"*Streamless*": Reducing Streaming through a Psychology-based Intervention Application

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0. Background

The internet has become an integral part of people's everyday lives. The average internet user in 2019 spent 6.5 hours online every day (Kemp, 2019), nearly 2.2 of which were spent on social media (TNW, 2019). With the internet becoming more easily available and user-friendly every year, the number of internet users has soared; internet usage having grown at 10% per year since 2005 (ITU, 2019). Currently, 62% of the global population uses the internet (Internet World Stats, 2020), indicating that many people are awaiting access to the internet. Besides having revolutionised communication and facilitated many aspects of human life (Dentzel, 2014), the internet has also created numerous negative externalities on social and environmental levels. Socially, the internet has been identified as a source of addiction (Young, 1998; Griffiths, 1999; Shaw & Black, 2008), negatively affecting people's mental health (Young & Rogers, 1998; Masih & Rajkumar, 2019), increasing loneliness despite virtually connecting people (Costa et al., 2018; Coget et al., 2002) and violating privacy rights (Culnan & Armstrong, 1999; Dinev & Hart, 2003). Environmentally, the internet is reliant on a lot of energy to be powered (Gombiner, 2011; Hinton et al., 2011), producing carbon dioxide which contributes to the deterioration of our climate. In this essay, we focus on the environmental aspect of the internet, as this remains understudied in the literature and individuals often do not acknowledge the internet's contribution to climate change (Eco Voice, 2020) as its emissions remain invisible (Schäfer, 2015).

The general energy crisis is not one of production but rather one of consumption. The same holds true for the internet, which has only seen internet consumption increase in light of technical advances and increased internet efficiency. As a consequence, the internet is the world's fastest growing carbon-emitting industry (Waddoups, 2021), with internet usage accounting for 2.6% of global energy consumption in 2017 and estimated to represent 4.0% in 2023 (The Shift Project, 2019). Although the industry is largely making a shift to renewable sources of energy to power the internet rather than relying on the burning of fossil fuels, "the internet already uses three times more energy than all wind and solar power sources worldwide can provide" (De Decker, 2018, para. 4), making this an insufficient process to reduce the internet's carbon footprint.

To narrow down the scope of our essay, we focus on the consumer practice of online streaming, as 53% of the internet industry's carbon emissions come from end-user devices, with streaming being "the biggest driver of explosive data growth" (Climate Care, 2018, The Amount Of Data We Use Is Increasing). In light of the Covid-19 pandemic many activities, both work-related and leisurely, have been forced to happen on the internet. As people have been forced to stay at home, consumer spending on streaming has significantly increased (Dixit et al., 2020; Gontovnikas, 2020; Rushe & Lee, 2020). The already fast growing industry thus gained a boost from the global pandemic, highlighting the need and urgency to reassess our internet behaviour as internet usage keeps growing exponentially.

The literature on the internet's carbon footprint comprises a body of conflicting numbers. The activity of streaming for 1 hour was estimated by many popular headlines to consume 3.2 kg of CO2, equivalent to driving almost 8 miles (Sparks, 2019; Cwienk, 2019; Jupp, 2020). An in-depth analysis by Kamiya (2020) refutes these claims and states that the energy intensity of streaming is much lower, with a Netflix video in 2019 consuming around 0.077 kWh of electricity per hour. Another study, by Preist et al. (2019), calculated that all YouTube videos watched in 2016 resulted in roughly 11.13 million tons of carbon dioxide, which is similar to the yearly amount of greenhouse gas emitted by a city the size of Glasgow (Schwab, 2019). The real energy use regarding the internet is hard to determine as the network is complex and fast-changing in nature (De Decker, 2015). The wide-ranging numbers originate in different ways of calculating. Some overestimate "the amount of data transferred each second during streaming" (Kamiya, 2020, para. 16), or fail to consider the energy required to manufacture the devices (De Decker, 2009), or study merely one sub-system and ignore "important parts of the overall system including data centers, international infrastructure, on-site networking equipment and end user devices, not to mention the differences between cable and mobile networks" (Greenwood, 2020, para. 9) and resolution (Kamiya, 2020).

Tielbeke (2020) however, warns us not to fall victim to the myth of the CO_2 glasses, namely that the ecological crisis can be reduced to calculations. The collapse of ecosystems, the extinction of insect populations, soil pollution and the floating dump in the ocean cannot be expressed in CO_2 equivalents (Tielbeke, 2020). Inconsistency in scientific literature makes it hard to give a coherent ecological reasoning for any interventions. Therefore, the focus of the problem analysis is on the negative impacts of streaming for the individual, rather than the environment. This choice was made because people are more likely to engage in behaviour

change when discourse is framed from a health perspective (Semenza et al., 2011; Petrovic et al., 2014) rather than from an environmental and climate change angle which often seems intangible (Schäfer, 2015) and the proven lack of behavioural effects in educational campaigns on greenhouse effects (Staats et al., 1996; Abrahamse et al., 2005).

1. Introduction

Traditional television has seen vast decreases in popularity over the past years (Turner & Tay, 2009; Luckerson, 2014), with viewers increasingly shifting to online modes of watching videos (Jones, 2009; Pisharody, 2013). Video streaming (hereafter 'streaming') is defined as "a type of media streaming in which the data from a video file is continuously delivered via the internet to a remote user" (Techopedia, 2021, para. 1). Because the video is split into parts and transmitted in succession in video streaming, the receiver can watch the video parts as they are received, without having to wait for the delivery of the whole video (Apostolopoulos et al., 2002). The ability to watch the video without having to wait until the whole video is downloaded, makes streaming a low-threshold, low-ability, convenient activity. This is a facilitator for the practice of binge-watching, a phenomenon defined as watching "at least two episodes of the same program […] until the end in one sitting" (Castro et al., 2021, p.9), which has become very common (Sabin, 2018), albeit remains stigmatised (Silverman & Ryalls, 2016). A report from Limelight Networks points out that "globally, people who watch online video spend an average of six hours, 48 minutes per week watching various types of content", with average viewing time having grown 59% since 2016 (2019, p.6). Binge-watching has become a widespread phenomenon, exacerbated by the Covid-19 induced lockdowns (Dixit et al., 2020), and has "ultimately become a normal way of consuming TV series among general audiences" (Pierce-Grove as cited in Starosta & Izydorczyk, 2020, p.1). Besides vehemently negatively contributing to climate change, the activity of streaming can have negative effects on viewers, including lower well-being and life satisfaction, lower levels of trust, isolation, feelings of loneliness, regret, tiredness, laziness and health risks such as physical inactivity, poor dietary intake, social isolation, sleep disturbances and poor sleep quality and behavioural addiction (Frey et al., 2007; Wagner, 2016; Rubenking et al., 2018; Scherer, 2020).

In this essay, we analyse the different stages and psychological mechanisms the individual encounters when streaming using the Fogg Behaviour Model (FBM) by B.J. Fogg (2009) to integrate interventions into an application which aims to reduce people's streaming. In section 2, we analyse the activity of streaming making use of Activity Theory (AT) (Kamanga et al., 2019) to discover the different stages, motivations and decisions related to the activity. We then elaborate on the theoretical framework we employ, the FBM, and apply it to the activity of streaming. In section 3, we set out the problem analysis according to the phases of before, during and after streaming, review the literature and highlight the psychological mechanisms

attached to the behaviour. We provide possible interventions, integrated into a mobile application, to reduce the individual's spent time streaming. Section 4 serves as a practical guide of the functioning of the application. The final section concludes the essay and discusses the limitations of this essay.

2. Theoretical Framework

2.1 Activity Theory

AT majorly developed in the 1920s and 1930s Soviet Union, drawing heavily from the works of three psychologists, Vygotsky, Rubinstein and Leontiev (Kamanga et al., 2019). Activities are dynamic in nature (Karanasios et al., 2015) and often interrelated, resulting in complex processes that are distributed through various subjects, objects and tools. AT is a useful framework to break down complex processes into goals, sub-goals and actions and enables users to visualise the entire journey of an activity, an essential step when trying to bring about change (Karanasios et al., 2015). AT helps identify potential areas for intervention (Kuutti, 1999) depending upon factors such as motivations, mediating tools and ultimate goals.

