

# PRINCIPLES OF INCREASING USER ENGAGEMENT AND HABIT FORMATION IN SOCIAL NETWORK PLATFORMS: AN EXPLORATORY LITERATURE REVIEW

What are the principles of increasing user engagement and building habit-forming social network platforms?

Master's Thesis

Topi Ronkainen

Aalto University School of Business

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Author Topi Ronkainen

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### Abstract

During the 21<sup>st</sup> century, there has been a surge in research focused on user engagement and habitual behaviour within online-based social networks. This surge in academic interest can be attributed to the rapid growth and popularity of the social network platform industry in today's information economy, branching to social media, social streaming and gaming services for instance. However, much of the existing literature tends to be narrow in scope, focusing solely on specific subbranches or individual platforms rather than encompassing the broader realm of social networks in a generalized manner. This research aims to bridge this gap by delving into the principles of information system (IS) science, habitual IS use, persuasive technology, behaviour and network economics, behavioural, social and motivational psychology, and other relevant fields. The objective is to provide insights for platform practitioners and researchers on enhancing user engagement and fostering habitual usage within social network platforms. The size and application domain of this thesis aims to benefit all forms and the different branches of SN platforms, as it emphasizes the paramount importance of establishing enduring user relationships and understanding what drives user engagement and habit formation for long-term success of SN platforms.

To address the research question, this master's thesis builds upon the author's bachelor's thesis on the same topic by conducting a comprehensive and multidisciplinary literature review that combines the author's prior research findings with insights from a broader scope of related fields and research. By synthesising this knowledge, the thesis presents a comprehensive overview and framework of principles, theoretical perspectives, and models that can effectively guide and inform the design and planning of features to increase user engagement and shape user habits within social networks. Notably, successful implementations of these principles can be observed in large-scale platforms such as Instagram, Facebook, and Twitter. By analysing the strategies employed by these large-scale social network platforms, this thesis offers practical insights into how applying these principles can lead to habit formation and increased user engagement.

The thesis is organised into five main chapters, each systematically addressing essential components and analysis required to explore the topic comprehensively. The final two chapters are reserved for discussing the research findings, the limitations, and potential implications, offering suggestions for future research and concluding the research.

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Keywords user engagement, habit formation, information system habits, social networks, social media, behaviour and network economics, behavioural and motivational psychology and design, persuasive technologies, gamification, goal setting, platform reliability

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Työn nimi Periaatteet käyttäjien sitoutumisen lisäämiseen ja rutiininomaisen käytön muodostumiseen sosiaalisten verkostojen alustoilla: Tutkiva kirjallisuuskatsaus

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2000-luvun aikana käyttäjien sitoutumiseen ja rutiininomaiseen käyttöön sosiaalisissa verkostoissa keskittynyt tutkimus on lisääntynyt. Tämä akateemisen kiinnostuksen nousu johtuu sosiaalisten verkostojen (SV) alustateollisuuden nopeasta kasvusta nykypäivän informaatiotaloudessa, pitäen sisällään mm. sosiaalisen median, sosiaalisen suoratoiston ja sosiaaliset pelit. Kuitenkin, suurin osa olemassa olevasta kirjallisuudesta on hyvin kapeaa ja keskittyy vain tiettyihin SV:iden alaryhmiin tai yksittäisiin alustoihin sen sijaan, että se kattaisi sosiaalisten verkostojen alustat laajemmin ja yleisluontoisemmin. Tästä syystä, tämä maisterintutkielma pyrkii kaventamaan tätä aukkoa akateemisessa kirjallisuudessa syventymällä tietojärjestelmätieteen, käytöstä muokkaavan teknologian, käyttäytymis- ja verkostotalouden, käyttäytymis-, sosiaali- ja motivaatiopsykologian sekä muiden asiaankuuluvien alojen periaatteisiin ja teorioihin. Tavoitteena on tarjota alustan suunnittelijoille hyödyllisten ja käytännöllisten periaatteiden listaus käyttäjien sitoutumisen lisäämiseen ja rutiininomaisen käytön edistämiseen SV alustoilla. Tämän tutkielman sovellusalue hyödyttää kaikkia SV-alustojen eri haaroja painottaessaan kestävien käyttäjäsuhteiden luomisen ja käyttäjien sitoutumista että rutiinien muodostamista ohjaavien tekijöiden ymmärtämisen tärkeyttä SV alustojen pitkän aikavälin menestykselle.

