

Going up? A thematic analysis of app store reviews and interview study of a smartphone application for habit formation

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**Project report submitted in part fulfilment of the requirements for the
degree of Master of Science (Human-Computer Interaction with Ergonomics)
in the Faculty of Brain Sciences, University College London, 2015**

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ACKNOWLEDGMENTS

I would like to thank my supervisors Danny Harrison and Dr. Paul Marshall for their patience, guidance and support throughout the process; the interview participants for their willingness and openness in sharing their personal experiences of behaviour change; and my family and friends who were supportive and tolerant throughout.

Particular gratitude to my two co-habitants; my partner, Nina, who kept life at bay whilst I was immersed in writing, and never wavered in her support and belief; and my cocker spaniel, Finn, undoubtedly my favourite bundle of automaticity, whose presence help keep me present and let me know, in his own special way, when it was time to step away and take in some fresh air.

“If I have seen further, it is by standing on the shoulders of giants”

- Isaac Newton (1676)

ABSTRACT

Sustainable behaviour change is the desired outcome for many in their pursuit of improvements to health and wellbeing, and has both personal and social benefits. However, most fail at long-term change. Research in habits and in technology-based behaviour change look to address this issue, but limited research has been conducted in how technology can specifically support habit formation. This study addressed that by using a qualitative approach to investigate ‘in-the-wild’ usage of a popular habit formation application, Lift. 507 app store reviews were collated and 16 user interviews were conducted. Key themes were identified using thematic analysis. Theoretical models of behaviour and habit formation were used to discuss and understand results.

The study revealed a key challenge for designers of habit applications: how to overcome a reliance on techniques that are effective for supporting repetition of behaviour and engagement, but compromise the development of automaticity. A ‘concentration risk’ was discovered whereby clustering multiple behaviour changes into one application led to more behaviour disengagement when usage of the application ceased. Periods of disruption, and the lack of support in planning and managing those situations, was a main cause for users to stop using Lift and exposed the consequences of concentration risk. Other findings include the importance of habitual usage, suitability of behaviours for this type of technology and how these applications fit within an ecosystem of other tracking and behaviour change technologies.

The study includes design recommendations that attempt to resolve the identified issues but also emphasizes the importance of not compromising engagement and habitual usage by crudely implementing theory. The research also demonstrates the effectiveness for generating insight by combining thematic analysis of app store reviews and semi-structured interviews for a qualitative study.

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1 INTRODUCTION

Improvements in health, wellbeing and personal growth often require the frequent repetition of behaviour. Additionally, many health problems are caused by frequently engaging in unhealthy behaviour (Curtis & Aunger 2011). Despite widespread knowledge of healthy behaviours, many do not instil these behaviours and stop unhealthy ones, especially over the longer term (Marcus et al. 2006). This is often referred to as the ‘intention-behaviour’ gap; a desire to change exists but it does not successfully translate into sustainable behaviour (Webb & Sheeran 2006). Only 8% of people are successful at keeping New Year’s resolutions (Statistics Brain, 2015). Even when diagnosed with chronic health conditions many do not change behaviours linked with their conditions, or initiate new behaviours that mitigate their symptoms (Newson et al. 2012).

There are two areas receiving increased attention that attempt to address these issues and underlie the focus of this study: habits and technology. Habits are a way of supporting long-term behaviour change. Through a process of developing automaticity of behaviours, dependency on memory and motivation is reduced and behaviours are more likely to be performed in the long term (Wood & Quinn 2005). Technology is increasingly used to deliver healthcare interventions and support behaviour change (Ritterban & Tate 2009). These technologies support existing interventions, providing longer term and more pervasive support, and offer behaviour change support to a much wider audience (e.g. Free et al 2013). Mobile technologies, in particular, are a rapid area of growth given their pervasive use and increasing capabilities (Klasnja & Pratt 2012).

Although these areas are actively researched as separate topics, limited research has been conducted in the intersection: how can technology can support habit formation. This study contributed to filling that gap by evaluating a smartphone habit formation application, Lift. The Lift application is focused on supporting users in building new habits. It was inspired by theory; in ‘The Science behind Lift’ the CEO details how they discovered and applied Fogg’s behaviour model (Fogg 2009; Stubbletine 2013). Lift was selected for focus because of this claim to be grounded in theory and also because it was one of the top 10 habit applications on the UK Apple app stores when the study commenced¹, and the author has personal experience with it. Although Lift was renamed to ‘Coach.me’ at the beginning of 2015, it is referred to as ‘Lift’ in this study for consistency and simplicity.

¹ Results for keyword ‘habit’. Retrieved 16 July 2014, from <http://www.appannie.com/apps/all-stores/keyword-top/united-kingdom/?word=habit&date=2014-07-16>

A qualitative study was conducted using thematic analysis of app store reviews to gain initial key themes and semi-structured interviews to gather more detailed insights. The aim of the study was to understand how users were engaging with Lift ‘in-the-wild’, establish if it was supporting long-term behaviour and habit formation, and investigate any other influential factors related to usage and success.

Discussion was conducted through a lens of habit formation and behaviour change theories and evidence. Michie et al. (2008) highlights how important it is to focus on how effectively theory is implemented, in order to improve the success of interventions.

In addition to discussions on the findings, design recommendations and future work were identified to provide actionable outcomes from the study.

2 BACKGROUND

2.1 Overview

This section contains a review of relevant literature. An overview of behaviour change research sets overall context and a few specific areas related to Lift's approach are also included. A review of habit literature defines what habits are and how they are formed, which supports an evaluation of Lift's habit capabilities. Finally, a review of how technology has been used to support behaviour change and habit formation is included, to consider existing approaches and associated research.

An overview of the 'Lift' application is also included.

2.2 Behaviour change theory

Behaviour change interventions are broadly defined as “...*coordinated sets of activities designed to change specified behaviour patterns*” (Michie et al. 2011). A large number of behaviour models and behaviour change theories have been created that support these interventions. Prominent examples include the Theory of Reason Action (TRA), the Theory of Planned Behaviour (TPB), and the Stages of Change model (Mariella et al. 2012; Taylor et al. 2006).

Recently, there has been effort to construct integrated frameworks to make theory easier to navigate and implement. For example, MINDSPACE was created to support using behaviour change theories to shape public policy (Dolan et al. 2012). Another example is the Behaviour Change Wheel (BCW) by Michie et al. (2011). The BCW is intended to help design interventions and is described as, “...*a 'behaviour system' at the hub, encircled by intervention functions and then by policy categories*”. In related work, Michie et al. (2013, p. 81) have created a taxonomy of 93 Behaviour Change Techniques (BCTs) that are “...*consensually agreed, distinct BCTs...*” and “...*offers a step change as a method for specifying interventions*”. This collection of BCTs provides a useful way of comparing and contrasting different interventions and solutions using consistent terminology.

There is a mixed picture of how effective theory has been in leading to successful behaviour change. There are meta-reviews that find a positive effect (Glanz & Bishop 2010; Taylor et al. 2012) and others that find no correlation or even a negative impact (Gardner et al. 2011; Prestwich et al. 2014). The challenge in these comparisons is that they do not consider how effectively a theory has been implemented, or if it was an appropriate choice of theory (Michie et al. 2014).

2.2.1 Fogg Behaviour Model

Fogg (2009) has created a simple, high level model to frame behaviour change and is introduced here as it has been cited as the main inspiration behind Lift (Stubbletine 2013). His model consists of three elements: Motivation, Ability and Trigger; all of which are simultaneously required at sufficient levels for a behaviour to occur.

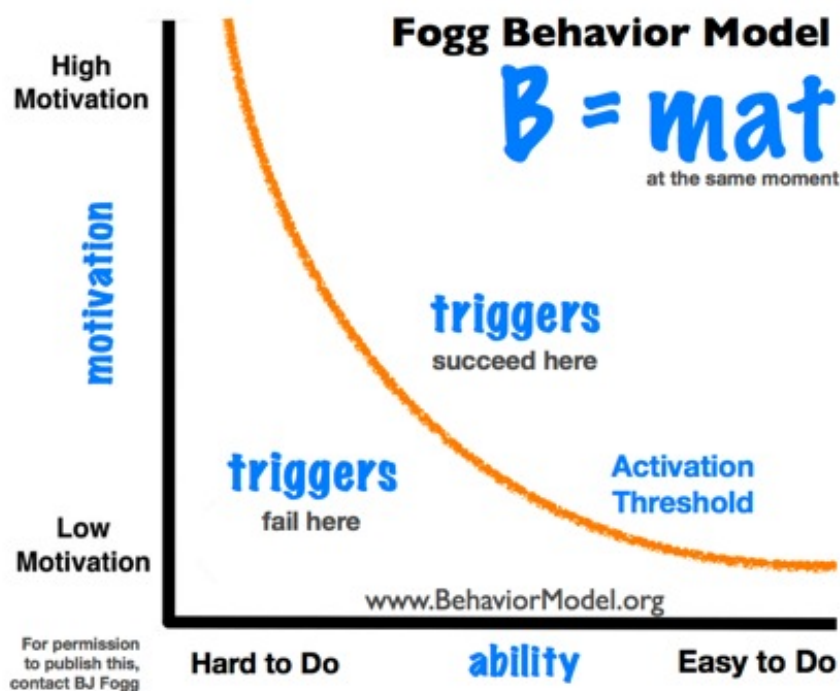


Figure 1. Fogg Behaviour Model (Fogg 2009)

His diagram (figure 1) explains how these three interact. It can be seen that by reducing the requirement for ability (by increasing simplicity), there is less dependence on motivation. This is the idea behind ‘Tiny habits’: create behaviours that are so easy to do they require little motivation to initiate and frequently perform (Fogg 2015). For example, flossing one tooth. Over time, as the habit is established, the behaviour difficulty is gradually increased.

2.2.2 Multiple behaviour change

Multiple behaviour change is where interventions target simultaneous behaviour changes. For example, focusing on exercise and nutrition at the same time (Prochaska et al. 2008). The research on single versus multiple behaviour change has mixed results. A 2010 meta-analysis suggested interventions should “...*focus their intervening on a single behaviour rather than potentially overloading their patients with multiple behaviour changes*” (Sweet & Fortier 2010, p. 1737).

However, a 2011 review found encouraging results for Multiple Health Behaviour Change (MHBC) in some areas, such as addiction (Prochaska & Prochaska 2011). Spring et al. (2012, p. i3) highlights that “...*more remains unknown than known about how to optimise multiple health behaviour change*”. They state more research is needed to establish optimal numbers of behaviours to target, how behaviours should be selected, and if they should be tackled simultaneously versus sequentially.

2.2.3 Fixed vs growth mindset

The theory of ‘fixed vs growth mindset’ is not typically considered a behaviour change concept and it originates from developmental psychology. However, Lift cites it a direct inspiration for some features and appears central to the philosophy of Lift (Frey 2014).

The theory states that individuals either have a more fixed or growth mindset. A fixed mindset believes intelligence is an ‘inborn trait’ and remains static. Those with a more growth mindset believe intelligence is flexible and can increase over time (Dweck 2006). Evidence suggest those with a growth mindset have a more positive attitude towards the value of effort and embrace challenges more readily. Results from multi-year studies on young students saw a correlation between a growth mindset and higher performance (Blackwell et al. 2007).

A growth mindset can be cultivated by emphasising challenge and effort, using meaningful progress measures and evaluating growth not outcomes (Dweck 2006).

2.3 Habits

Habits are a form of automated behaviour. From a lens of behaviour change, habits sit on both sides of the coin. On the negative side, existing and engrained 'bad' habits explain why much behaviour change is difficult and on the positive side habits can be leveraged as an effective way of making sustainable behaviour change (Rothman et al. 2009).

In its simplest form, a habit is an impulse to act that is activated automatically in response to an internal (e.g. an emotion or thought) and/or external trigger (e.g. a notification or specific place). Frequency is often considered to be a key component of a habit but Gardner (2012) highlights frequency of behaviour is not necessary for the habit construct, some habitual behaviours are activated infrequently. Frequency, however, is important in habit formation.

Automaticity has two important consequences: limited cognitive resources are needed to perform habits and there is no emotional 'flavour' to the behaviour (Wood

et al. 2002). This increases the chance the behaviour will be performed and mitigates the effect of reduced motivation derailing the behaviour. Even if there is an intention or motivation to perform an alternative behaviour, strong habits dictate the behaviour (Verplanken & Aarts 1999) - which explains why breaking bad habits can be so difficult.

By regularly repeating an action in a consistent context over time a habit will likely form. Once it is formed it will be automatically triggered - without conscious deliberation - when that trigger is experienced. Research suggests 66 days is the average for habit formation but can take years in some cases depending on the habit, strength of existing bad habits and individual attributes (Lally et al. 2010). Lally & Gardner (2013) describe a four-stage process for habit formation. Firstly, a decision or intention to perform the behaviour is needed. Secondly, this intention must be translated into action, often through planning. Thirdly, the behaviour must be repeated. Fourth, it must be repeated in way that supports automaticity; primarily in response to a stable context or trigger. The challenge is in stages 3 and 4, where the behaviour must be frequently repeated in a stable context for the habit to form (Wood & Neal 2007). For Lift to be a successful habit formation application it is in these stages where it will need to provide support, and this will be a key lens for evaluation in this study.