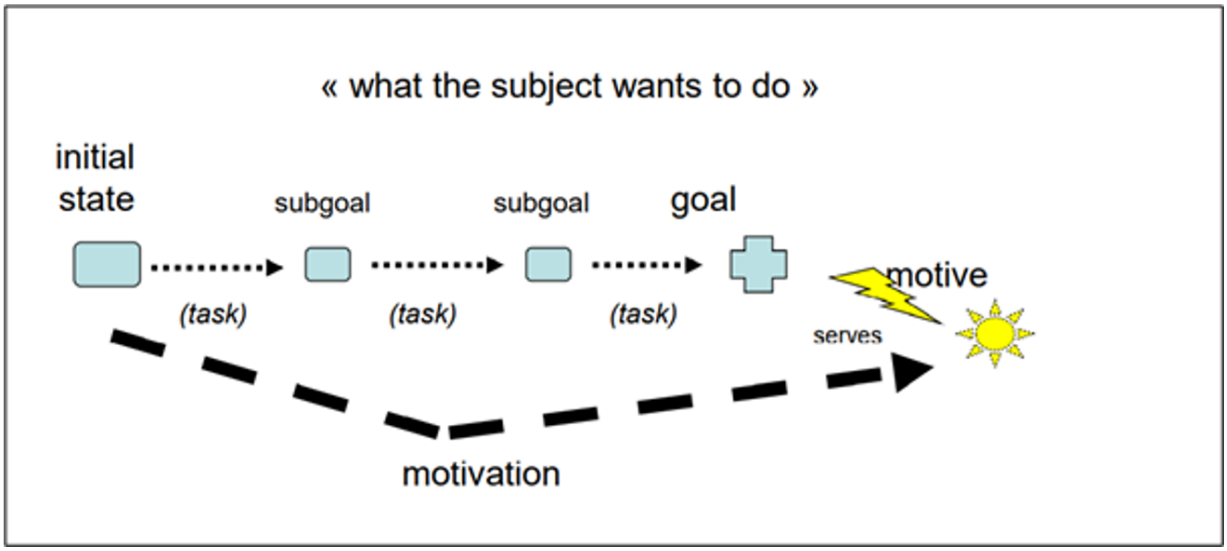


Figure 1: AT simplified (adapted from Rubinstein, Leontiev, Lomov, Nosulenko)

An activity has various elements. The activity itself is driven by motives and goals, i.e. the final desired state. The goal is attained through sub-goals, which are intermediate states and reaching each sub-goal is known as a task. Completing each task leads to action driven by the subject's motivation (Hasan, 1998).

We used AT to map (see figure 2) how an individual uses various streaming platforms by identifying motivations at different points in time - from making the decision to stream to the effects post-streaming. This facilitated a classification into three phases: before streaming, during streaming and after streaming.

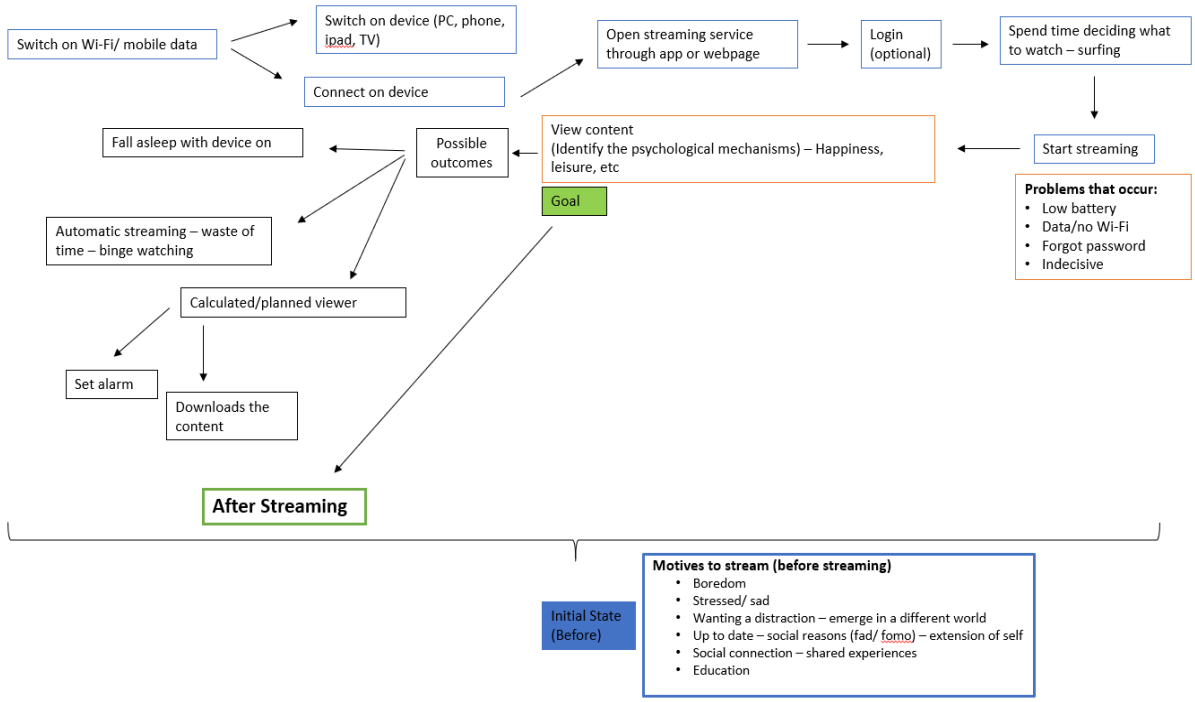


Figure 2: AT applied to streaming

The three phases each have different psychological mechanisms underpinning the decision of streaming and/or continuing or stopping streaming. "Before streaming" entails the motivations behind a user planning on streaming through a platform. Because streaming requires relatively little effort, it is a popular and mainstream activity (Garrison, 2001). "During streaming" comprises various sub-goals that facilitate streaming and keep the user engaged, which could potentially lead to binge-watching. "After streaming" mainly comprises how a user feels once they stop streaming. This could be both positive - feeling relaxed, happy, caught up with the recent fad - and negative – waste of time, irritated, emotional distress, poor sleep quality, etc. (Wagner, 2016; Rubenking et al., 2018; Castro et al., 2021; Steiner & Xu, 2018).

2.2 Fogg Behaviour Model

The theoretical underpinning of this essay, the FBM (Fogg, 2009), posits that for a behaviour to occur "a person must have sufficient motivation, sufficient ability, and an effective trigger" (Fogg, 2009, p.1) all being present at the same time. The equation is thus as follows: Behaviour = Motivation x Ability x Trigger/Prompt (figure 3). To get people to possess sufficient levels of motivation and ability that put them above the action line, often either motivation or ability must be increased. A well-timed trigger is essential to turn sufficient motivation and ability into

the desired behaviour. The FBM states that to prevent a behaviour one of the three factors should be eliminated.

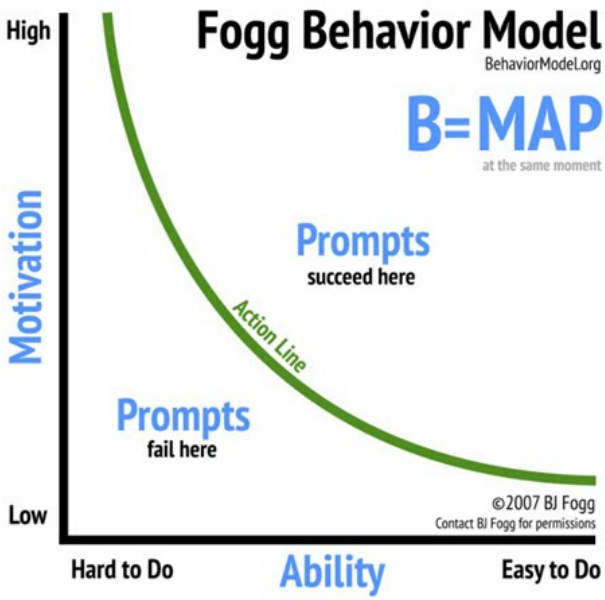


Figure 3: Fogg Behaviour Model (Fogg & Euchner, 2019)

Generally speaking, the ability to stream is high, assuming that one has sufficient access to the internet, a streaming platform and a device, making it an easy to do activity. To reduce people's streaming behaviour, it is thus important to either decrease individuals' motivation to stream or to increase individuals' motivation to pursue an alternative activity. We come up with ways to decrease/increase motivation to stream/do an alternative activity and effective triggers that allow for the desired behaviour to occur.