Tämä maisterintutkielma rakentuu tutkijan samaa aihetta käsittelevään kandidaatintutkimukseen tarjoamalla kattavan ja monialaisen kirjallisuuskatsauksen, jossa yhdistyvät kirjoittajan aikaisemmat tutkimustulokset sekä kyseisestä tutkimuksesta saatuihin tutkimustuloksiin. Syntetisoimalla tutkimusaiheen akateemista kirjallisuutta tämä tutkielma tarjoaa kattavan yleiskatsauksen ja viitekehysten periaatteista, teoreettisista näkökulmista ja malleista, jotka voivat tehokkaasti ohjata SV alustojen että alustaominaisuuksien suunnittelussa käyttäjien sitoutumisen lisäämiseksi ja käyttäjien rutiinien muodostamiseksi SV:eissä. Erityisesti näiden periaatteiden onnistunut toteutus on havaittavissa suurissa alustoissa, kuten Instagramissa, Facebookissa ja Twitterissä. Analysoimalla näiden sosiaalisen verkoston alustojen käyttämiä strategioita, tämä tutkielma tarjoaa käytännön näkemyksiä siitä, kuinka näiden periaatteiden soveltaminen voi johtaa tapojen muodostumiseen ja käyttäjien sitoutumisen lisääntymiseen.

Tämä kirjallisuuskatsaus on jaettu neljään pääosioon, joista jokainen systemaattisesti tutkii ja käsittelee oleellisia periaatteita aiheen kokonaisvaltaiseen tutkimiseen. Kahdessa viimeisessä luvussa keskustellaan tutkimustuloksista, rajoituksista ja eettisiä seurauksista, sekä tarjoaa ehdotuksia tulevaa tutkimusta varten tutkimustulosten lisäksi.

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Avainsanat käyttäjien sitoutuminen, rutiinien muodostus, tietojärjestelmärutinit, sosiaaliset verkostot, sosiaalinen media, käyttäytymis- ja verkostotaloustiede, käyttäytymis-, sosiaali- ja motivaatiopsykologia, ja -suunnittelu, käytöstä muokkaavat teknologiat, pelillistäminen, tavoitteiden asettaminen, alusta luotettavuus

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# Table of Contents

<b>1</b>	<b>Introduction .....</b>	<b>1</b>
1.1	Research Objectives and Research Questions.....	4
1.2	Scope of Research .....	5
1.3	Structure of the Research.....	6
<b>2</b>	<b>Methodology.....</b>	<b>8</b>
2.1	Research Framework .....	9
2.2	Conducting the Literature Review.....	11
<b>3</b>	<b>Literary Review .....</b>	<b>13</b>
3.1	Important Definitions .....	13
3.1.1	Social Network Platform.....	13
3.1.2	User Engagement.....	15
3.1.3	SN Continuance.....	17
3.1.4	Habit and Habit Formation.....	19
3.2	Building Social Network Habits .....	22
3.2.1	SN Habit.....	23
3.2.2	Sense of Belonging in Social Network Habit Formation .....	30
3.2.3	Operant Conditioning – The Skinner Box.....	33
3.2.4	Case Example: Habit Formation in Twitter.....	34
3.3	Prevalent Economic Views and Persuasive Technologies .....	40
3.3.1	Network Economics .....	42
3.3.2	Behaviour Economics.....	45
3.3.3	Reliability View .....	49
3.4	Persuasive Technology .....	50
3.4.1	Introduction to Persuasive Technologies.....	51
3.4.2	Fogg’s Behaviour Model and Captology.....	52
3.4.3	Fogg’s & Hreha’s Behaviour Grid .....	54
3.4.4	Nir Eyal’s Hook Model .....	57
3.4.5	Gamification.....	64
3.4.6	Goal Setting and Goal Conflicts within Motivational Designs .....	72
<b>4</b>	<b>Discussion .....</b>	<b>80</b>
4.1	Synthesizing the Research Results .....	80
4.2	Implications to Practice.....	85
4.2.1	Managerial Implications.....	85