During the 3rd stage, behaviour is driven by intentional behavioural processes. Techniques such as implementation intentions and self-monitoring can help (Lally & Gardner 2013). Implementation intentions (IIs) are deliberate plans of the form 'When X occurs, I will do behaviour Y' (Gollwitzer & Sheeran 2006). They essentially mimic a habit, but are driven by deliberate processes. Creating IIs introduces a level of automaticity, similar to habits but more goal directed. They bring the triggers into awareness and intentions are less likely to be forgotten (Sheeran 2002). A meta-study demonstrated their effectiveness in bridging the 'intention-behaviour' gap (Gollwitzer & Sheeran 2006). Self-monitoring involves keeping track of aspects of behaviours or outcomes, often to increase self-awareness (Snyder 1974). Interventions that include self-monitoring are more effective than those without (Michie et al. 2009).

Rewards are an aid to habit formation but not a part of the habit construct. If an on-going behaviour is contingent on a reward it does not meet the automaticity threshold needed to be a habit (Dickinson 1985). However, rewards can be seen to be both a motivator to behavioural repetition but also in strengthening development of automaticity (Judah 2015). Intrinsic rewards are generally considered more effective in this context than extrinsic ones; there is evidence that rewarding every behaviour with an extrinsic motivator can damage the habit formation process by reducing intrinsic motivation (Deci et al. 1999).

2.4 Technology for behaviour change

Using technology to deliver behaviour change is a growing area (Ritterban & Tate 2009). There is particular interest in leveraging mobile technology as a way of reaching larger populations for lower cost than in-person interventions (Klasnja & Pratt 2012). There are four key reasons why mobile technology is an attractive area for interventions Klasnja & Pratt (2012):

- Wide adoption of smartphones with increasing capabilities; approximately 71% had a smartphone in the UK in April 2014 (Arthur 2014)
- Most carry their phones everywhere
- Most are attached to their phones
- Availability of context awareness features; sensors and personal information

There are many applications developed in research to support behaviour change. Common examples includes those that allow self monitoring of personal data such as nutrition and physical exercise (e.g. Lee et al. 2006; Consolvo et al. 2008), those that present and analyse data from external sensors such as blood pressure monitors and fitness bands (e.g. Denning et al. 2009), and games that teach healthy living (e.g. DeShazo et al. 2010). There are many more in the commercial arena available on app stores, and a plethora of separate physical devices used to track and monitor body data and activity.

Studies have conducted reviews of technology interventions across behaviour types and their effectiveness; examples include for weight loss (Levine et al. 2013), physical activity (Vandelandotte et al. 2007), smoking cessation (Shahab & McEwen 2009) and diabetes management (Holtz & Lauckner 2012). In general, across Internet based interventions there is “...a small but significant overall effect on behavior” but, “...reported efficacy and effectiveness of individual interventions vary hugely” (Morrison et al. 2012, p. 1).

Additionally, studies have reviewed how effectively theory and behaviour change techniques have been implemented in interventions. Yang et al. (2015) compared 100 of the top ranked physical activity applications to the Behaviour Change Taxonomy by Michie et al. (2013). They found biases towards techniques they claim have more modest evidence (e.g. social media integration for social support) rather than those with more established efficacy (e.g. self-monitoring). The study does not offer reasons why this bias exists, although speculates the lack of self-monitoring may be due to automated sensing capabilities. It also does not consider how techniques are combined for an overall effect. Lift contains both social support components and basic self-monitoring capabilities, which are central to its use. As part of this study the combination of techniques provided by Lift will be examined.

There is little research on habit formation applications. A recent piece of research performed a study of reminders and rewards, and a theoretical analysis of popular habit forming applications, including Lift (Stawarz et al. 2015). In a four-week study, they compared how effective smartphone reminders were with real world triggers, and the role of positive rewards. They discovered reminders were more effective at ensuring repetition of behaviours but were not as effective as real world triggers in developing automaticity. This highlights how a feature may support one component of habit formation, repetition of behaviour, yet impede another, developing automaticity. It raises the question of what other features in these applications may have a similar effect.

Functionality	Habit formation elements	Behavior change techniques	Examples apps
Task tracking	-	Self-monitoring, Feedback on behavior	Daily Habit
Reminders	-	Prompts / cues	Healthy Habits
Graphs & stats	-	Feedback on behavior and its outcomes, Self-monitoring	Way of Life
Goal setting	-	Goal-setting	HabitFlow
Calendars	-	Feedback on behavior, Self-monitoring, Goal-setting	Habit Calendar
Goal progress tracking	-	Feedback on outcomes of behavior, Self-monitoring	Strides
Rewards / points	Positive reinforcement	Rewards & incentives	Habit RPG
Notes	-	Prompts / cues	Any Habit
Habits library	-	Goal-setting, Action planning	The Fabulous
Pictures	Cues	Positive self-talk, Rewards & incentives, Prompts / cues	The Habit Factor
Motivational quotes / own statements	Positive reinforcement	Positive self-talk, Rewards & incentives	Good Habit Maker
Peer support / feedback	-	Social support, Feedback on behavior	Lift
Visual cues on home screen	Cues	Prompts / cues, Feedback on behavior	3 Week Habit
Routine creation	Implementation intentions	Action planning, Goal-setting	Habitual Free

Table 1. Theoretical analysis of habit formation applications by Stawarz et al. (2015)

For the theoretical assessment, they reviewed 115 iOS and Android applications and created a categorization system based on marketing literature. These applications were coded for habit formation elements (based on habit literature) and for behaviour change techniques (based on the taxonomy by Michie et al. 2013).

Table 1 (above) summarises their analysis. They found limited support for techniques grounded in habit formation theory and highlighted the risk of dependency, and to automaticity, when reminders are used as triggers. Although this highlights a gap in how habit theory is being implemented in applications, it is not clear if this is effecting longer-term behaviour change or habit formation ‘in-the-wild’.

Models to support building behaviour change technology have been created. Fogg’s B=MAT model of behaviour has been translated into a set of eight steps for persuasive design (Fogg 2009a). Specifically to building habit forming technologies, Eyal (2014) created a four stage model of how to ‘hook’ users by combining the commonly found three step habit formation process of trigger, behaviour, reward with a fourth stage of ‘Investment’ that ‘loads the next trigger’, increasing the likelihood users will return. These models are mostly focused on techniques to build technology for frequent use or habitual use, rather than for technology that supports broader behaviour change or habit formation.

2.5 Lift

Lift is a smartphone application, available for iOS and android, and via the web, that supports changing multiple behaviours in order to form habits.

Users can select or create habits they wish to develop and then track their progress (see figures 2 & 3, overleaf). It has several mechanisms to motivate regular usage including visuals to demonstrate progress, rewards at various points and social components. Streaks, based on the Seinfeld method (Isaac 2007), are one of its main ‘reward’ features. Streaks are built when a behaviour is performed for a series of consecutive days - the number of days is the streak. It can be seen how this supports habits by motivating frequent repetition of behaviours, which is a key component in habit formation (Lally & Gardner 2013).

The social components include the ability to follow others and be followed, to give and receive ‘props’ which are similar to ‘likes’ on other social networks, and a Q&A section where questions are posed and responded to. Lift also offers ‘plans’ which give more specific details about how to perform the behaviours, typically with daily instructions.

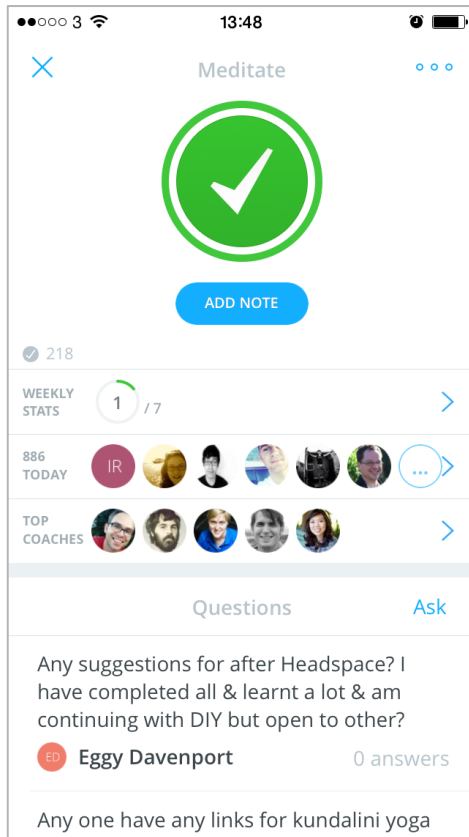


Figure 2. Lift: Checking in to a habit

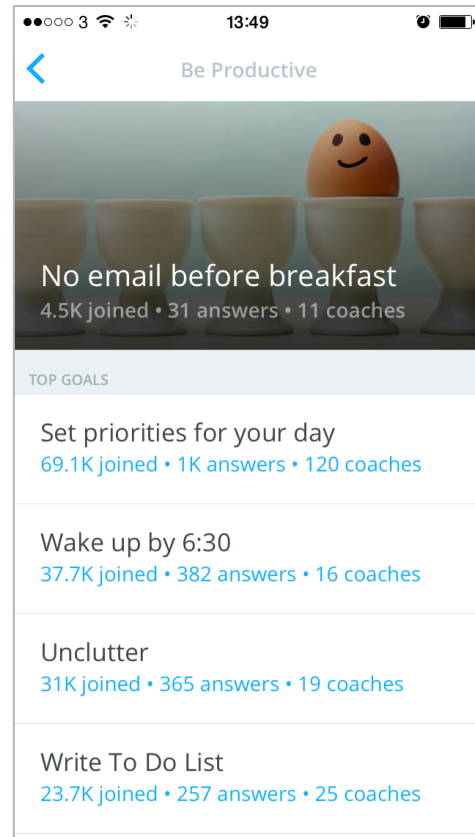


Figure 3. Lift: Joining a new habit

During this study, Lift has introduced a coaching model², where users can pay a monthly fee for a personal coach to support their change. This study did not focus on coaching for two reasons: the focus was on how technology specifically supports behaviour change, and, as a new feature, participants had limited experience.

In their blogs, Lift identifies several theories from psychology as inspiration. Cited as the original inspiration behind Lift is Fogg's B=MAT model (Fogg 2009), "*When people ask us what psychology we used to design Lift, we almost always point them to BJ Fogg*" (Frey 2012). More recently, they have explained some features in terms of Dweck's 'fixed vs growth mindset', "*...there's another Stanford professor that's just as influential [on Lift], Carol Dweck*" (Frey 2014).

Lift was released in late 2012 and has released frequent updates; 33 have been discussed on their blog ("Coach.me" 2015).

² Coaches were introduced in late 2014

2.6 Summary

Technology based interventions and behaviour change are focus areas for research, and increasingly habits are being explored as a way of supporting long term and sustainable behaviour change. However, there is little research on how technology can support habit formation. The two-part study by Stawarz et al. (2015) is the only research conducted in this space. From that study, questions remain of how other features, in addition to reminders, support repetition of behaviour versus automaticity, and if a lack of theoretical grounding in habit theories is actually impeding applications in supporting long-term behaviour change and habit formation. Additionally, fledgling research in multiple behaviour change has not extended to consider changing different types of behaviour simultaneously.

This study looked in detail at one application, Lift. The aim of the study was to understand how users were engaging with Lift ‘in-the-wild’, establish if it was supporting long-term behaviour and habit formation, and investigate any other influential factors related to usage and success. A qualitative approach supported an exploratory and deeper dive into the behaviours, motivations and outcomes of users.

3 METHODS

This section explains which methods were chosen and why. Heckler et al. (2013) suggested some approaches for evaluating behaviour change technologies that do not require lengthy studies. Two of those concepts were used: focusing on “meditation/path and moderation” i.e. establishing how an intervention works and for whom and under which circumstances, and using theory to evaluate qualitative data. Because of time constraints a longitudinal approach was not feasible.

No published research has been conducted on Lift or a similar habit formation application. Thus a qualitative approach was selected, which supported the more ‘open-ended’ enquiry needed (Moriarty 2011). This approach will involve thematic analysis of both app store reviews and semi-structured interviews to gather data and identify themes.

3.1 Thematic analysis of app store reviews

Information shared online is a rich source of information that can be relatively easily and quickly extracted, whilst avoiding the Hawthorn affect (Kozinets 2010; Stand 2000). ‘App stores’ are a valuable source of insight (Pagano & Maalej 2013) and will be used as the source of data in this study. Reviews of Lift will be scraped from the Apple App Store and thematic analysis will be used to generate initial themes for investigation in interviews.

This method was preferable to questionnaires as responses are unprompted and thus independent of researcher bias, and is quicker to gather data that will allow more time for interviews.

3.2 Semi-structured interviews

Semi-structured interviews are a common qualitative study technique (Britten 1995). They are useful to structure discussions and investigate behaviours and motivations (Cooper et al. 2007). Whilst a structured interview gives more consistent information and an unstructured interview would give more freedom to probe, the semi-structured format is a compromise that is the most commonly used qualitative method (Rubin & Rubin, 2011).

Interviews have been partnered with app store reviews as they offer complimentary strengths and weaknesses. The reviews give an unprompted and independent set of data quickly, whilst interviews allow a deeper exploration although introduce more researcher bias and are time consuming.