Fogg's elements of motivation are helpful to incorporate into the application to decrease motivation to stream. The pleasure/pain motivator explains that people engage in certain behaviour because of instinctively responding to what is happening in the moment. Individuals must thus be relieved of the pain associated with not/limiting streaming and must experience pleasure in it. Secondly, the hope/fear motivator, characterised by anticipation of an outcome, can be applied to the health aspect of streaming. Hopefulness must be connected to health benefits of not/limiting streaming, whereas fear must be linked to health risks. Finally, the social acceptance/rejection motivator posits that "people are motivated to do things that win them

social acceptance" (Fogg, 2009, p.4) and avoid social rejection. Individuals should be triggered to remember that the norm regarding streaming is to refrain from binge-watching.

Triggers, which ensure action (does not) happen(s), can be sparks, facilitators or signals. These different types correspond to lacking motivation, lacking ability and possessing both motivation and ability to perform the desired behaviour respectively. They can take the form of a notification containing health information, alternative activities, or feedback.

3. Problem Analysis and Interventions

To aid individuals control and reduce their streaming habits, we present a design of a mobile application. The FBM was used to analyse the psychological processes behind streaming behaviour and design triggers and rewards for continual use of the application (Filippou et al., 2015). The proposed interventions integrated into the application are grounded in scientific literature. Each feature is designed to address one or more 'target behaviours', i.e. behaviours that we want to change to reach the goal of reducing streaming.

3.1 Before Streaming

3.1.1 Problem Analysis

Streaming can be motivated by various factors: to escape from negative feelings, regulate moods, fill time, break away from the daily grind, enhance enjoyment, lack of alternatives, feelings of boredom, desire to flee the world, loneliness, exhaustion, background noise for multitasking, avoiding spoilers and maximizing social currency (Castro et al., 2021; Mcllwraith, 1998; Panda & Pandey, 2017; Steiner and Xu, 2018; Sung et al., 2018; Sussman & Moran, 2013; Wagner, 2016). Research has found that people usually binge-watch alone, on weekday evenings and nights, and mostly in the living room and bedroom (Castro et al., 2021). Panda and Pandey (2017) state that users often get caught up in a 'flow' that keeps them psychologically hooked to the content due to uninterrupted viewing, persuasive narratives, transportation, and cliff hangers (Jenner, 2017; Green & Brock, 2002). Previous research has established a link between long unintended/unplanned streaming and reduced well-being in the form of regret (Castro et al., 2021; Rubenking et al., 2018). While streaming cannot and should not be eradicated completely, it can be reduced, resulting in fewer carbon emissions and increased user well-being.

3.1.2 Interventions in the Scientific Literature

3.1.2.1 Information & Toolkits

Health behaviour studies have shown that people may not follow through with their goals if they are unaware of the negative consequences of their behaviour (Becker, 1974; Weinstein, 1988). Dandamudi and Sathiyaseelan (2018) suggest awareness workshops, to provide users with information about the impact prolonged viewing has on their health and environment. Evidence-based toolkits are an effective way for knowledge transfer and aid practice change

(Yamada et al., 2015). It is also important to supplement the information with high quality evidence when the aim of the toolkit is to bring about a change in practice (Grimshaw et al., 2012).

It is equally necessary to supplement information with actionable interventions at the right time for a behaviour change to happen (Fogg, 2009). This warrants the need for timely interventions that curb impulsive and maladaptive viewing (Walton-Pattison et al., 2018).

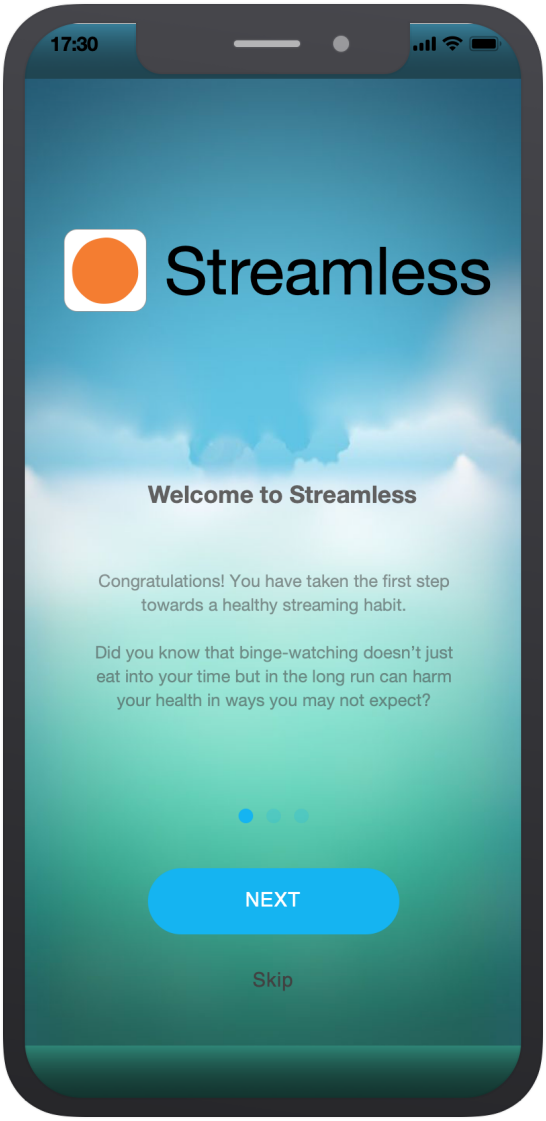
3.1.2.2 Goal-Setting

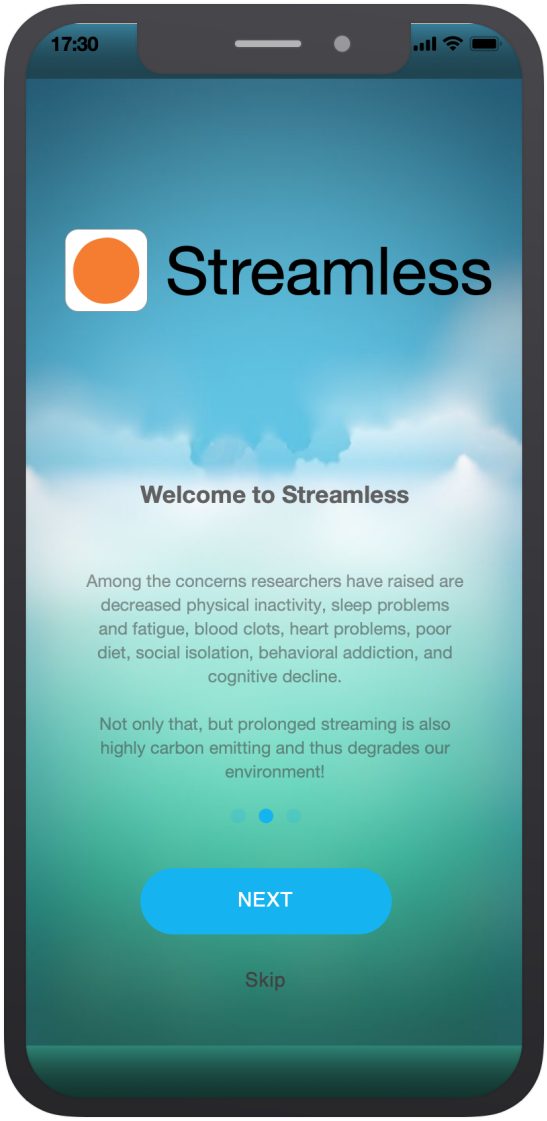
The theory of goal-setting (Locke & Latham, 1984) involves establishing goals that one wants to achieve, as goals can impact action (Ryan, 1970). Goals are outcomes that one wants to achieve (de Feijter et al., 2016). Goal-setting increases one's motivation and commitment towards the task and decreases the possibility of distraction (Strecher et al., 1995). Latham (2004) showed how goal-setting increased employee motivation and commitment within an organisation. Whereas Miller (2020) displayed a link between goal-setting and achievement in a classroom setting and established a positive link between goals and academic performance. Goal-setting and self-monitoring strategies have been effectively used in many dietary and weight loss interventions both in the long- and short-run (Samdal et al., 2017; Saperstein et al., 2007). With the advent of ubiquitous internet, fitness and weight tracking applications have become very common wherein goal-setting techniques have proven useful along with various triggers (notifications, reminders, feedback) to enhance goal attainment (Laing et al., 2014; Wen et al., 2017). In the context of online viewing, De Feijter et al. (2016) proposed an application that would determine optimal viewing time and alert the viewer of the same.

