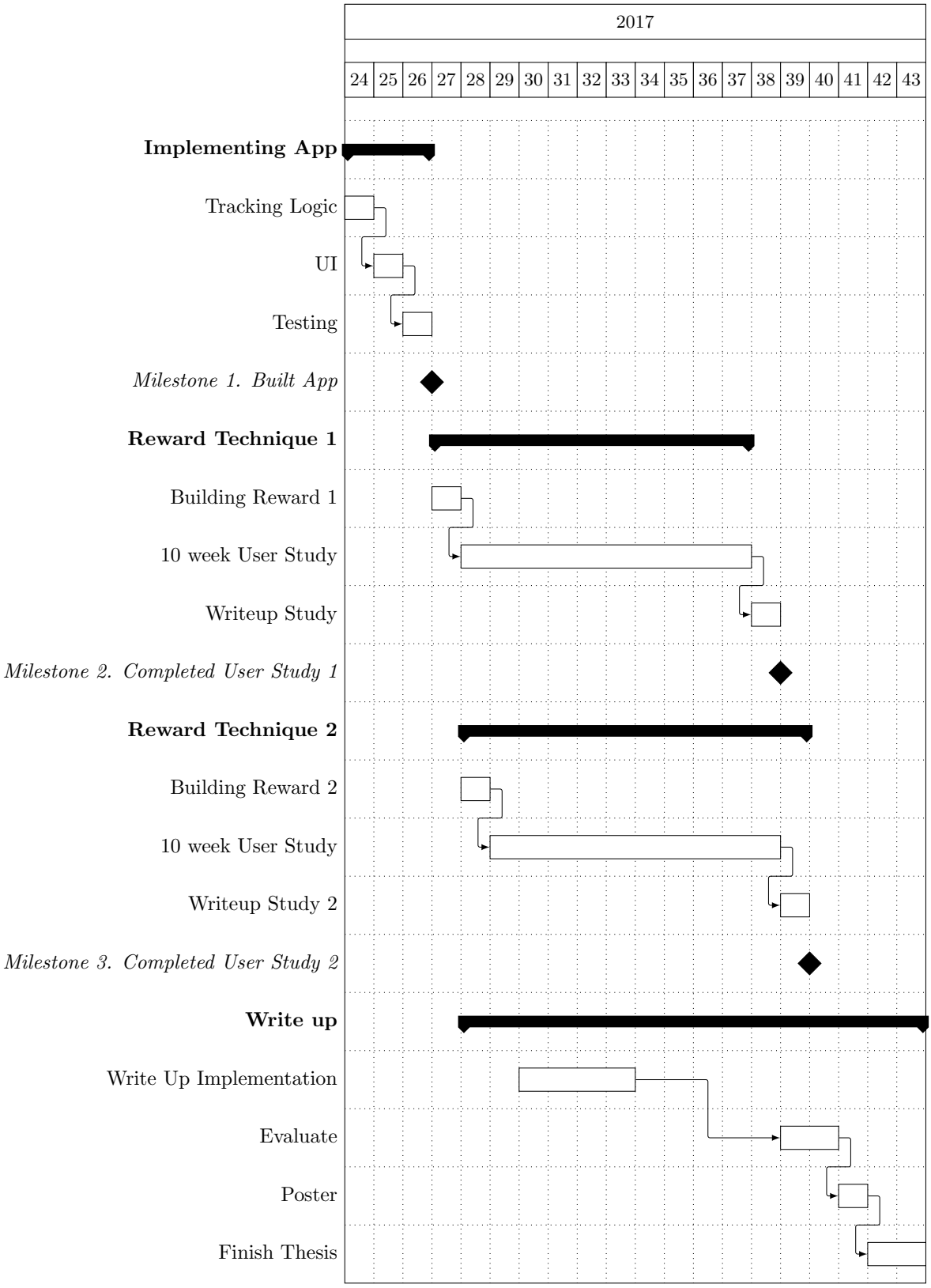
8 Work Plan

For this project there are X number of milestones to achieve.

Scope

Expected Timeline

The app is to be built, then two 30 day user studies will test the effectiveness of the app techniques.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Implementing App
Tracking Logic
UI
Testing
Milestone 1. Built App
Reward Technique 1
Building Reward 1
10 week User Study
Writeup Study
Milestone 2. Completed User Study 1
Reward Technique 2
Building Reward 2
10 week User Study
Writeup Study 2
Milestone 3. Completed User Study 2
Write up
Write Up Implementation
Evaluate
Poster
Finish Thesis

Deliverables

8.1 Risk Analysis

Table of risks and mitigation techniques.

9 References

[1] Katarzyna Stawarz, Anna L. Cox, and Ann Blandford. Don't forget your pill!: Designing effective medication reminder apps that support users' daily routines. pages 2269–2278, 2014.

[2] Ian Renfree, Daniel Harrison, Paul Marshall, Katarzyna Stawarz, and Anna Cox. Don't kick the habit: The role of dependency in habit formation apps. pages 2932–2939, 2016.

[3] Bas Verplanken and Sheina Orbell. Reflections on past behavior: A self-report index of habit strength. *Journal of Applied Social Psychology*, 33(6):1313–1330, 2003.

[4] Benjamin Gardner, Charles Abraham, Phillippa Lally, and Gert-Jan de Bruijn. Towards parsimony in habit measurement: Testing the convergent and predictive validity of an automaticity subscale of the self-report habit index. *International Journal of Behavioral Nutrition and Physical Activity*, 9(1):102, 2012.

[5] Mayrsohn BG Rowland JL Lyons EJ, Lewis ZH. Behavior change techniques implemented in electronic lifestyle activity monitors: A systematic content analysis. *J Med Internet Res 2014;16(8):e192*, 2014.

[6] W. Luton. *Free-to-Play: Making Money From Games You Give Away.* Pearson Education, 2013.