3.3 Thematic analysis

Thematic analysis is a common technique to identify and analyse key themes from qualitative data (Boyatzis 1998), it is considered a useful method for capturing the intricacies (Guest et al. 2011). It was used for both the app store reviews and interviews.

The approach taken followed the six-stage process outlined by Braun & Clarke (2006):

1. Familiarise self with data
2. Generate initial codes
3. Search for themes
4. Review themes
5. Define themes
6. Produce report

An inductive approach was used, where the data was solely used to form codes and themes. Theory was introduced after themes were identified to support ‘theoretical agnosticism’ (Henwood & Pidgeon 2003).

4 THEMATIC ANALYSIS OF APP STORE REVIEWS

In this phase, a thematic analysis (Braun & Clarke 2006) of app store reviews of Lift was conducted to identify key themes from a broad set of users. These themes were used to guide the interview phase. The three research questions identified previously influenced this stage: (1) does Lift support behaviour change and habit formation, (2) if so, how does it do that, and (3) what other circumstances or factors are influential.

There is precedent for using app store reviews to garner insight. Pagano & Maalej (2013) assert that app store reviews “...include useful comments, bug reports, user experience, and feature requests”. Stawarz et al. (2014) used app store reviews to evaluate medication reminder applications. It enabled them to gather over 1000 user reviews from 40 applications, and with thematic analysis gain a real-world understanding of use in an effort efficient manner.

4.1 Method

4.1.1 Design/Materials

The main item used was a script³ that downloads reviews from all Apple app stores across the world. Excel was used to process and analyse these reviews.

Due to the public nature of reviews, participant’s consent was not sought and no rewards were paid. As per Sudweeks & Rafaeli (1996), analysis of publicly posted messages without approval was not considered a violation of privacy.

4.1.2 Participants

507 unique participant's reviews were coded. The majority (351; 69%) were from the USA app store, with notable numbers of participants using the Canada store (40; 8%) and the UK store (33; 7%). The remaining 83 (16%) were distributed across a further 30 countries’ stores. No further demographic information about participants was available.

4.1.3 Procedure

Reviews of Lift were downloaded from global Apple app stores. Reviews were filtered by removing duplications, those not in English, those for versions earlier than 1.6 and those without substantive information (e.g. “great app” or “hated. deleted.”). Version 1.6 was selected as it contained the majority of current features

³ Retrieved 10 June 2014 from ‘<http://tellini.info/2011/05/scraping-mac-app-store-reviews/>’

and allowed a sufficiently large set of reviews. App store ratings were kept with reviews for additional reference.

The first 20 reviews were coded slowly to identify a core set of codes. The remaining reviews were coded using those codes and extending the set as necessary. In hindsight, it would have been beneficial to code more reviews slowly to create a better initial set, as it was refined noticeably during the coding. After initial coding was completed, the codes were reviewed, refined and aggregated. Average app store ratings were created for the top 5 codes. Codes were then grouped into key themes on an affinity diagram for reporting.

4.2 Results

Six key themes were identified from the thematic analysis of the app store reviews, and are presented here.

4.2.1 Application evolution has been impactful

Participants reported how they experienced the regular updates to Lift. The most frequently cited was how participants were unhappy with how Lift has evolved (n=92), *“I have loved using Lift in the past, but some of the changes in this version are frustrating and even upsetting to me”* (P341). Participants took issue with changes to features they had found useful and introduction of new features that interrupted their usage.

Many comments came from the 1.9x update, when some of the popular social features were removed, *“Receiving props by others and seeing how they are getting on with their habits each day was really motivating. With the social activity feed gone sticking to a habit will be harder”* (P64).

In many of these cases participants suggested they would no longer use the application. Several indicated they had previously achieved successful behavioural changes and ‘loved’ the application, *“This WAS my most used and loved app! [...] It really did keep me motivated and on track [...] Crazy to go from most used to deleted!”* (P388).

Some, however, appreciated the regular improvements and innovation, *“I have been using Lift for over a year and it keeps getting better. The team at Lift keeps innovating with improvements to the app”* (P281).

Although several of the unpopular changes were short lived, participants who’d had successful behaviour changes had already been ‘driven’ from the application. It raises an interesting question on consequences of leaving the application and how that impacts behaviour change.

4.2.2 Successful behaviour change

Many participants (n=83) indicated the application has helped them make successful behaviour changes, *“I now have ten daily habits that I do consistently that I had previously struggled with”* (P146). Some went further and indicated it has had a profound effect on their lives, *“This app has literally changed my life. 2013 was the best year of my life and that is in large part thanks to Lift”* (P408).

Participants highlighted ways that Lift has assisted these changes. They talked about how it held them accountable, *“It does a phenomenal job of keeping you accountable to the habits you want to set for yourself”* (P303) and increased motivation, *“It has been so helpful and motivational for me to do stuff that is for my wellness”* (P325). Others talked about how it helped them focus on their goals, *“This app allows me to keep things top of mind and I feel a sense of accomplishment everyday”* (P233).

One participant identified how making these successful changes made him feel better about himself, *“It boosts my self esteem, cos. I can see myself doing good stuff and missing out on the bad, ie fast food”* (P1).

From this evidence, Lift is supporting successful behaviour change for some users. However, a deeper exploration of that successful usage is needed to understand more about the causes and attributes of those successes.

4.2.3 Social features generally appreciated and effective

Many participants mentioned the social or community features of Lift, with most (n=76) having a positive outlook, *“... the other users all share a common goal. Help others succeed. You will not find the same community anywhere else”* (P37).

Participants suggested a sense of ‘belonging’ were key parts of how the social features supported behaviour change, *“I feel like I'm a part of something bigger when I use it. It is almost as if we are all keeping each other in check in a positive way...”* (P168). Additionally, others highlighted how a community with like-minded people attempting to make the same changes contributed to that sense of belonging, *“I like fact others who trying accomplish similar habits are able to like and comment on your progress”* (P134).

Others highlighted how they felt supported by the community and how they appreciated being able to give support. Participants suggested part of the appeal was how simple it was to do, *“The Lift community is really supportive, and the app makes it easy to both give and receive support”* (P290).

More specifically, participants identified props as an effective way to support and be supported, highlighting how they invoked positive affect. They noted how they appreciated props from people trying to make the same changes:

“Went from chocoholic to current 145 days streak of no sweets [...] thanks to Lift and the props from strangers trying to break the same habit.” (P89)

However, some found the social features less desirable. Several focused on how they were uncomfortable with ‘strangers’ being involved with their experience, *“...I just don't like the idea of some random person watching my progress” (P265)*. Others expanded on that to suggest feedback from ‘strangers’ was not motivating and negatively affected their experiences, *“...if you're not the kind of person who's motivated by props and comments from strangers, it can be fairly off-putting” (P34)*.

For some, though, their issues were with privacy, *“why should my personal goal or habit be so public. I don't like it!” (P234)*. Earlier versions of Lift did not support private habits; this was added in a later version.

The social features appear to be supportive and motivating to many participants. Props, in particular, were identified as being supportive and helpful. Although some did not want to engage with these features and more insight is needed to understand the causes of that.

4.2.4 Everyday usage

Participants did not discuss their usage patterns in much detail. However, a significant number of participants stated they used the application every day (n=45), *“I work Lift into my daily schedule...” (P433)* and *“Lift for me is one of the few apps I use on daily basis...” (P86)*.

For those using it daily, their average rating of the app was 4.94/5.00 compared to an overall average of 3.84/5.00. Although a crude indicator, this suggests a correlation between daily usage and positive experiences, although it is insufficient to conclude causation in either direction.

Some stated usage was part of a routine or structure, *“I'm using it daily, it's now part of my routine” (P70)* and *“I work Lift into my daily schedule and try to keep streaks going” (P433)*.

Although others admitted they forgot to update Lift on occasion, *“...sometimes I miss checking in” (P31)*. One participant specifically called out the need to form a

habit of using the application to gain the benefits, *“you need to form a habit to use this app before you can use it to form other habits”* (P43).

Participants only gave a taste of how they used Lift, but evidence here suggests usage patterns are important for further enquiry.

4.2.5 Design and ease of use supports frequent use

Although design and usability are not explicitly about behaviour change, it is evident from many participants that they are important components of their experience of Lift.

The overwhelming consensus was positive on the overall design, *“...this is a very simple app (in both concept and beautiful minimal design)”* (P259). P192 summed up how simple Lift’s core flow of features works, *“...plan a goal, mark it when done each day and get props from others as motivation to continue. It’s simple, functional and a great minimal design”* (P192). Others explicitly tied the simplicity to its effectiveness and behaviour change, *“I love how simple it is to use, and I have definitely strengthened some of my own habits”* (P358).

Beyond being simple and easy to use, others expressed how they enjoyed using Lift, *“A beautiful app that makes self-betterment a fun goal instead of a chore”* (P330) and *“I really enjoy this app and find that I am much better at tracking what I do”* (P440).

Lift’s simplicity and ease of use were well thought of by participants and likely contribute to on-going engagement and frequent use. In the interviews, this will be expanded by asking more generally about liked and disliked features of Lift.

4.2.6 Streaks are the primary motivator

Participants suggested that Lift helped increase motivation and that supported their successful behaviour changes. The most frequently mentioned motivational feature was streaks. Lift’s implementation of streaks is based on the Seinfeld method, where performing a behaviour for periods of consecutive days constitute a streak (Isaac 2007).

Participants explained how building a streak feels like a positive reward, *“...I love seeing the number of days in a row grow and grow”* (P244) and how it was motivating, *“The small kick in the pants I get from Lift each day to keep my streaks going has me speaking passable Spanish”* (P227).

Others emphasised that it was more a fear of losing the streak that was motivating, *“When I’ve stuck to a habit for 10 days in a row, I really don’t want to lose that streak”* (P143).

Additionally, some suggested streaks helped them on days when they did not feel like performing their behaviours, *“So many times I was feeling too lazy or rushed to make my bed or do at least 3 rounds of sun salutation [...], but the thought of breaking my streaks totally overpowered the laziness”* (P170).

Lift’s implementation of the Seinfeld method (Isaac 2007) was well received by participants. They motivated either by garnering a sense of challenge or from fear of loss.

4.3 Discussion

As many of the findings will be explored and discussed in more depth in the interview phase, the discussion of themes here will be high level.

Evidence suggests technology can facilitate interventions and support behaviour change (for a review, see Webb et al. 2010). This study suggests Lift is successful at supporting behaviour change for some. Many factors cited by participants as why Lift worked for them are likely categorized under ‘Motivation’ in Fogg’s B=MAT model (Fogg 2009). Fogg suggests motivation is the hardest of three model components to design for because it is individualistic: different things motivate different people. Participants who are finding success with Lift may have their motivational needs met by Lift, and others with different needs do not try the application or are unsuccessful.

Social features are known to be an effective way of supporting behaviour change, both in traditional (for a review, see Verheijden et al. 2005) and technology interventions (e.g. Toscos et al 2006). Lift uses social support in the form of props and somewhat via the Q&A, and all its social features suggest a social proof effect (Cialdini 1987). Participants indicated how they felt a sense of belonging and an emotional connection to the Lift community, suggesting they had adopted a social identity (Tajfel 1982). A social identity can support performing “...activities that are congruent with the identity” (Ashforth 1989, p. 20) which, for Lift, could be performing the tracked behaviours participants were trying to change. A social identity can also foster organizational loyalty (Meyer et al. 2002) and that could be a positive influence for on-going engagement with Lift.

Regular engagement with Lift seemed important to participants, many citing daily use. Facilitating regular engagement with smartphone applications is challenging, many health applications are used less than 10 times (McClean 2011). In Fogg’s BMAT model, it is suggested that the easiest way to facilitate a behaviour is to focus on increasing a user’s ‘Ability’, and the best way to do that is make the behaviour simpler to do (Fogg 2009). Many participants suggested Lift has achieved a high level of simplicity, particularly in the core feature of checking off a

completed behaviour. Creating a simple habit loop of usage is a way to support frequent usage over the longer term (Eyal 2014). This combination of daily usage and simplicity of design could be a component of why many participants used Lift frequently.

As the most popular motivation technique in Lift, participants comments suggested streaks could be considered a light form of gamification: the challenge to build a bigger streak (e.g. Swacha & Baszuro 2013). They may also be activating loss aversion, which is a tendency for people to be more motivated to avoid losses rather than seek comparative gains (Tversky & Kaheman 1991). Streaks could be considered a form of investment in the application itself. Eyal's (2014) model of habit formation for technology theorises that 'Investment' is a fourth component in addition to the more common 'trigger-behaviour-reward' habit loop. Building a streak could be considered an investment that motivates users to return. This suggests streaks are both supporting repetition of behaviour and frequent usage of the application.

4.4 Limitations

Although this method is a relatively quick way of gathering a large number of perspectives, it suffers from a few limitations. Participants were self-selecting; only people who were motivated to leave a review were included. Often, this includes those who have either strong negative or positive views. It is also not possible to validate the authenticity of reviews; fake reviews are a well-known problem in the Apple app store (Clover 2014). Similarly to questionnaires, there is no opportunity for follow-up or clarification and there were cases where comments were ambiguous. By restricting the reviews to English language only, it likely reduced the cultural diversity of participants. The limited demographic information made it impossible to look for patterns based on gender, age or educational background. Finally, as the sole coder, there was a risk of individual bias from the author.