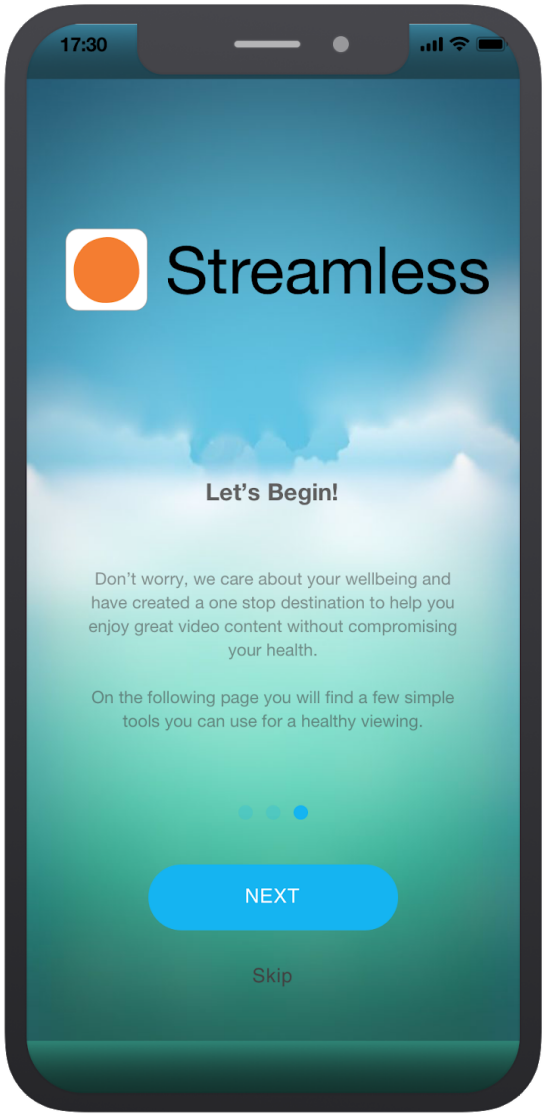
3.1.3 Integration into the Application

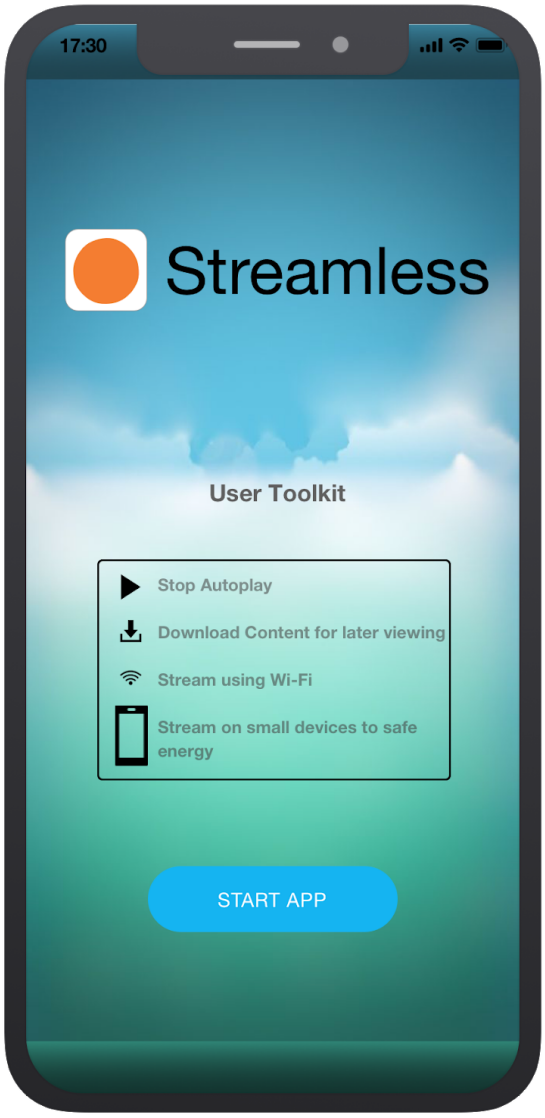
As soon as the user sets up the application, they will be shown a toolkit. This toolkit serves two purposes: educate the user on the health benefits of controlled streaming and provide the opportunity for the user to make certain one-time adjustments to their settings. It also includes information about the environmental ill-effects of excessive streaming. The user will be prompted on the following: using Wi-Fi or mobile data (Wi-Fi being more energy-efficient), streaming device, quality of streaming, to stream or download content and the option to disable auto-play.

The toolkit will first educate the user briefly on how prolonged streaming is detrimental to oneself and then provide multiple avenues for change. This is when the user can opt in or out of the above mentioned. E.g.:

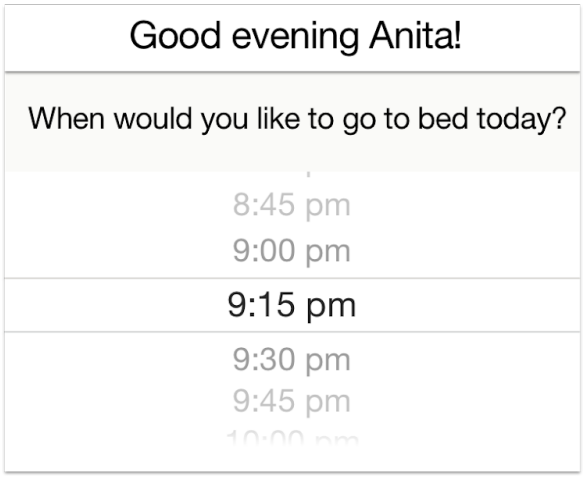


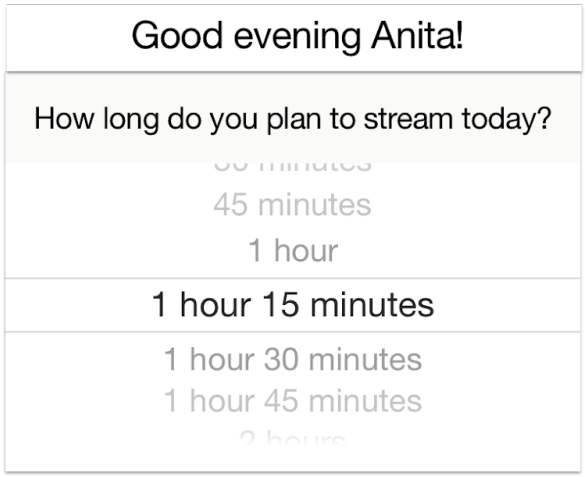




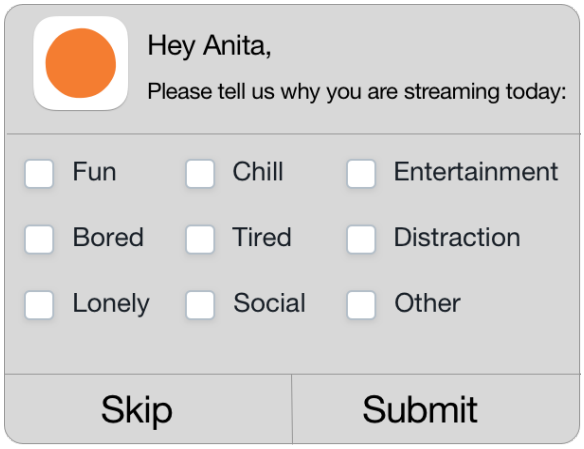


Scheduling here means setting up the time when the user would ideally like to go to bed or log off as well as how long/ how much the user wants to stream. E.g.:

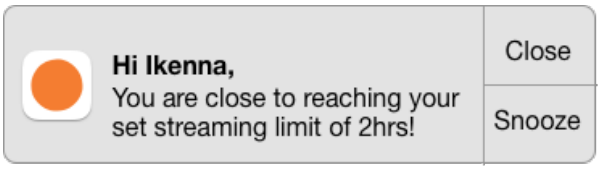


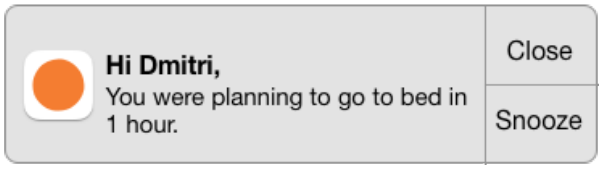


Here, the application also asks the user to record their motivation for streaming. E.g.:



Inputting these values, the application will recommend (and notify) when the user should stop streaming and prepare for bed or the next (planned) activity. E.g.:





It is important that the user is asked this before streaming as they are more likely to take a 'responsible' decision before streaming than while they are engaged in the content that is being viewed.

We use reminders as a trigger as suggested by the FBM, when the behaviour is a high ability and highly motivated one (Fogg, 2009).

Figure 4: FBM to depict scheduling behaviour

3.2 During Streaming

3.2.1 Problem Analysis

As the user has received the information from the toolkit and set the goals, the next step would be to remind them of their knowledge and intentions once they have begun streaming. This stage can be tricky. According to the FBM (Fogg, 2009), humans naturally love simplicity, in other words, activities that require low ability to be completed. Relying on the automatic 'next episode' mechanism and algorithms to recommend individual relevant content, streaming media simplifies the platform so that users need not think too much while being engaged endlessly (Leslie, 2016; Gomez-Uribe & Hunt, 2015).

Due to the low-effort characteristic of features like auto-play, users can lose their sense of agency during streaming (Granow et al., 2018). Furthermore, the phenomenon of hedonic adaptation states that people grow accustomed to pleasurable things in life (Richins, 2013) to the extent that its impact on long-term well-being reduces over time (Pilipets, 2019). Consumers with high-materialism show "hedonic elevation in product-evoked emotions before purchase, followed by hedonic decline after purchase" (Richins, 2013, p.1), highlighting the importance of anticipated happiness. Particularly individuals with self-regulation deficiency, prone to passively consuming several videos one after the other (Tukachinsky & Eyal, 2018), can be affected more. This can increase the risk of conflicting goals between life obligation and entertainment consumption (Granow et al., 2018).

3.2.2 Interventions in the Scientific Literature

3.2.2.1 Goal-Striving & Behaviour Replacement

The next step to goal-setting is goal-striving (effort, persistence, strategic planning), which represents the process of performing the necessary actions to achieve desired goals (Mann et al., 2013). Self-regulation and forming implementation intentions can tackle problems that people face during the process (Trope & Liberman, 2003). Giving a target environment for people to consistently engage in can also promote goal-striving behaviours over time (e.g., Bargh et al., 2001). One way to set up this target environment is to prompt replacement behaviours. In addition to reducing undesirable behaviours, the importance of teaching the replacement behaviour has been highlighted (Alberto & Troutman, 2003). Replacement behaviours are any behaviours identified and developed as an appropriate behaviour that will

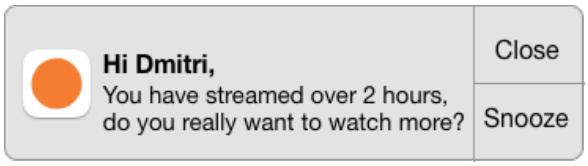
replace the problem behaviour and meet the same needs as the problem behaviour (Landrum et al., 2003). It is important that the replacement behaviour fulfils the same function(s) as the undesirable behaviour for it to have effect (Landrum et al., 2003). Lack of appropriate relevance and understanding of proposed replacement behaviour can limit the user's ability to implement the behaviour appropriately (Blood and Neel, 2007).

Here the proposed replacement behaviours vary across a range to cover different motivational needs that are being recorded in before streaming. Strong support in the literature can be found for turning isolated binging sessions into group viewing sessions as a method to reduce viewing time, from 5 to 3.5 hours on average (Yetter, 2018). Pittman and Steiner (2021) distinguish between feast watching and cringe watching, where the first is planned, social and attentive and the second is unplanned, solo and distracted. They state that shared media experiences, especially with close ties, lead to improved mental wellbeing (Pittman & Steiner, 2021). Lyubomirsky notes that streaming with family and friends can contribute to happiness and overall well-being whilst the social aspect can turn the activity into a pleasure that strengthens relationships (cited in Scherer, 2020).

A study by Brikk (2006) successfully implemented a health behaviour change intervention using the social ecology model, which argues that the intervention suggested must be culturally and socially relevant for the respondent to find the change realistic and desirable. This supports our suggestion of alternatives such as content relevant events occurring in proximity and online and offline socialising. Pittman and Steiner's (2021) study identified 'fear of missing out' as a major factor for binging, suggesting that viewers of shows would be interested in participating in narratives surrounding the show.

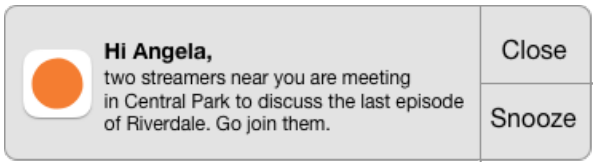
3.2.3 Integration into the Application

The time limit reminder has been set up before streaming. During streaming, once the viewing time is exceeded, the reminder text will be prompted.

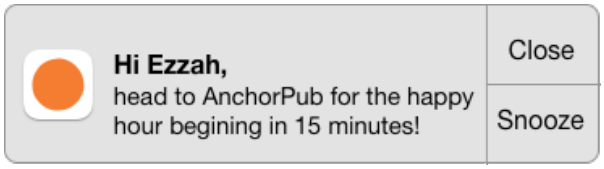


We use spark triggers ‘during streaming’ to motivate users to be a planned viewer, calculate and control their streaming. The user has also recorded the motivation for streaming in the before stage. Based on this information one of the following replacement behaviours will subsequently be suggested:

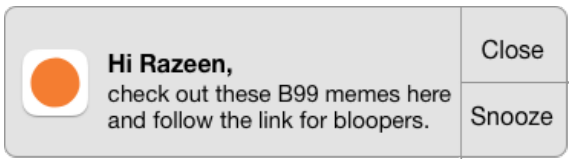
a) Offline connection of people: when multiple viewers are streaming at the same time within a pre-decided radius, a spark suggests meeting offline. While it is not a simple activity, it is an activity with high motivation for extroverts and for lonely people, as it triggers them to avoid the pain of loneliness and find pleasure through connection.