4.5 Summary

The main purpose of this thematic analysis was to garner key themes for deeper exploration in the interviews. To achieve this, 507 app store reviews were analysed using thematic analysis, which resulted in six key themes presented here.

In summary, the following six areas were identified for exploration for the interviews:

1. Identify consequences of stopping usage of the application.
2. Investigate experiences of successes with Lift and behavioural suitability.

3. Explore social features and identify which of those features are most beneficial.
4. Investigate habitual and daily usage of Lift.
5. Identify liked and disliked features and attributes of Lift.
6. Explore Lift's rewards and motivators for both daily and non-daily behaviours.

5 INTERVIEWS

After completion of the thematic analysis of app store reviews, 16 semi-structured interviews were conducted to explore the key themes found and investigate usage experiences. Interviews allowed follow-up questions to clarify responses and dive deeper, which addressed a key limitation of the previous stage.

5.1 Method

5.1.1 Participants

All participants were existing or prior users of Lift with at least 3 weeks experience. 16 participants were recruited, via social media adverts and emails to students at UCLIC, and interviewed; 9 were male and 7 were female. This number of participants was based on approaching a saturation point for fresh insight and time constraints. 14 of these 16 were not known to the author before the study. Half (8) had over 3 months experience with Lift, and of those, 5 had been using Lift for over a year. The remaining half (8) had between 3 weeks and 3 months of experience.

The range of ages was 18-54 and participants were mostly from the UK (see Table 2, below). All but 2 participants were educated at bachelors degree level or above, and most were Masters level or above (7). Most were employed (7) or self employed (5), and the rest were either students (3) or not working (1). Non-students were primarily targeted to ensure a representation of real world experiences of behaviour change under family and work conditions.

Country	#	Age	#
UK	10	18-24	5
France	2	25-34	6
Australia	2	35-44	1
New Zealand	1	45-54	4
USA	1		

Table 2: Participants by country and age group

5.1.2 Design/Materials

Two surveys were created for screening initial participants, gathering demographic data and for participants to give informed consent (see appendix).

The semi-structured interviews were all conducted via Skype and recorded. An interview script of 12 questions (see appendix) was prepared with key questions and

potential follow-ups. Emphasis evolved through the process to focus more on new and emerging insights in later interviews. Participants had access to the Lift application on their phones or tablets during the interview for reference.

Transcription was manually performed. Thematic analysis was conducted via a combination of Dedoose, for coding and initial grouping, and Excel for higher-level analysis.

5.1.3 Procedure

Participants were recruited primarily via social media; users of Lift were targeted directly through Twitter, and via Twitter and Facebook ads (see appendix). Additionally, an email was sent to the UCLIC students email list (see appendix). All materials directed potential participants to the initial screen survey. Participants were selected for interview if they met the eligibility requirements.

Interviews were scheduled and participants were directed to the second survey which provided information about the study and contained the process for informed consent. Interviews were conducted via Skype. Participants were reminded that the call was being recorded, they could end the interview at any point and they did not have to answer any questions that made them uncomfortable. Interviews lasted between 25 minutes and 50 minutes. After completion of the interview, participants were compensated with either a £10 or £15 amazon voucher (or local currency equivalent).

Transcription and thematic analysis (Braun & Clarke 2006) was conducted shortly after each interview, and contributed to the direction of later interviews as they focused on emerging insights.

5.2 Results

Six key themes emerged from the thematic analysis conducted on the interview data, and they are presented in this section.

5.2.1 Behaviour suitability

Most participants implemented some successful behaviour changes using Lift. Successful behaviours were often specific and easy to perform behaviours, and were frequently added to existing behaviour chains or routines. Others had success with increasing frequency of existing behaviours. However, few experienced success with behaviour cessation.

Easy, specific and daily

Many of the successes participants reported were from specifically defined behaviours and those quick and easy to perform, “...two [of my most successful behaviours] *are to take a multivitamin and to eat an apple*” (P4). Typically these were daily behaviours, “*My most successful one is to be grateful for something every day, I've done that over 100 times in a row*” (P11). P16 had been using Lift since it launched and concluded Lift was best for daily activities, “*Lift from me only works as a daily habit thing even though you can adjust what your goal is. All three of these [most successful behaviours] are daily*” (P16).

P9 explained how she had an unspecific ‘healthy’ behaviour listed before which had not worked, and how switching to a simpler, specific behaviour had worked, “...one of the reasons it didn't work before was my goals were quite general like ‘eat healthy’, whereas this time I'm using it for ‘drinking more water’” (P9).

Other participants also identified the lack of specificity of behaviours as an issue. By introducing ambiguity and not having a clear idea what the behaviour was, participants were less likely to perform the behaviours, “*I think the biggest problem was maybe my goals were a little too vague or something*” (P13). However, several participants recognised this and corrected it. It is possible Lift’s approach supported this self-realisation.

Additionally, with unspecific behaviours some participants would adjust expectations downwards for what they would consider acceptable to have ‘completed’ the behaviour. Most examples were from exercise:

“...for exercising daily I felt like I could get away with a lot. If I went for a walk with a friend I thought I could count that [...] the habit was pretty vague: ‘exercise’ [...] I didn't have a measure for what that actually was.” (P13)

Routines and behaviour chains

Participants often placed these behaviours into existing routines or chains of behaviour. Typically part of morning or evening routines, “...it would fit into a morning routine” (P8). Consequently, these were often performed in a consistent context and with a consistent trigger, normally the completion of a preceding behaviour:

“I usually do that [prayer] before I go to bed and it's the very last thing I do before I climb into bed. So I usually go and brush my teeth and then pray and then get into bed [...] it's a regular pattern for me.” (P10)

In the case of P14, he explicitly created a morning routine with a series of behaviours using Lift, “...one of the ones I’ve been quite successful with [is] doing a morning routine. I’ve been quite successful for that one I think I’ve done 13 days in a row [...] it’s a set of very simple habits, I’ve just got two or three steps [...] I just do a couple of simple things one after another” (P14).

In contrast, participants identified how more ‘floating’ behaviours dependent on affect or memory were problematic, “...the ones I’ve been less successful are more ad hoc and free-floating and I’ll do them when I feel like it or if I notice it in the app...” (P14). P4 had identified several regular opportunities during the day to read but the lack of a specific commitment to a consistent context appeared to impede her, “...it’s harder for me to fit in reading but I try to read when I’m in transit like on the bus or on my break [...] or if I’m not into the book I’ll read when I get home at night [...] I’m kind of all over the place” (P4).

Increasing frequency

Several participants were successful with increasing the frequency of behaviours they were already performing before Lift, “I would say that it [Lift] has helped me go to the gym more regularly, more frequently” (P8). It was simpler for participants to increase frequency of an existing behaviour rather than start something new.

P6 was looking to increase frequency of walks to help her lose weight. She ended up exceeding her goal frequency, and had a 33-day streak, “I was only doing three times a week and with Lift I needed to up that [...] so I thought six times [...] but actually using Lift [...] I’m up to 33 [day] streaks. I’ve managed every day and I’ve never in my life walked every day!” (P6).

Not useful for cessation

Lift was of limited use in behaviour cessation, “[I’m tracking] no alcohol, but that one I haven’t checked in for some time” (P8). In behaviour change approaches, cessation normally involves different techniques than creating new behaviours but Lift does not differentiate. P2 had noticed this need for a different approach, “It hasn’t been very successful at restricting me at not doing something, [...] they’re very different processes” (P2).

Interestingly, P13 liked the specificity inherent in a cessation behaviour and had some success, “I liked not having gluten or no added sugar because it was pretty cut or dry [...] it forced me to be strict and not have any wiggle room in my diet...” (P13).

Summary

Lift is more suited to change some types of behaviours than others. By inserting behaviours into routines some implicitly created Implementation Intentions (Gollwitzer & Sheeran 2006), although not intentionally. Lift allows users to track any behaviours which led to some participants taking a sub-optimal approach in both selection and definition.

5.2.2 Frequent and habitual usage

Participants who achieved more successful behaviour changes with Lift tended to use the application frequently or in a habitual way. Most either used the application as part of regular daily routine or immediately after performing a behaviour, or a combination of the two. Tracking some specific types of behaviour was supportive to frequent use and habit formation, as was the simplicity of design and using the application as a reminder of intended behaviours.

Routine Usage

Many participants used Lift in either their morning or end of day routines, sequencing it around other activities they regularly performed, *“...when I come home at the end of the day I'll review what I've done [...] I'll be checking emails and doing some writing. Then I'll probably check Lift as part of that...”* (P9).

During this review they would check off any activities performed during the day or the previous day, *“...[I update Lift] at breakfast. I normally have my iPad and I look at things so I might remember what I've done”* (P6). Participants often used the application in a consistent physical environment, at a consistent time of the day and with a consistent trigger, normally the completion of a prior behaviour. This suggests participants were forming usage habits, *“I do that [update Lift] as I'm winding down at the end of the day pretty much before I start to read for half an hour before I go to bed”* (P5).

P11 highlighted how it is a ‘nice’ process and generates positive affect. These are rewards that may contribute to habit formation:

“I tend to check off all of my days stuff at the end of the day, it's a nice thing I like to do before I go to bed. It makes me feel settled and I like looking at the things I've done today” (P11)

In some cases, participants would update Lift immediately after completing behaviours, *“...I nearly always tick them off in Lift immediately”* (P8). This would often happen in the mornings when several behaviours were being completed. This is different from the daily reviews (above), as use was being explicitly triggered by

completing tracked behaviours, “... *I take a multivitamin with that [eat fruit] so after I've taken the multivitamin, I'll tick the two of them off together*” (P4).

Many participants stated they would forget to use Lift “*I don't always do that [update Lift] some days I forget*” (P5) and “...*but now and again I forget*” (P8). This emphasises the importance of building the usage habit - to make it an automated behaviour that does not depend on memory.

Supporting frequent use

There were some consistent ways that participants used Lift that enabled this frequent usage, particularly for new users. Many tracked behaviours that they were confident of performing frequently, somewhat akin to ‘quick wins’. These were typically daily behaviours that participants were already successful with or concrete, simple and small behaviours that were easy to perform:

“I like having a few really simple ones in there like ‘make bed’ and ‘take multivitamin’ because it reminds me and it’s really nice to have some ticked off every day.” (P14)

Increasing the frequency of already existing successful behaviours was also effective to drive frequent use, “*I keep that on just as a little thing because it's nice to have one checked off consistently*” (P11).

By adding these ‘quick win’ behaviours, participants were regularly exposed to the ‘reward’ features delivered immediately or in close proximity to completing behaviour. Participants highlighted how they appreciated some of these immediate rewards and experienced positive affect, “...*it's satisfying to tick the box*” (P1), “*I really liked [...] ticking the big tick and getting a big green tick*” (P16) and “*I got a high five on a streak that I had so I do like getting that positive endorsement*” (P9).

For P6 there was a stronger indication of the success of the rewards, indicating he anticipating the tick off process “...*it's kind of something to look forward to being able to do the tick*” (P6).

Additionally, the simplicity of Lift’s design was highlighted as key factor by most and contributed to frequent usage. They highlighted how Lift was “*intuitive and easy-to-use*” (P6) and that they “...*love the design and simplicity of it*” (P16). Participants commented how it is easy to both add behaviours and then tick them off when they’re completed, “[I] *like that it's simple to use: it's simple to add habits, whether that be your own custom ones or ones that are already in the system*” (P14) and “...*it's very simple, it's just a quick swipe and it's off your list*” (P8).

Participants also reported how using Lift acted as a reminder to perform other behaviours, effectively creating a reinforcing ‘loop’ of use, *“I would open up the Lift app at the end of the day to update and realise I usually hadn’t done the reading or the meditation and then I might do them right then and add it in”* (P13).

Longer term usage

Over the longer term, forming a usage habit was not always enough to ensure on-going frequent usage. Some participants noted how over time behaviours they tracked were no longer an accurate set of their intentions:

“After a while my list of habits was getting a bit stale, some of them I just didn’t want to really do any more and I wasn’t doing [...] that was probably one of the reasons I didn’t use it for a while.” (P1)

Others highlighted how they more actively managed their set of behaviours using the archive feature to mitigate this risk, *“I would check my list of habits monthly, archive some that didn’t make sense and add in some new ones”* (P14).

In other cases, when participants had stopped using the app and had later returned, performing this audit or starting afresh was an important first step, *“I archived them all when I started using it again this year and I started with new ones”* (P9).

Summary

The way users set up and used the application was key to ensure on-going and frequent engagement. Also, design simplicity and using the application as a reminder helped support frequent usage. Building a habit of using the application on a daily basis was optimal. With habitual usage, users are less susceptible to memory and motivation and more likely to benefit from the behaviour change techniques Lift employs.

5.2.3 Disruptions

Most participants experienced changes in circumstances or times of difficulty that disrupted behaviours and usage of Lift. Participants highlighted how sometimes the two related: when behaviours were disrupted, usage of Lift reduced or stopped completely. Some participants found Lift was not supportive or flexible to disruptions, and invoked frustration and amplified feelings of failure.

Causes and consequences

Participants explained how their behaviours were disrupted. Examples included holidays, *“I’ve been on holiday and stuff so a lot of them [tracked behaviours] have*

gone by the wayside” (P10), change in careers, “...the gym definitely dropped off when I returned [from a job] to University” (P8), changes in family setup, “I’m a father now a very young children [...] and you get railroaded [away from intended behaviours] quite frequently” (P15) and relocating, “I had a daily meditation practice and then I moved [...] and everything changed” (P13).

Others highlighted how periods of disruption directly reduced their use of Lift, *“I tend to use it [Lift] less if I’ve got a lot of other things on” (P11) and “...there have been quite a few changes in my life recently [...] my usage of lift dropped off...” (P8).*

However, P10 highlighted how having an easy behaviour with a long streak helped her maintain that behaviour, and using Lift, throughout disruptions. It appeared to increase the resilience of both the behaviour and her usage of Lift:

“[I’ve got a streak of] 340 days. It’s the one I’ve kept since I’ve started the app and it’s kept me attached to the app even when other things are going a bit mental.” (P10)

Stopped using

In other instances, these periods of disruption led participants to stop using the application completely. Participants stated causes were stress and busyness, *“...there was a lot going on in life at that time of the year, everything got a bit hectic and overwhelming and I just stopped using it” (P9) or a temporary loss of structure, “I finished my job and started a new one, so I didn’t really have a structured time in December, so I stopped using it” (P3).*

Some suggested that Lift was not helpful in navigating these periods and that led to stopping use of the application. P2 intended to exercise regularly but postponed all physical activity for a period whilst his injuries recovered. He lamented that during this period Lift did not understand him and his physiological condition, and that reduced his commitment to use it:

“...I set my goal for exercise three times a week but I knew I was going to have to be very gentle or I would aggravate my shoulder, so I couldn’t go to yoga. So I thought I’m not going to start at the gym yet either [...] why should I have any commitment to what this app is saying to me, it doesn’t really know my physiological condition!?” (P2)

Ultimately, he stopping using the application after about 8 weeks suggesting *“...it doesn’t require me [during recovery from his injury] to have to engage with it, so I don’t!” (P2).*

Similarly, P13 indicated how she was dealing with several health issues and was no longer able to perform some of her behaviours in Lift and it just became less relevant “...with this health stuff I had to stop exercising and I had to stop being so strict about my diet, so with all of that I just stopped using it” (P13). She highlighted how that was partly due to a feeling of failure from not performing more of her tracked behaviours “...part of me felt if I wasn't doing one or two of them I felt that I was failing at the day” (P13).

Summary

Changes in circumstances or times of difficulty that disrupt behaviour and usage were common. When behaviours were disrupted, sometimes usage of Lift was reduced or stopped completely. Lift made little effort to support behaviour or usage through these disruptions and was even a considered a negative influence by some.

5.2.4 Dependency

Over half the participants had periods when they stopped using Lift for two weeks or more. Often a cause of the stoppage was because participant's behaviours were disrupted and that subsequently affected usage, as discussed previously (in 5.2.3). However, in these periods some participants hinted that beyond the impact of the disruptions, not using Lift contributed to a downward spiral of behavioural disengagement. Indications of dependency on reminders and streaks could be a contributory factor to this.

Behaviours during non-use

In many cases it appeared that Lift usage was a ‘victim’ alongside other behaviours that were disengaged with during periods of disruption, “...my behaviours were just not as frequently performed [during a difficult period] Lift probably got caught up in that” (P8) and when asked why he stopped using Lift he grouped Lift usage with other behaviours, “...I just was in a bad space and wasn't doing many of things that were good for me” (P14).

However, others suggested that not using Lift contributed to behavioural disengagement, “... it was a struggle to keep on top of all these habits [...] I think it [not using Lift] impacted the ones I'd been successful with” (P12). P5 discussed a period of behavioural disengagement when he was not using Lift, “I [...] got less disciplined, the morning routine dropped away a bit, I probably also put on weight because I wasn't doing those habits [in Lift]” (P5). He explained that phase by suggesting without the accountability from Lift he would give in to temptation, “...you want to tick off that behaviour so you say ‘no, no, no’ to eat during the day, but without that emotional leverage, I'll eat that chocolate biscuit you just put in front of me and no gym today!” (P5).

P3 disengaged with most of his behaviours when he stopped using Lift due to leaving his job and losing his daily structure and mentioned how his behaviours ‘collapsed’, *“I went into a period where it was quite stressful I was trying to get a new job [...] I was using my phone a lot less, I didn’t want to think about all those habits in Lift I was meant to be doing [...] it all kind of collapsed”* (P3).

Some participants identified how specific behaviours were impacted because Lift had been supporting them, *“It was only a couple of weeks [I stopped using Lift] and there wasn’t really a good reason [...] but I stopped flossing. I’ve struggled with that one, and I suppose I needed the prod from Lift”* (P1).

Other participants more directly claimed stopping using the application contributed to behavioural disengagement; they stopped using the application because they were not performing some behaviours, which subsequently led to their other behaviours ceasing as well, *“I think the times I stopped using it were because some of my behaviours [...] I wasn’t doing them and I don’t want to face up to the fact I’m failing [...] but then I can get in a bit of f**k it mode and stop doing any of them”* (P14).

Feature dependencies?

Although participants did not explicitly state certain features were responsible for contributing to behavioural disengagement, they did indicate dependencies on two features: reminders and streaks. This may explain the phenomenon above.

Reminders

Half the participants used the reminders feature, in several cases for all their behaviours, *“I have reminders set up for all of them”* (P15).

However, many who used reminders indicated they used them as triggers for their behaviours to be performed at certain time, *“...for press ups I get reminders on Monday, Thursday and Saturday at 8 AM and [...] I intend to do the press ups at those times”* (P15). This creates a risk of dependency on technology.

Others used them as deadlines, they set them at times when they expected to have already completed the behaviour, *“...it’s when I want to, in my head, when I should have already done it”* (P4). This avoids using a reminder as a trigger and likely reduces risk of dependency but still keeps the behaviour at the ‘front of mind’.

Reminders based purely on time can be contextual naive and can make them unsuitable as triggers, *“[if I] happen to be working in a cafe and I got a reminder to do push-ups, I’m not going to do anything about it”* (P15). This lead to negative

affect in some participants, *“I took them off because then I beat myself up if I wasn't doing it at that particular time, even if it wasn't a good time to do it”* (P9).

Streaks

Streaks stood out as the feature most participants cited as increasing their motivation, matching findings from the app store reviews, *“...streaks were what helped motivate me a lot”* (P10) and *“I was really enjoying having the streaks”* (P9). Participants directly identified it as being responsible for longer term behaviour changes, *“...prayer is my most regularly checked in goal just because keeping the flame thing going, the streak is pretty motivating to me at this point because I'm on like 340”* (P10).

Some emphasised the positive nature of a challenge to keep a streak going, *“...because I've got this 33 days straight [...] how long can I keep this going?”* (P6). Whilst others focused more on the desire to not lose a streak, *“having a big number is helpful in that you don't want to break it”* (P10).

Some indicated a negative side to streaks. Participants highlighted that losing a streak could be demotivating and reduce the repetition of the behaviour, *“...when I've broken a streak I'm less motivated to do the behaviour and that has been the pattern with many of my behaviours. [Streaks] helped me do it more often but when I have fallen off the wagon [...] I feel like it's reduced my motivation”* (P14).

P8 commented how it could be restricting as a reward. He suggested because he could not build a streak for non-daily behaviours, he just was not doing them, *“I haven't really been doing those ones [non-daily behaviours] very much because I haven't been able to build up the streak”* (P8).

Summary

In periods of not using Lift, participants typically disengaged from some of their behaviours - this was often a reason they were not using Lift. However, there is evidence that Lift may have magnified this behavioural disengagement. The removal of streaks and reminders that participants were dependent on to perform the behaviour could have been the cause.

5.2.5 Social

Participants discussed the main social features of Lift: friends, props and the Q&A. Most participants had dabbled with social features but generally engaged with them infrequently. Several saw Lift as a more personal application and did not appreciate the social connectivity. Others did find value in some of the features, and suggested they influenced and supported their behaviours. There were few privacy

concerns. Most participants were comfortable with others, and the company behind Lift, seeing, and potentially using, their data.

Limited interest

The most common experience of the social features was of disinterest, *“I don't use the social features massively”* (P14). Participants had generally used the social features but not found sufficient reason to use them regularly or to invest time in expanding their usage. That included reviewing friends timelines, *“I've got a couple of friends but [...] I don't really check what they're doing”* (P11), engaging in the Q&A, *“I've not really used the Q&A much, I think I've answered a couple of questions”* (P14) and props *“I've never given props, well maybe I've given them as a joke!”* (P8).

Explaining this further, participants stated how they did not find the social features particularly helpful or motivating, *“I don't think it influenced me too much. It definitely didn't keep me using the app”* (P13) and *“...I don't find them [props] particularly motivating [...] it doesn't really change your behaviour”* (P10).

P15 identified what could be one of the reasons why many did not embrace the social features: social network fatigue, *“...I'm social networked out, I'm not interested in more of that”* (P15). All the participants were users of other social networks and already maintaining multiple networks of friends.

Isolated usage

Some explicitly were not interested in using the social features and saw Lift more as a personal experience, *“I don't really buy into the public facing side of it I just kept it quite private”* (P3). These participants were looking for the application to support personal accountability and be motivating, rather than rely on a community for support, *“...the point is for me to feel happy about my own productivity so it doesn't really matter if other people encourage me more or if somebody gave me props”* (P11).

Benefits

Conversely, some participants indicated they liked some of the social features and found them helpful. Participants commented how they appreciated the Q&A, *“...like-minded people sharing certain tips and philosophies”* (P5) and enjoyed the *“...ability to answer other people's questions in areas that I know quite a bit about”* (P1).

More specifically, participants indicated they appreciated the social proof aspects (Cialdini 1987), *“I like the community of it you can see who else is doing*

what” (P13) and “...it's more than just nice that somebody else has the same goal.” (P10). They spoke of how it was beneficial to see others attempting and performing the same behaviours as themselves and how they felt a sense of belonging, “... for the walk one it's about 280 people a day around the world who are ticking off that they have walked [...] it helps you feel like you're part of a bigger thing” (P6).

Individual differences

In talking about the social features, different participants emphasised they were looking for different social constructs. Some preferred building a separate Lift community, preferring ‘strangers’ with similar behaviours to be in their network:

“...you'd be motivated more by strangers than people you know. [I want] to add people who may have goals similar to mine [...] you already have something in common and you're more likely to motivate them.” (P4)

Others preferred support from existing friends *“...props coming from my friend are nicer because they actually know you [...] it feels more like getting a favourite on twitter” (P10)* and found it hard to understand how ‘strangers’ could play any kind of useful role in support, *“I don't know why you'd want to follow a random person” (P8).*

Several participants explicitly wanted to be able create private accountability groups. They suggested they would benefit by having some control over membership and managing transparency, *“I'd like to set it up in the same way I have Instagram, I have a small group of friends where we take part in daily yoga challenges. It's a closed and safe group where we cheer each other on and give feedback” (P1).* That ‘safety’ might allow tracking of broader behaviours, *“[with private groups] I'd probably put even more meaningful things in there” (P15).*

Privacy

Few participants expressed any notable privacy concerns. The general view was that, *“...all of mine are public and I'm comfortable with that” (P5).* That extended to the company behind Lift as well, *“It doesn't bother me too much if the company uses my data because I think the activities I've got [...] they're very abstract” (P11).*

However, some admitted there were behaviours they would not track, where there was potential personal or professional consequences, *“...I didn't choose that one [drink less alcohol] because I was afraid...because it's got the social media aspect and is public [...] I don't want anyone to think I'm an alcoholic” (P6).*

Summary

Experiences of the social features was mixed, with most participants not frequent engaging. As one of the most common features in behaviour change applications, the evidence here suggests that it is not a panacea. Where interested in social features, participants wanted to have more control over their communities, to construct the type of social support that would work for them.

5.2.6 Behaviour change ecosystem

Most participants use or have used other applications to track aspects of their behaviour. In most cases, participants saw little issue with using these applications alongside Lift, even when the same activities were being tracked.

Different purposes and benefits

Some participants noted how the different applications were for different purposes. Lift is a high level application with a simple check-in mechanism, whereas other applications are often for tracking specific details of the behaviour, *“MyFitnessPal and Fitbit are geared towards very specific types of behaviour where it's very detailed. Lift is a bit more high level”* (P1).

Additionally, participants talked about some of these details they appreciated, and the benefits this offered, *“I was interested to find out the distance and how long it took me [...] Strava gives you an estimated amount of calories”* (P8) and *“...it's more from my record of how many miles I've clocked up [...] the leaderboard is really cool”* (P3).

Joint tracking

In several cases, participants were tracking activities in both a dedicated application and Lift. P9 was trying to develop a writing habit *“I've added this writing habit into Lift but I'm also tracking it on the other website I mentioned earlier”* (P9). P16 attributed his success at keep active on a daily basis to both a steps application and Lift, *“I did the 10,000 steps and I probably do walk more but that's probably a combination of using the Moves application and Lift”* (P16).

A few participants noted how the detailed tracking applications were more motivating and more responsible for behaviour change, *“...I use RunKeeper which I became a pro user this year [...] and that generally speaking guilt's me into doing some running rather than Lift”* (P15).