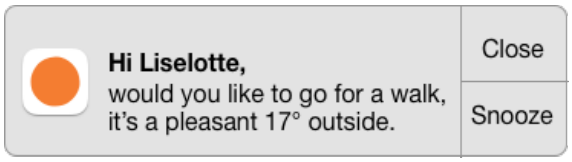
b) Connect with offline stakeholders: the user is informed about online or offline events taking place near them at the same time. The events act as motivators to not stream and find entertainment elsewhere, in cafes, bookstores, theatres, etc. The events that are online would have high ability as they require less physical effort, but those that are offline might need to be more relevant to the user’s interests to act as an efficient motivational spark.



c) What else is out there: the spark provides content-relevant alternatives off the streaming platform such as fanfiction or fan art, interviews and celebrity content, reviews, games, discussion groups and meme pages about the show. This spark provides high motivation and requires very little input on the part of the user as they are engaged in the same story, just on different platforms. These interventions also seek to increase real time opportunities to receive social acceptance, by providing a common ground for connecting and reducing chances of rejection.



d) Weather information spark: during streaming users see a small pop-up that displays the weather outside, including both real photos and a friendly inquiry based on various weather conditions. This spark basically works to improve users' awareness of the outside world and encourage them to join in outdoor activities.



3.3 After Streaming

3.3.1 Problem Analysis

(Binge-) watching videos can have several negative implications once one has ceased the activity. Streaming for too long can leave people feeling unhappier, dissatisfied, guilty, lazy, tired, regretful, and less relaxed (Wagner, 2016; Rubenking et al., 2018; Castro et al., 2021). Guilt can arise due to a lack of intentionality when binge-watching (Wagner, 2016) and regret from replacing other activities and responsibilities with watching videos (Rubenking et al., 2018). Here the aim is thus to avoid future negative feelings attached to the behaviour.

3.3.2 Interventions in the Scientific Literature

3.3.2.1 Feedback

Feedback is omnipresent as a behavioural change intervention both in the context of health and pro-environmental behaviour. Feedback has led to less energy consumption at home and work by informing consumers of their consumption (Darby, 2006) and using feedback of energy efficiency and health level (Zhuang & Wu, 2019) which changed consumers' beliefs. Additionally, findings of effects leading to efficient (Casal et al., 2017), pro-environmental behaviour such as recycling (Schultz, 1999) and self-regulation (Fishbach & Finkelstein, 2012) demonstrate how viable feedback can be as a behavioural change intervention.

Direct feedback has greater effects than indirect feedback (Bonini et al., 2018; Darby, 2006; Zhuang & Wu, 2019) whilst the importance of feedback frequency is being debated. Frequent feedback was found to facilitate habit building (Bonini et al., 2018; Fischer, 2008; Zhuang & Wu, 2019) but contrarily not seen as effective or positive for behaviour change (Casal et al., 2017; Lurie & Swaminathan, 2009). Similarly, normative comparisons can be ineffective as

they can lead to boomerang effects (Fischer, 2008; Schultz, 1999). However, Schultz et al. (2007), found that the use of an injunctive component could eliminate this effect, leading to an overall improvement. Therefore, feedback should be intermediate, precise, easy to understand and interactive (Bonini et al., 2018; Darby, 2006; Fischer, 2008; Zhuang & Wu, 2019).

Regarding goal-setting and self-regulation, both negative and positive feedback have proven to be effective (Fishbach & Finkelstein, 2012). While "positive feedback increases motivation when it signals that the goal is valuable and the person is able to successfully pursue it" (Fishbach & Finkelstein, 2012, p. 225), "[n]egative feedback […] increases motivation when it signals discrepancy with a desired end state" (Fishbach & Finkelstein, 2012, p. 225).

3.3.2.2 Social Comparison & Conscious Permanent Visibility

Individuals deem the opinions and actions of others important and social norm dynamics can have essential societal outcomes (Nyborg et al., 2016). Social information can affect individuals' behaviour as they might want to "fit in (or on the contrary, stand out), avoid social disapproval, or seek social esteem" (Farrow et al., 2017, p.1). Similarly, humans constantly use social comparison information to judge themselves and attach great importance to relative standing (Klein, 1997; Suls et al., 2002). The effects on self-evaluations are usually greater in social comparison with members of meaningful in-groups than with out-group members (Major et al., 1993; Brewer & Weber, 1994) because in-group members are often viewed as similar and are therefore a more informative standard of comparison (Goethals & Darley, 1977). Psychological closeness, relatable attributes and a high salience of one's connection with others can promote assimilation to a certain behaviour (Suls et al., 2002). Social comparison can lead to competitive behaviour, as individuals have a basic drive of improving their performance to reduce or omit discrepancies between one's and others' level of performance (Festinger, 1954; Garcia et al., 2013). Social comparison and consequential competitiveness can thus encourage people to perform aligned with the norm and/or better than others. Individual gratifications gained from good/normative behaviour can further strengthen people's intention to use the application (Pei-Shan & Hsi-Peng, 2014).

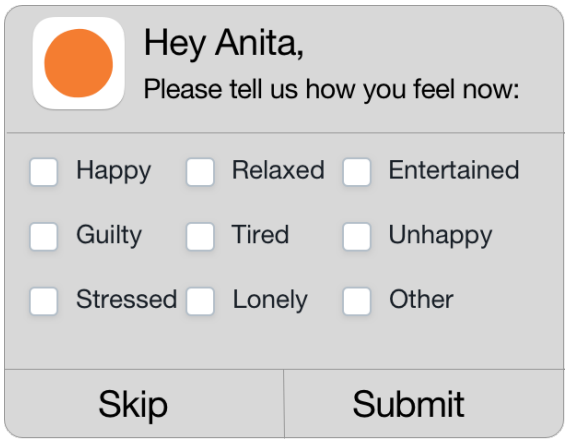
People who live in ubiquitous computing environments and use internet services, should assume that they can be monitored by anyone (Mitrou et al., 2014). The data internet users gather and create has been theorised as "participatory" or "interpersonal" surveillance, where every user "can be equally observer and observed, controller and controlled" (Mitrou et al.,

2014, p.12). Electronic surveillance operates similarly to Bentham's Panopticon due to its invisible inspection and its anonymous, constant, and automatic character (Lyon, 1994). Functioning in a similar fashion to the Panopticon's conscious permanent visibility (Foucault, 1975), the action of streaming videos can be put into the public sphere by making the individual's streaming data visible to others, therefore regulating and normalising their behaviour (Tsui, 2003).

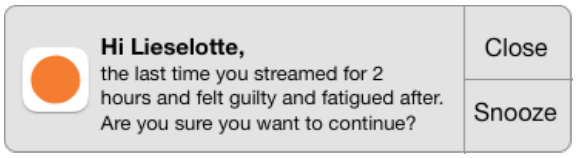
3.3.3 Integration into the Application

In the after streaming stage, it is imperative to change future behaviour. The interventions are mainly composed of notifications, based on the FBM's hope/fear motivator and the social acceptance/rejection motivator. These notifications are signal triggers, which serve as reminders.

Once users have ceased streaming, they are asked how they feel. The next time the user starts to stream, they will receive a notification reminding them of how they felt the last time.

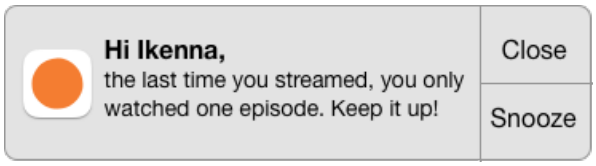


In case the viewer stored a negative feeling, by being reminded of it, their motivation to engage in the activity of streaming can go down - assuming the ability to stream is high - potentially even below the action threshold, leading to the individual resorting to an alternative activity. The reminder (trigger) could look as follows:

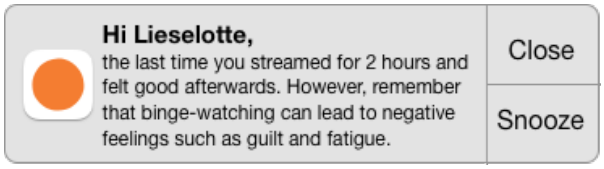


If the viewer stored a positive feeling, the messages should vary depending on whether the user binge-watched or not. If they did/did not binge-watch the last time, following Fishbach and Finkelstein (2012) negative/positive feedback should be used in order to increase the motivation - to not binge-watch this time or refrain from - hence move their motivation to engage in an alternative action or cease streaming after one episode above the threshold for action. The notifications are based on the hope/fear motivator, playing into health-related incentives.