In these cases of joint tracking, most did not see an overlap or inefficiency between them. P8 commented, *“I don't think it really clashes with any of the other apps”* (P8). In some cases, participants appreciated the difference between the

applications and noted how the separation was beneficial, *“I’m okay with using them separately. I prefer using them that way for my own organisation. I feel like they do to different things”* (P11).

Integration

However, some participants did consider how Lift could be integrated with other tracking applications, *“... my ideal would be to have an integrated solution”* (P15). Participants suggested that when they complete an activity in a detailed tracking application it would be beneficial if Lift could be automatically updated, *“...so if I went for a run and tracked in my running app it could automatically tick that off in Lift”* (P8).

However, P14 commented that without that manual ‘checking in’ he would not need to use the application, *“...given checking off behaviour is the main feature I use in Lift, if you start automating it they’d be no point for me to use it!”* (P14).

Not compatible

Some participants did see an undesirable overlap, and that resulted in stopping usage of either the detailed tracking application or Lift. How to track details of the behaviour was often pertinent to the decision:

“I think I’m done with Lift partly because I’ve found other ways [...] Now I use five apps to keep track of everything [...] I don’t understand why that works better for me but I guess there is something about keeping track of the details that appeals.” (P13)

Summary

Most users are increasingly likely to be using multiple applications and/or devices to track and change their behaviours. It is important to understand how users interact with a whole ecosystem of behaviour change applications and devices, and not just individual applications. Lift demonstrates that this does not necessarily mean technical integration.

5.3 Discussion

This section uses a theoretical lens to analyse and discuss the interview results. Seven key themes are discussed:

1. Suitable behaviours
2. Frequency vs automaticity
3. Habitual usage
4. Unsupported disruptions
5. Concentration risk
6. Conflicting Behaviour Change Techniques (BCTs) across ecosystems
7. Social features

5.3.1 Suitable behaviours

There were patterns with the types of behaviours that participants were successful with. These generally tallied with those Fogg suggests are most suitable for ‘mobile persuasion’ on his behaviour grid (Fogg 2009); the ‘span’ and ‘path’ durations for the ‘blue’ and ‘purple’ types (see figure 4, below). Participants also had some success with ‘green’, initiating new behaviours.

	GREEN Initiate new behavior	BLUE Reinitiate familiar behavior	PURPLE Increase behavior intensity	GREY Decrease behavior intensity	BLACK Stop existing behavior
 DOT One time behavior	 GREEN DOT <i>Do a new behavior one time</i>	 BLUE DOT <i>Do familiar behavior one time</i>	 PURPLE DOT <i>Increase behavior one time</i>	 GREY DOT <i>Decrease behavior one time</i>	 BLACK DOT <i>Stop behavior one time</i>
 SPAN Has a duration	 GREEN SPAN <i>Do behavior for a period of time</i>	 BLUE SPAN <i>Maintain behavior for a period of time</i>	 PURPLE SPAN <i>Increase behavior for a period of time</i>	 GREY SPAN <i>Decrease behavior for a period of time</i>	 BLACK SPAN <i>Stop behavior for a period of time</i>
 PATH Lasting change	 GREEN PATH <i>Do new behavior from now on</i>	 BLUE PATH <i>Maintain behavior from now on</i>	 PURPLE PATH <i>Increase behavior from now on</i>	 GREY PATH <i>Decrease behavior from now on</i>	 BLACK PATH <i>Stop behavior from now on</i>

Figure 4. Fogg Behaviour Grid (Fogg 2009); yellow box indicates behaviours most suited to ‘mobile persuasion’

For these ‘green’ behaviours, successes would often take the form of specific and easy behaviours somewhat akin to ‘Tiny habits’ (Fogg 2015). Lift emphasises

this approach in their blogs and other communications (Stubblebine 2013), which some participants had noticed. Additionally, some participants selected featured habits – created by Lift or associated coaches - which had these attributes.

Several attempted cessation ('black') behaviours but few had success. Behaviour cessation or breaking bad habits is often considered to be a different process with different techniques than developing new behaviour (e.g. Lorencatto et al. 2012). Lift does not provide a different pathway for these cessation behaviours, instead relying on the same set of techniques for creating a new behaviour. This likely explains the lack of success participants had with these behaviours.

Lift is premised on 'path' behaviours and nearly all participants were tracking those behaviours, with a few attempting 'span' behaviours with a fixed duration. There was no noticeable difference in successes.

Lift has no controls over what behaviours are tracked and subsequently some participants were tracking behaviours they were unlikely to succeed with. More guidance and nudging in tracking behaviours that are suited to the approaches Lift utilises might benefit users.

5.3.2 Frequency vs automaticity

Combining evidence from this study and habit theory, it appears Lift is more effective at supporting frequent repetition of behaviours than developing automaticity. Furthermore, in some cases approaches for motivating repetition may actually be negating automaticity. This is in accordance with findings by Stawarz et al. (2015).

In mainstream parlance, 'habit' is used to mean regularly performed behaviours. However, from a psychological perspective, habits are often thought of as a form of context dependent automaticity (Gardner 2012). Behaviour frequency should be considered more a causal factor of habit formation and likely consequence (Snihotta & Pesseau 2012). Lally & Gardner (2013) make this distinction clear in their four-stage model of habit formation, where 'promoting continued repetition' and 'supporting automaticity' are distinct steps.

Streaks were the most frequently mentioned motivator that supported behaviour repetition. Streaks motivated participants by providing a challenge to keep a streak, indicating it is a form of gamification, and by loss aversion, the disproportionate impact of loss versus comparative gain (Tversky & Kahneman 1991). Some participants also cited other features such as 'high 5s' – a 'splash' screen with celebration animations and touch based vibrations to mimic a physical high 5 – and 'props' as motivational.

Interestingly, when participants spoke of streaks they rarely mentioned the behaviour; the object of focus and motivation was the ‘streak’ concept. This is evidence streaks were extrinsically motivating for participants. The issue is that expected extrinsic rewards can negate the development of automaticity by keeping a behaviour goal focused and reducing intrinsic motivation (Deci et al. 1999). This effect is likely most pronounced for those with long streaks where automaticity should have developed, but if the goal is the main motivator for the streak then automaticity is less likely to develop. The recent introduction of coaches, where their streaks are prominently presented to demonstrate credibility, may make this worse by increasing streak’s external value.

In contrast, ‘props’ have different qualities – they have no permanent construct to attach to and arrive unpredictably. Additionally, self-determination theory suggests encouraging autonomy, competence and connection with others can boost intrinsic motivation (Ryan & Deci 2000). Props could be seen to support all three of these and may be more effective at supporting intrinsic motivation.

Dependence on reminders may also threaten development of automaticity, which tallies with findings from Stawarz et al. (2015). Additionally, this study suggests a possible cause for that: reminders activated at a specific time are crude triggers that do not consider broader context and automaticity gains are supported when behaviours are repeated in a stable context (Wood & Neal 2007). Depending on the consistency of an individual’s routine, reminders can trigger behaviour in different contexts and that likely dilutes automaticity development.

This finding provides a challenge; effective techniques at supporting frequent repetition may inhibit development of automaticity. A transition of rewards as repetitions increase should be considered.

5.3.3 Habitual usage

Frequent and habitual use was correlated with success and longer-term generally used it in an habitual way.

Fogg’s B=MAT model, selected because of its focus on persuasive design in technology, is used to discuss why participants used the application in a repetitive way and how that supported habit formation (Fogg 2009). Fogg’s model suggests three factors need to be present for a behaviour to occur: motivation, ability and a trigger.

Motivation

Lift uses a small number of rewards delivered immediately after checking off a behaviour that supports a pleasure motivation and formation of a usage habit. Some

are rewards that occur consistently, such as the satisfaction from ticking off the behaviour and seeing it drop to the bottom of the list. Others are intermittent, for example the display of 'high 5s' is contingent on certain rules. These rewards were recognised as having positive affect and given their proximity to the act of launching the application and checking off behaviour(s), they likely are contributing to habitual usage.

Other rewards in Lift like building streaks and receiving props are also 'pleasure' motivators. Participants reported positive affect from these. Additionally, some identified positive affect from social support and engaging with others. The main fear motivators mentioned were loss of streaks, and a fear of not completing weekly goals.

Ability

This is the ability that users have to perform a behaviour. Fogg highlights how the easiest way to increase user's ability is to decrease the difficulty of the behaviour (Fogg 2009). Most participants cited Lift's simplicity as one of their favourite features, especially the core features of adding and tracking behaviours.

Triggers

Triggers help ensure a behaviour will be performed. There were two main triggers used by participants: immediately after completing a tracked behaviour and a daily review as part of an existing morning or evening routine. In several cases, participants used a combination of the two. Habitual usage as part of a daily routine provides more resilient use, as it is not as dependent on successful performance of behaviours to trigger use, and is more likely to be performed in a stable context, which is conducive to habit formation (Wood & Neal 2007). Usage triggered by the completion of a behaviour is likely one of the reasons why use of Lift ceased when participants disengaged from some of their behaviours.

Hooked

The analysis with Fogg's (2009) model explains the components involved, but not clearly how they come together to lead to habitual use. The 'Hook' model (Eyal 2014) can be used to demonstrate this better (figure 5, overleaf). This model is focused on how to build the simplest possible loop of behaviour that supports a usage habit. The additions in yellow are based on how participants discussed their use of Lift. It was likely this simple and effective loop that contributed to many participants forming a usage habit.

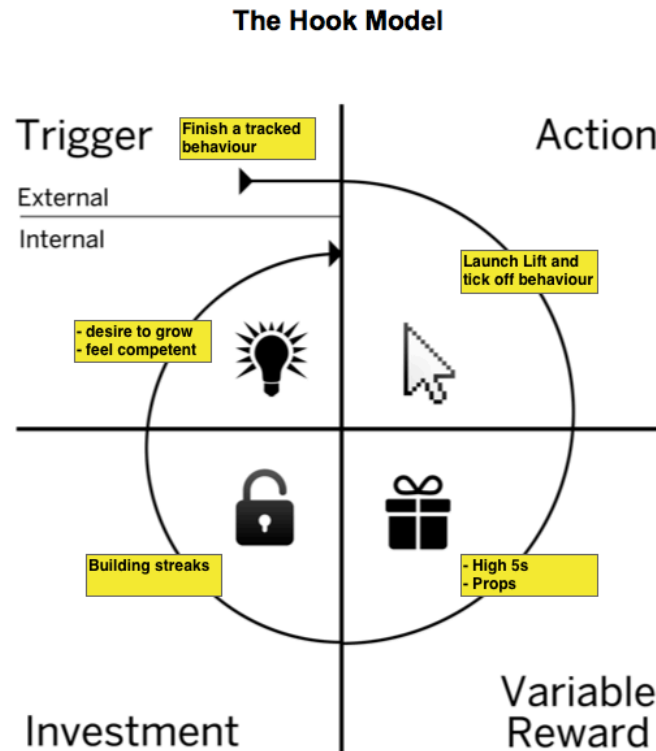


Figure 5. 'Hook' model (Eyal 2014); yellow boxes are Lift's 'loop'

5.3.4 Unsupported disruptions

Most participants experienced periods of disruption affecting behaviours and usage of Lift. Lift provided little support to plan, react or recover from these periods, or ways to maintain engagement through the period. This led to some users stopping their use of Lift.

Where participants reported periods of increased stress and busyness, it is likely their 'Motivation' and 'Ability' to perform behaviours was impacted. At a high level, hindrance stress and motivation have an inverse relationship (LePine et al. 2004). Motivation may also be affected by a greater depletion of limited will power during these periods (Baumeister et al. 1998). Reductions in ability could be explained through a lack of time to perform behaviours or, where relevant, less physical or mental resources. Theoretically, as an automated behaviour, habits should be more resilient to stress. However, if periods of stress and busyness impact routine, it could disrupt triggers (Verplanken & Wood 2006).

In other cases, participants experienced significant changes in circumstances, such as moving house. Increases in stress and busyness during these periods likely impacted behaviours (as discussed above). Additionally, from a habit perspective, changes in context are known to be disruptive as they can shift an individual from automaticity to deliberate processing, negating the habit (e.g. Wood et al. 2005).

Lift provided little support in helping participants navigate through, or prepare for, these disruptions. In some cases, the loss of streaks compounded the situation by negatively affecting motivation.

A commonly recommended approach for dealing with disruptions proactively is ‘Coping Plans’ (Sniehotta et al. 2005). In creating these plans, individuals anticipate difficulties and plan how to deal with them. This increases the likelihood of maintaining the behaviour through a challenging period (Sniehotta et al. 2005). In periods of stress, for example, the frequency or difficulty of a behaviour could be reduced to increase the likelihood it will be maintained, or even paused for a period.

A strategic approach, particular for behaviours impacted by stress, would be to proactively support development of psychological resilience. Psychological resilience is a “...*flexibility in response to changing situational demands, and the ability to bounce back from negative emotional experiences*” (Tugade et al. 2004). Implicitly, Lift can be seen to do this by encouraging behaviours believed to support resilience, such as exercise (Penedo & Dahn 2005) and meditation (Alexander et al. 1991). However, a more directed approach could be beneficial (e.g. Steinhart & Dolbier 2008).

5.3.5 Concentration risk

The features and rewards that Lift provides to support behaviour change could be termed ‘scaffolding’ that provides temporary support whilst habits form. However, as discussed above, with Lift this scaffolding is a more permanent structure to support on-going behaviour repetition. This brings risk. In instances when participants stopped using Lift, often from periods of difficulty, that scaffolding was instantly removed. Any behaviours dependent on Lift for motivation or triggering often ceased during this period. Some participants indicated how Lift contributed to this by amplifying feelings of failure and lower self-efficacy. Housing multiple behaviours in one application appears to have led to a ‘concentration risk’.

It could be theorised that by grouping together a collection of previously independent behaviours, a relationship has formed that did not previously exist. Although this relationship may be beneficial when there is positive momentum (e.g. Unger 1996) and from motivational ‘spill over’ between behaviours (Mata et al. 2009), it may contribute to increased disengagement during more challenging times.

Research in Multiple Health Behaviour Change (MHBC) has not identified this issue. However, it is a new field of investigation focusing primarily on multiple behaviours with existing relationships (e.g. food and exercise) for single outcomes (e.g. weight loss), which is different from Lift with its mix of behaviours and desired outcomes (Sweet & Fortier 2010).

As discussed in the previous section, Lift does not provide any support or flexibility through challenging periods. Supporting continued application engagement through disruptions would help mitigate this risk. More strategically, a greater focus on supporting habit formation would reduce dependency on Lift – making the scaffolding a temporary construct - and reduce this risk.

This is a tentative finding, and needs further investigation. It is plausible this phenomenon acts independently of Lift, that the initial causes of behavioural disengagement were solely responsible and led to lower self-efficacy. Additionally, there was insufficient data to examine how using other tracking applications alongside Lift contributed to, or mitigated, this effect.

In summary, there is a concern that in providing ‘scaffolding’ of a permanent nature to support multiple behaviour change, its rapid removal can contribute to greater behavioural disengagement.

5.3.6 Conflicting BCTs across ecosystems

Most participants used other applications to support behaviour changes and saw them as complementary to Lift. Participants appreciated tracking more details in specific behaviour applications, and in several cases tracked that same behaviour in Lift. On the surface, it would appear the behaviour change techniques across these applications were complementary.

However, several of the applications include competitive components and reward performance. Lift takes a different approach in developing a growth mindset (Dweck 2006). Lift’s rewards are geared towards behavioural repetition and not on outcome or specifics of the behaviour. ‘High 5s’, streaks and ‘props’ all celebrate the effort of repeating the behaviour and not for demonstrating good performance. It is unclear how this apparent clash may impact longer-term behaviour change or habit formation.

Others have discussed the combination of BCTs and have called for more research on how to best to group them (Abraham & Michie 2008). This study suggests that in addition, combinations of BCT provided by multiple technologies should also be a focus.

5.3.7 Social features

Participants had a mixed response to the social features of Lift; for many other features were sufficient for successful behaviour change. Some did highlight features they appreciated and were motivational, but few considered them critical.

Some participants expressed a preference to use Lift in an isolated way. They were not interested in changing behaviours in public. This tallies with findings from Paay et al. (2015), where participants giving up smoking saw it as a personal challenge and desired to 'do it alone'. Lift supports isolated use, although participants were not always aware they could set their habits to private.

Others had not found the social features engaging. Participants had experimented but not persevered. In a systematic review of behaviour change using social networks, Maher et al. (2014) found retention and engagement issues was common with dedicated behaviour change social networks. Some participants suggested they wanted to customise the social features - a common request was for private accountability groups. Users do not feel as connected to a social community if they do not have a role in creating it (Lin 2014). Adding an ability to create private accountability groups, or other customisable social features, could support engagement.

Props were the most engaging and accessible social feature, requiring little effort to initiate or maintain. Social support is a core behaviour change technique (Abraham & Michie 2008) and props are a simple implementation of that. Most preferred props from either people they knew offline or Lift friends making similar changes. Other studies have indicated preferences for support from others tackling the same changes (Paay et al. 2015) or existing friends (Foster et al. 2010). For some, the effort to configure and maintain a social network was the issue, suggesting 'social networking fatigue' ("Social Networking Fatigue" 2007).

It is evident from behaviour change literature that social factors can be effective in interventions (e.g. Verheijden et al. 2005), and social features are the most common in behaviour change applications for physical activity (Yang et al. 2015). However, ensuring engagement is challenging. Lift has revised its social features on several occasions but it appears there is opportunity for improvement.

5.4 Limitations

Several limitations must be considered for the interviews. There were challenges recruiting non-student participants. This resulted in most participants being UK based because of the difficulty of interviewing '9-5' workers in the US time zones. The US has the biggest Lift user base and was most represented in the app store reviews, so findings and comparisons are less representative. The challenge in securing participants also led to a mid-study increase of compensation from £10 to £15, which could have affected motivations of later participants. Conducting interviews solely via Skype audio made it more difficult to build rapport and may have impacted how open participants were. Although interview participants spoke of 'habits', no recognised measure was used to evaluate those

statements. Additionally, it is likely participants used a colloquial meaning of ‘habit’ rather than a formal psychology definition. Some questions required participants to recollect and discuss past experiences, in some cases, years ago. This likely introduced memory biases. In some cases, participants were unsure of the author’s relationship with Lift. This may have impacted responses as participants felt a need to be more positive or complementary if they assumed a formal relationship.

5.5 Summary

Sixteen interviews were conducted to understand users and their experiences of Lift. The participant set included a wide range of ages (18-54), different durations of Lift usage (from 3 weeks to 2.5 years) and were based in 5 different countries. From interview transcripts, codes were created and themes identified. Subsequently, these have been presented and discussed.

Seven key themes were identified and have been discussed:

1. Suitable behaviours
2. Frequency vs automaticity
3. Habitual use of Lift
4. Unsupported disruptions
5. Concentration risk
6. Conflicting BCTs across ecosystems
7. Social features

6 GENERAL DISCUSSION

Evidence from both methods suggests that Lift is supporting users to make behaviour change. Successes were generally with new behaviours that were relatively easy for participants or increasing frequency of existing behaviours. It was less effective for more ambitious changes or cessation. It is likely the approach employed by Lift is not suitable for these types of changes or for mobile technologies generally, as Fogg's behaviour grid suggests (Fogg 2009). Additionally, more cognitively complex behaviours may not be suitable for habit formation (Redish et al. 2008).

Successes were achieved primarily by increasing motivation to perform a behaviour repetitively. Streaks were the most effective at this. Streaks activated both a sense of challenge and loss aversion (Tversky & Kahneman 1991), that were both motivating. A concern was highlighted that as extrinsic motivators, streaks may be a dependency for on-going repetition (Deci et al. 1999). These findings are likely inherent in the Seinfeld method (Isaac 2007), although no research is available to confirm this.

However, development of automaticity was less well supported, which tallies with findings by Stawarz et al. (2015). Whilst streaks were effective at motivating behaviour repetition, they may damage automaticity by maintaining a goal focus for behaviours (Deci et al. 1999). Streaks are a core technique for many habit-forming applications (e.g. four out of the top five habit applications in the US Apple app store use streaks⁴), so it is critical more research is conducted to investigate this and better understand how to move beyond motivating repetition to develop automaticity. Reminders can be used as triggers but are context insensitive, which can also hinder developing automaticity by activating in mixed contexts (Lally & Gardner 2013), and can lead to technology dependence. Some participants, however, developed automaticity by independently following evidence based approaches, although not always intentionally. This suggests that technology does not necessarily need to provide all the 'scaffolding' to support habit formation.

Lift's design and features were found to be conducive to habitual usage, which contributed to frequent engagement over the longer-term. This habitual usage was key for successful change. It ensured regular exposure to the behaviour change techniques and rewards Lift employs, and was a reminder of other behaviours to be performed. The combination of simplicity of use and tracking daily behaviours with a high likelihood of consistent performance were the main facilitators of regular

⁴ Sourced from ranking of applications with 'habit' keyword <http://www.appannie.com/apps/all-stores/keyword-top/united-states/?word=habit&date=2015-03-26> on 26th March 2015

use. Completing tracked behaviours was an effective trigger for use and immediate rewards from checking off a behaviour reinforced the habit. Using as part of a routine further supported habit formation by providing a stable context and trigger (Wood & Neal 2007). There is an increasing focus on how to build habit-forming applications to support regular engagement (e.g. Eyal 2014); evidence here suggests Lift has been successful.

Lift provided little support to plan for, react or recover from behaviour disruptions caused by changing circumstances or periods of difficulty, experienced by most interview participants. With more planning and support, these behaviours may have been maintained, rather than being disrupted and habit formation damaged. Additionally, these periods of disruption often led to users leaving the application. Encouraging behaviours to build psychological resilience (Tugade et al. 2004) or introducing a form of coping plans (Sniehotta et al. 2005) could help both with both behaviour resilience and continued engagement with Lift.

There was evidence of a concentration risk from attempting to change multiple behaviours in one application. It appeared that when the ‘scaffolding’ Lift provided to support behaviour repetition was removed – because a participant had stopped using the application – behaviours dependent on Lift ceased to occur. This appeared to be compounded for some: not using Lift amplified feelings of failure and contributed to lower self-efficacy. This effect can be somewhat seen in the more extreme case of treatment outcomes for alcohol dependency. After leaving primary care, with the loss of that intense ‘scaffolding’, the most influential factor in long-term outcomes is continued aftercare (Walker et al. 1983). When participants stopped using Lift there was no equivalent to aftercare. It is likely this phenomenon applies to other habit applications that support multiple behaviours and thus more research is needed.

It is unclear how broadly effective the social components of Lift are. The thematic analysis of app store reviews and interviews resulted in somewhat contradictory findings. The engagement issues highlighted in the interviews may be a result of study limitations or from causal factors such as social network fatigue or Lift’s implementation of the features. This highlights a downside to the approach taken in this study: there was no way to resolve conflicts between the two methods. A third method, such as a quantitative survey, could have been used to resolve this issue. A clear finding was that some prefer changing behaviours in private and others are open to a public approach. Technology should offer both experiences to appeal widely.

Despite little technical integration, Lift worked well with other behaviour change applications for many participants. However, there is a concern of clashing Behaviour Change Techniques (BCTs) across applications which users may not be

aware of. Whilst Lift tried to focus on developing a ‘growth’ mindset (Dweck 2006), techniques in other applications used competitive elements and focused on performance, which could be counter to developing a growth mindset. More work is needed to consider cross-application behaviour change.

This study highlights the importance of balancing user engagement, design that supports habitual usage and implementation of theory. All are needed for an effective behaviour change application. Although recommending the addition of Implementation Intentions to better support habit formation makes sense from a theory perspective (Stawarz et al. 2015), it would add effort and complexity for users, which would likely undermine engagement with Lift. Furthermore, it raises a broader question of design methods for behaviour change applications. Are there inherent issues caused by the tension between an iterative user centred design process and a fixed behaviour change theory perspective?

A related question is whether technology needs to provide all the ‘scaffolding’ recommended by a theory. Some participants combined using Lift for its self-monitoring, reward and support features, whilst independently implementing evidence based techniques for developing automaticity. Self-determination theory suggests autonomy is important for intrinsic motivation and, subsequently, behaviour change (Ryan & Deci 2000). Overly prescriptive approaches could threaten this and a balance needs to be sought.

By introducing personal coaches in recent versions, Lift has potentially mitigated the issues identified in this study; a good personal coach grounded in theory and evidence would address them. However, the focus of this research has been how technology can directly support behaviour change.

6.1 Design recommendations

Based on findings from the study, the following design recommendations and ideas are offered for habit formation applications.

6.1.1 Build for disruption and difficulties

Life brings changing and difficult circumstances for many and disrupts behaviour change and habit formation. Applications should embrace these as opportunities to build resilience, maintain behaviours and provide support. It will also increase user retention. Approaches could include:

In anticipation of difficulties:

- Highlight behaviours that build psychological resilience, such as sleep, exercise or meditation (Reivich et al. 2011)

- Prompt tracking of on-going and simple behaviours to help engagement when difficulties arise
- Find subtle ways to nudge users to consider informal coping plans, perhaps by stimulating conversations on the topic in social communities. This leverages social proof (Cialdini 1987).
- Offer a ‘difficult times’ switch where goal frequencies are reduced by 50% or only some behaviours are active

During disengagement:

- Model usage and behaviour patterns to understand when users are disengaging
- Increase frequency / reduce criteria of rewards
- De-emphasise rewards that are contingent on repeated success (e.g. streaks)
- Nudge users towards social support, e.g. make it easier to support (prop) users who are struggling
- Use social proof (Cialdini 1987): others struggle at times too

If users drift away from the application for a while, when they return:

- Make it gentle return experience, use social proof (Cialdini 1987) to reassure it is common
- Prompt a revisit of behaviours and frequencies, emphasise reducing behaviours and goals is not a failure

6.1.2 Support context dependent repetition and automaticity

It is not sufficient for a habit formation application to focus on repetition of behaviour at the expense of developing automaticity. Additionally, applications should support building habits that operate independently of the application.