- In case of a positive feeling after the last normal streaming session, the reminder (trigger) could look as follows:

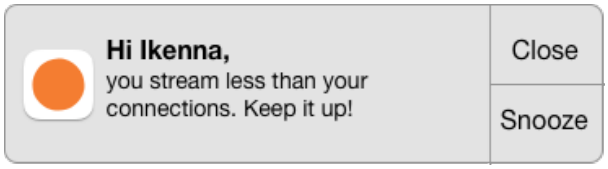


- In case of a positive feeling after the last binge-watching session, the reminder (trigger) could look as follows:

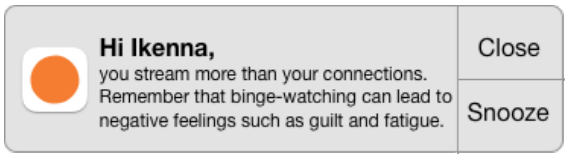


Individuals can further connect with other users, and view the streaming data of their connections. Following the logic of the Panopticon, users will be inclined to adjust their behaviour towards the norm of refraining from binge-watching, as the activity is stigmatised both by non-binge-watchers and binge-watchers alike (Rasolofoarison, 2013; Da Costa, 2019). If someone streamed more/less than their connections, negative/positive feedback will be used in order to increase the motivation to perform better than/keep up with their connections - hence move the user's motivation to engage in an alternative activity or watch less above the threshold for behaviour. The notifications here are based on the social acceptance/rejection motivator.

- In case of a good ranking compared to one's connections, the reminder (trigger) could look as follows:



- In case of a bad ranking compared to one's connections, the reminder (trigger) could look as follows:



The application will also incorporate individual gratification features, such as weekly rankings of the users who streamed the least and awarding awards. Here again the aim of the function is to decrease the motivation to stream.

The graph below is a summary of the interventions implemented into the application along with their respective psychological underpinnings. The application stores the data from previous streaming sessions, which will then be used to correctly prompt the user during their next streaming session.

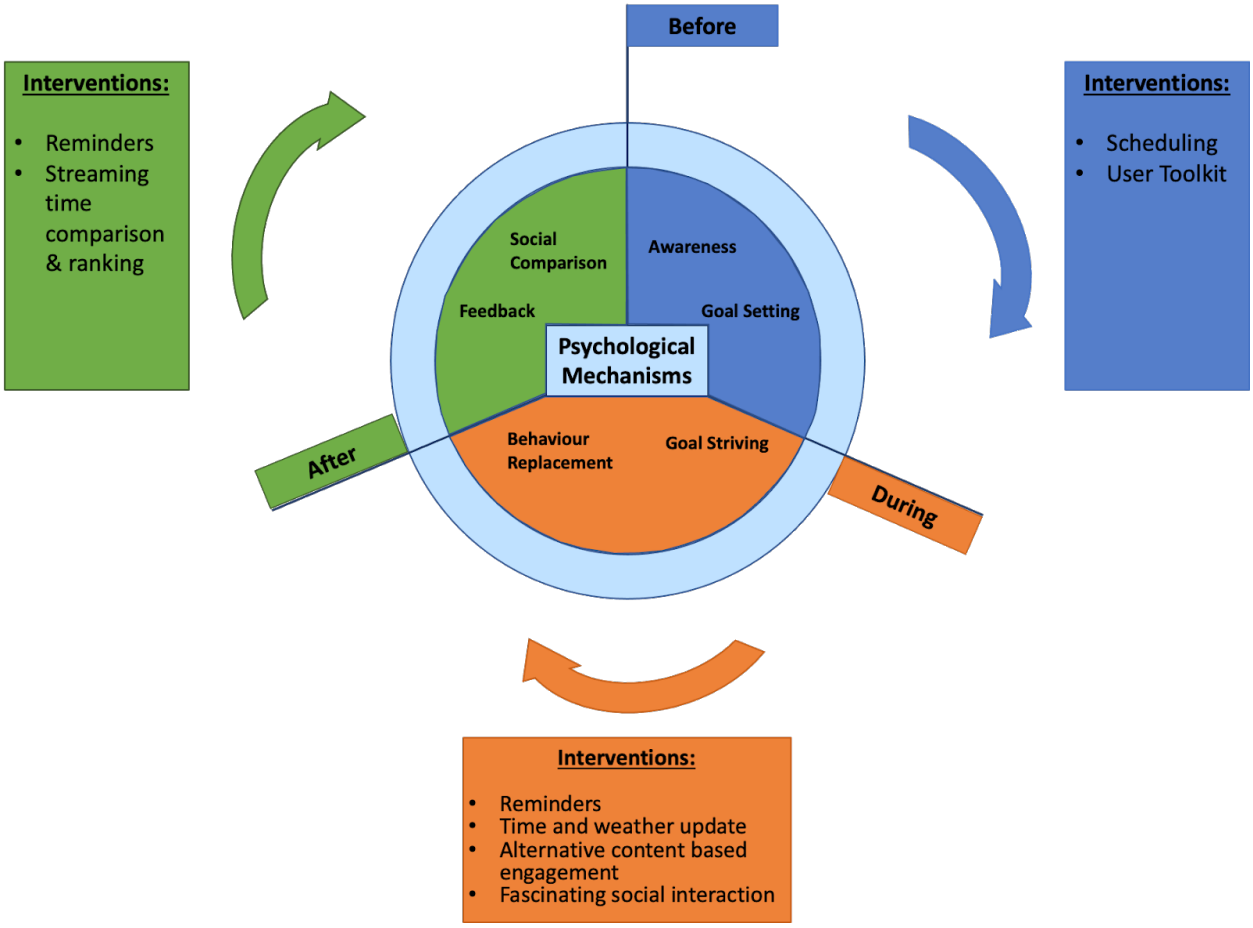
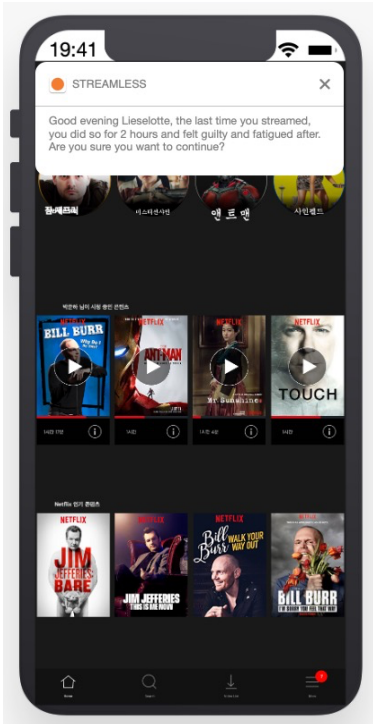


Figure 5: Summary of the psychological mechanisms and proposed interventions in the context of streaming

4. Design of the Application

The interventions explored above are integrated into a mobile application called *Streamless*. Once the application has been installed it requests permission for push notifications, location data and to monitor the use of streaming services.

Streamless first walks the user through the concept of binge-watching and educates them about the negative effects of binge-watching. When the user has decided to stream and open the streaming platform, the user is sent a message to schedule their sleep time (if streaming at night) and/or intended viewing time. They are also asked what motivates them to stream. This information will enable the application to send the relevant notifications for replacement behaviour once the viewer is about to cross the scheduled viewing time. Each time the viewer stops streaming and begins another activity, feedback on their mental state is recorded. This information is used to improve the prompts used the next time the user chooses to stream. In this manner Streamless creates a closed loop that works with the user to meet a target that has been set for mutual benefit - to improve the health of the user and to reduce the carbon footprint of binge-watching. The images below demonstrate the design of the notifications on a laptop and a phone.