- Create reminders that are more context sensitive so they are delivered in a consistent context. This will likely reduce their significance in triggering the behaviour as the context is paired with the behaviour.
- Find ways to ‘fade’ these reminders over time, handing over triggering responsibility to the external context⁵
- With evolution of Internet of Things, look to partner with technology that can trigger behaviour using ambient approaches, where dependency is less problematic and reduces concentration risk

⁵ more research is needed to understand the specific components of context in triggering behaviour to establish if this is feasible

- Understand and study how users are engaging with rewards; watch for excessive extrinsic motivators

6.1.3 Fit into user's ecosystems

In many cases, users will be using multiple tracking and behaviour change applications. Prioritise understanding how users are engaging with other applications to ensure a smooth user experience and effective combination of behaviour change techniques.

- Technical integration may be the answer, but it is not always necessary for an integrated experience.
- It is not necessary to warehouse all users' behaviour change data and be the centre of their behaviour change universe. Doing a few things and doing them well works.
- Consider how the Behaviour Change Techniques (BCTs) and rewards fit together, perhaps recommend and support other applications that offer complementary approaches.
- Automation between applications should be treated carefully. If engagement is necessary to deliver the BCTs then automation will impact that.

6.1.4 Balance engagement, habitual usage and theory

Engagement and habitual usage are necessary to expose users to BCTs and rewards but grounding in theory is key to delivering actual behaviour change.

- Be deliberate about this balance and acknowledge the trade offs.
- Theory inspired is better than no theory at all.
- Conduct research explicitly on how accurately theory has been implemented.

6.1.5 Offer flexible social configuration

Users desire and are motivated by different social constructs; one size does not fit all. Offer flexibility.

- Allow both a private and social experience.
- Offer the ability to create individualised accountability groups that reflect these different desires.

6.2 Limitations

There were some limitations of the overall study. Although a ‘bottom-up’ approach was taken, the author was a long-term Lift user and that may have biased theme selection and interviews. Additionally, all thematic analysis was performed by one coder, and this effect over two methods may have been compounded. Contrasting recruitment approaches for the two methods led to the possibility of findings based on different user groups, which would make them less suitable for comparison. Themes from app store reviews may have overly narrowed focus for the interviews phase, given that app store reviews typically contain on certain types of information.

No claims of successful behaviour change or habit formation were verifiable in either method, they were both based on self report. Few interview participants were active users of the social features, and the app store reviews suggested there are many who are, so findings on social aspects should be considered with that limitation in mind. Beyond basic demographics, no individual character or personality attributes were considered, so individual differences could have influenced experiences and successes, and effected habit formation (Judah 2015).

Due to time constraints, it was not possible to quantitatively validate key themes after the interviews phase, which would have established if findings are more broadly valid. Lift is constantly evolving and changing so inevitably some findings are more relevant to older versions. However, this does not necessarily negate findings as lessons can still be learnt.

7 CONCLUSION

This study used a qualitative approach to investigate ‘in-the-wild’ usage of a habit formation application, Lift. Although there is significant research in habit formation and technology based behaviour change, there has been little focus at how technology supports habits. The only research in this area conducted a study of reminders and rewards, and performed a theoretical analysis of habit applications (Stawarz et al 2015). Their approach did not facilitate understanding of how these applications were being used in real world contexts, or how successful users were at behaviour change and forming habits ‘in-the-wild’. This study has addressed those gaps.

The study found that Lift was effective for supporting behaviour change, mainly by motivating frequent repetition of some types of behaviour. The two key factors that supported this were streaks as motivators and a design conducive to habitual usage.

However, beyond motivating behavioural repetition, Lift did not provide much support for developing automaticity, which tallies with conclusions from Stawarz et al. (2015). This study raises an important concern that dependence on streaks may inhibit development of automaticity. The study highlights that habit applications need to balance rewards that support engagement and behavioural repetition, without compromising development of automaticity, and ideally supporting it.

There were, however, examples of participants forming habits where evidence based approaches were being followed independently of Lift. This demonstrated habit applications can be a partial solution, and do not need to control the whole process.

The study introduced the idea of a ‘concentration risk’ in applications that support multiple behaviour changes. By clustering a mix of behaviours together, their repetition became vulnerable if Lift was no longer used. The sudden removal of ‘scaffolding’ used to support this repetition appeared to be the cause. Research in multiple behaviour change is relatively new, and this effect has not been discovered previously. More research is needed to understand if this is credible and extends beyond Lift.

The study also found that changing or difficult circumstances led to behaviour disengagement and affected application usage. Little support was provided to plan and respond to these circumstances. This was a missed opportunity to support building psychological resilience and maintain behaviour change efforts through difficulties, as well as retaining users to the application.

A series of design recommendations for habit applications was made to highlight successful components of Lift and to address identified issues. However, it must be emphasised that in addressing issues, the core reasons for engagement and habitual usage must not be undermined. This study highlights that being grounded in theory can not trump engagement or habitual usage; all are needed.

Finally, fusing thematic analysis of app store reviews with semi-structured interviews was an effective way to perform a qualitative study. The thematic analysis of app store reviews was a quick and easy way to gather a large set of views and experiences independent of researcher bias. The resulting themes were useful to guide the deeper exploration in the interviews. Gathering data with theoretical agnosticism and then introducing theory for framing discussion was a fruitful approach and garnered interesting insights. Although without specifically targeting data to support or contradict theories it was not possible to form firm views of theoretical grounding. Both Fogg's B=MAT model (Fogg 2009) and the four step habit formation process (Lally & Gardner 2013) were useful as frameworks for analysis.

7.1 Future Work

Three areas for future work have been identified:

1. Investigate concentration risk and behavioural disengagement in applications that support multiple behaviour change.
2. Evaluate effectiveness of using multiple applications and Behaviour Change Techniques (BCTs) to support behaviour change.
3. Investigate streaks / the Seinfeld method (Isaac 2007) for habit formation.

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APPENDICES

Appendix A: Interview script

1. Behaviour change history and results
 - a. Experiences of changing behaviours before Lift? Successes / failures? Examples? Methods?
 - b. Tried other approaches? Which? What happened?
2. Lift usage
 - a. How long been using Lift?
 - b. How did you discover Lift?
 - c. Why did you choose Lift? What was your motivation?
 - d. What were you hoping to achieve with Lift?
 - e. Why do you keep using Lift?
3. Behaviour change with Lift
 - a. What types of habit are you tracking? How many?
 - i. Examples?
 - ii. When do you perform those habits? What's the trigger to perform them
 - iii. History with those changes?
 - b. What behaviours changed? Which not?
 - i. Why?
 - c. How long sustained?
 - d. When stop tracking behaviours?
4. Views on Lift
 - a. What do you like most about Lift?
 - b. What do you like least about Lift?
 - c. Which features do you use the most?
 - d. Has Lift met your expectations?
 - e. How would you make Lift better?
5. When use Lift (after behaviour? daily? Ad hoc?)
 - a. Where update Lift? Home/on the go? Same/different places?
 - b. Typically how long do you use the Lift app for? How many times a day?
 - c. Which applications do you use more often?
 - d. Where do you keep the app on your phone? (home page, bottom 4 icons)
 - e. Any periods when stopped using it?
 - i. Why?
 - ii. How were your behaviours during that period?
6. Social
 - a. Use social aspects? Which? How often? Experiences with them?

- i. Props / Q&A / Friends
 - b. Real life friends? Or Lift only friends?
- 7. Coaching / featured plans
 - a. Use this?
 - b. Views and/or experiences? Especially increased emphasise on coaching
- 8. Other applications
 - a. Have you tried any other applications similar to Lift? How was your experience with those?
 - b. Do you use any other applications to track and change behaviour e.g. food logging or exercise?
 - i. How do you use them in conjunction with Lift?
- 9. Evolution of app (if longer term user)
 - a. App got better or worse? How?
 - b. How has Lift team managed and communicated changes?
 - c. Has it evolved better or worse than other applications you use? How?
 - d. Do you have a favourite version (if not latest). What do you like about that version?
- 10. What do you think the impact would be if you stopped using Lift?
- 11. Privacy
- 12. Anything else?

Appendix B: Qualifier survey



Participate in a study investigating the use of the smartphone application '[Coach.me](#)' (previously 'Lift')

Participants will be compensated with a £15 / \$20 Amazon voucher.

Your participation will involve:

- 1) Completing a short survey (approximately 5 minutes)
- 2) A 30 minute interview via Skype

Requirements for participation:

- Aged 18+
- Current or past user of 'Coach.me' ('Lift') app on iOS
- Not registered as a coach on 'Coach.me'
- Able to access Skype

* * If you wish to participate, please complete the form below * *

This survey and the interview are part of an MSc dissertation at UCL (London, UK). The study has been approved by the UCLIC Research Department's Ethics Chair [Project ID No]: UCLIC/1314/007.

Please note, that by completing this form you are giving us permission to contact you in relation to this study. If you are chosen to participate in the study we will contact you via email to arrange a date and time for the interview at your convenience. Information gained in interviews will be used for the purpose of academic research and may be presented in an academic publication and/or conferences, workshops and/or teaching material. Confidentiality and anonymity will be maintained, and it will not be possible to identify you from any publications. During the interview an audio recording will be made for later transcription. Your details will NOT be used for any purposes other than this and will be stored in accordance with the Data Protection Act 1998. You are free to withdraw from the study at any time.

All questions require a response.

Please contact [Ian Renfree](#) if you have queries or concerns.

1. Please provide your email address:

Email addresses will be solely used for the purposes of this study and will be discarded when the study is complete or at any time if requested.

2. Typically what are the best times for you to participate in an interview?

- ☐ Week days - morning
- ☐ Week days - afternoon
- ☐ Week days - evening
- ☐ Week days - lunch time
- ☐ Weekends - morning
- ☐ Weekends - afternoon
- ☐ Weekends - evening
- ☐ Other (please specify)

3. Gender

- ☐ Male
- ☐ Female
- ☐ Other
- ☐ Do not wish to disclose

4. Age

- ☐ 18-24
- ☐ 25-34
- ☐ 35-44
- ☐ 45-54
- ☐ 55-64
- ☐ 65+
- ☐ Do not wish to disclose

5. Which country do you primarily reside in?

6. What is the highest level of education you have attained?

- ☐ No education
- ☐ Secondary school / high school
- ☐ College
- ☐ Bachelors degree
- ☐ Masters degree
- ☐ Higher level degree (e.g. PhD)
- ☐ Do not wish to disclose

7. Employment Status

- ☐ Employed
- ☐ Self employed
- ☐ Homemaker
- ☐ Student
- ☐ Military
- ☐ Retired
- ☐ Not currently working
- ☐ Other
- ☐ Do not wish to disclose

Appendix C: Informed consent

A rapid ethnography of the 'Lift' behaviour change application

Thank you for agreeing to participate in this study.

Before you participate in the interview you need to read the [information sheet](#) and respond to the questions below to give your informed consent.

After giving consent, you will be presented with some further questions regarding your use of Lift.

This study has been approved by Rachel Benedyk (Research Department's Ethics Chair)

Project ID No: UCLIC/1314/007

Please contact lan.Renfree.11@ucl.ac.uk if you have any questions or concerns.

PARTICIPANT'S STATEMENT

I agree that I have

- [read the information sheet](#);
- had the opportunity to ask questions and discuss the study;
- received satisfactory answers to all my questions or have been advised of an individual to contact for answers to pertinent questions about the research and my rights as a participant and whom to contact in the event of a research-related injury.
- I understand that my participation will be taped/video recorded and I am aware of and consent to the analysis of the recordings.
- I understand that I must not take part if I am not physically able to do the tasks

For the following, please select "Yes" or "No".

1. I agree for the video recording to be used by the researchers in further research studies

☐ Yes
☐ No

2. I agree for the video recording to be used by the researchers for teaching, conferences, presentations, publications, and/or thesis work

☐ Yes
☐ No

3. I understand that I will have the opportunity to confirm these decisions after I have seen my video recording.

☐ Yes
☐ No

4. I understand that I am free to withdraw from the study without penalty if I so wish. I understand that I consent to the processing of my personal information for the purposes of this study only. I understand that any such information will be treated as strictly confidential and handled in accordance with the provisions of the Data Protection Act 1998.

Please enter your name in CAPITALS to confirm you understand and agree with all the above statements.

Appendix D: Social Media adverts

Facebook

**Coach.me / Lift user?**

Like Page

Sponsored · 

User of Coach.me (Lift) app? Earn £15 or \$20 by participating in a 30min interview



Earn £ for interview

Requirements for participation: Aged 18+ / Current or past user of 'Coach.me' ('Lift') on iOS / Not registered as a coach on 'Coach.me' / Able to access Skype

OPINIO.UCL.AC.UK

Like · Comment · Share

Twitter

**Ian Renfree** @ianrenfree 21 Jan, 9:33 AM

Coach.me (Lift) user? Earn £15 or \$20 by participating in a short interview
opinio.ucl.ac.uk/s?s=35141

Appendix E: Recruitment email to UCLIC

Participants are invited to take part in a study investigating the iOS smartphone application 'Coach.me' (previously called Lift). As a participant you will complete a short web based survey (approximately 3 minutes) and a 30 minute interview via Skype.

If you wish to participate, please sign up here: <https://opinio.ucl.ac.uk/s?s=35141>.

Payment:

Participants who complete the survey and interview will be compensated with an Amazon voucher for £15.

Requirements for participation:

- Aged 18+
- Current or past user of 'Coach.me' ('Lift') on iOS
- Not registered as a coach on 'Coach.me'
- Able to access Skype