5. Discussion and Limitations

Through this essay we attempt to limit individual streaming as a measure for improving the individuals' health and benefiting the environment by writing up the blueprint for a theoretically supported mobile application-based intervention. AT was applied to break down the process of streaming into identifiable stages in which appropriate interventions can be implemented. The interventions have been chosen in accordance with the FBM so that the user's ability and motivation not to stream are increased with each trigger.

These interventions were incorporated into the mobile application Streamless. There is potential for building a partnership with offline stakeholders, such as bookstores and movie theatres, who have a vested interest in the success of the application. In any case, the potential trend away from binge-watching holds immense capacity to reduce the carbon footprint of online streaming. But at the risk of putting all responsibility on the individual, we must remember that "while individual actions are important, we need governments to implement strong climate policies to achieve structural emission reductions across all sectors" (Kamiya, 2020 as cited in Taylor, 2020, para. 27).

While each intervention has strong theoretical backing, this remains a unique combination of efforts that fits together seamlessly to allow people to 'streamless'. It is imperative that the user sets appropriate goals which requires a level of self-awareness, not to mention that goal-striving can suffer if streaming is deemed more important than the set health goals. The motivations and feedback of the user are recorded according to a limited range of options, which means that when their experience is not included, the application cannot successfully map their behaviour pattern or suggest appropriate interventions.

There are also limitations to the effect of self-monitoring on motivation. The main function of self-monitoring is to enable users to understand their problematic usage behaviour rather than to motivate them to take action. Once they become familiar with their usage and perceive their problems, they can neglect the self-monitoring screen (Ko et al., 2015). Using the application for reminders and to track their own behaviour may help users see trends, but there is also the danger that it might teach them to depend on technology. Because of this dependence, applications that require constant engagement might hinder the development of automaticity of behaviour (Stawarz et al., 2015).

For further research, the convergence of hedonic and utilitarian systems for productive use as gamification (Koivisto & Hamari, 2019) has strong applicability for our aim. The restructuring of tasks to increase intrinsic hedonic motivation, extrinsic environmental motivation and affordances (Hamari et al., 2014) is in line with our application of the FBM, even as most gamification attempts rely on the self-determination theory (Deci & Ryan, 2000). Gamification would allow users to set explicit targets, track progression over time, facilitate establishment of social norms around reduced streaming and have better engagement as games are more enjoyable (Mäntymäki & Salo, 2015). While the current interventions rely on feedback and replacement behaviour to provide the motivation, gamification can improve motivation by relying on social and personal affordances such as badges. (Koivisto & Hamari, 2019). The application of gamification was beyond the scope of the current research due to various logistic constraints.

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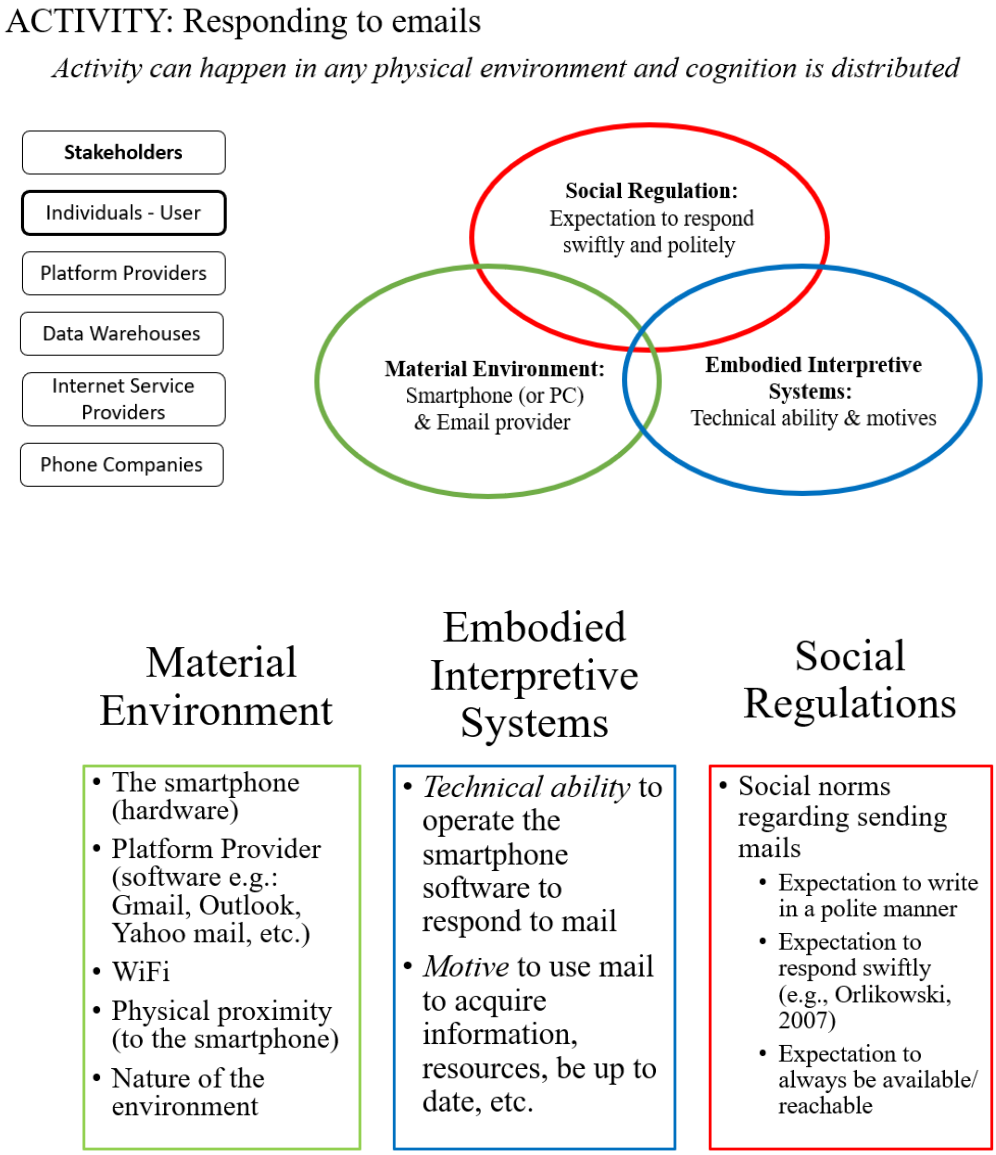
7. Appendix

7.1 Decluttering Emails: Reducing incidental internet waste

Problem: Emails are another source of energy consumption that can be easily dealt with through minor changes to our settings. Nearly 78% of all our emails are spams, concludes a research by McAfee. Every year, nearly 62 trillion spam messages are sent, accounting to around 20 million tonnes of carbon emissions per year (Berners-Lee & Clark, 2010).

Analysis: We use Activity theory and Installation theory to identify areas for interventions. This is as follows:



The focus is on what an individual can do to engage more sustainably with the internet. They can do so by reducing incidental waste through:

- Changing the default options that result in data being stored unnecessarily
- Using hard disks for storing important information rather than the Cloud
- Changing social norms regarding availability and politeness
- Reduce mindless scrolling

Solutions:

Layer	**Solution**
Material Environment	• Unsubscribe from unnecessary email listing • Use email providers that require shifting old data offline periodically o e.g. Protonmail – has 500mb capacity only

Embodied Interpretive System	• Raising awareness
	  o e.g. information on how much storage space is used by unopened or spam emails and how often emails are checked
	  o e.g. information on how long you have not checked your old emails or delete them periodically
	  o e.g. deleted does not always mean deleted – delete from the trash as well
	• Habitually categorizing – filing important emails instantly

Social Regulation	• Change the social norm regarding 'thank you' emails - #ThankYouNoThankYou
	  o e.g. by including a "No Thank You Emails" signature.
	• Change the social norm regarding the expectation of constant availability
	  o e.g. by referring to non-work hours / day hours as offline hours
	• Change the social norm of quick responses
	  o e.g. by referring to non-work hours / day hours as offline hours
	• Change the social norm of being on your phone when alone
	  o e.g. by starting a "connect – offline" movement at parties (wish we had them) and make offline cool