4.2.2	Policy Implications.....	86
4.2.3	Future Recommendations and Research.....	86
<b>4.3</b>	<b>Limitations and Constraints .....</b>	<b>87</b>
<b>4.4</b>	<b>Ethical Discussion .....</b>	<b>89</b>
4.4.1	Concerns of Designing Habitual SN Platforms.....	89
4.4.2	Social Network Addiction.....	91
4.4.3	Policing Persuasive Technologies .....	92
<b>5</b>	<b>Conclusion .....</b>	<b>96</b>
	<b>References.....</b>	<b>98</b>

## List of Tables

Table 1. Overview of the adoption and year-on-year growth of connected devices and services (Kemp, 2022a, 2022b) .....	1
Table 2. Mobile time by activity worldwide (Kemp, 2022a) .....	3
Table 3: Types of Lock-In and Associated Switching costs (Shapiro & Varian, 1999) .....	45
Table 4: The Behaviour Grid (Fogg & Hreha, 2010) .....	55
Table 5: Levels of Game Design Elements (Deterding, Dixon, et al., 2011).....	67
Table 6: Design principles for successful gamification designs (Krath & Korflesch, 2021) .....	69

## List of Figures

Figure 1. The world’s most-used social media platforms (Kemp, 2022a) .....	2
Figure 2. Demographic of social media users worldwide (Kemp, 2022a) .....	2
Figure 3. Conceptual Research Framework Visualised.....	11
Figure 4. Three examples of automaticity increases in Lally et al's., (2010) research.....	21
Figure 5. Conceptual illustration of all key factors affecting SN habit formation. ....	23
Figure 6. Illustration of Limayem et al's. (2007) research framework. ....	24
Figure 7. Bayer et.al's. (2022) Levels of Habit Analysis.....	29
Figure 8. Bayer et.al's. (2022) Illustration on how SN habit sequences stack. ....	30
Figure 9. Illustrations of Barnes & Böhringer (2009, left) and Liu et.al. (2011, right) research frameworks. ....	35
Figure 10. Visualization of the key views impacting Persuasive Technology.....	41
Figure 11. Graphic illustration of the Fogg Behaviour Model (Fogg, 2009) .....	52
Figure 12. Graphic illustration of Nir Eyal’s Hook Model (Eyal, 2014) .....	58
Figure 13. Social Media Use and Adolescent Mental Health (Millennium Cohort Study, 2019).....	60

## 1 Introduction

The use of technology for social interaction, particularly through social networks, has become a prevalent phenomenon in the 21st century. It offers new business models and opportunities for our generation. The significant number of people using social network (SN) platforms has greatly impacted the way people interact, consume goods and services, and has created a new competitive field for companies to achieve surplus profits. According to Kemp (2022b), out of the 7.91 billion people in the world in October 2022, 5.07 billion are internet users, with 4.74 billion using social network platforms (4.95 billion and 4.62 billion in Jan. 2022 respectively) (Table 1; Kemp, 2022). The largest SN platform, Facebook, has 2.91 billion users, and other platforms such as YouTube, WhatsApp, Instagram, WeChat and TikTok also have over one billion users each (Figure 1; Kemp, 2022). This indicates that SN platforms are used by 58.7% of the world's population, which is 93% of all internet users (Kemp, 2022a). As internet adoption continues to expand in lower-income countries and the age demographic of users widens, this trend is expected to continue.

Date	Total Population		Unique Mobile Phone Users		Internet Users		Active Social Media Users	
	Jan. 2022	Oct. 2022	Jan. 2022	Oct. 2022	Jan. 2022	Oct. 2022	Jan. 2022	Oct. 2022
Amount	7,91 bn.	7,99 bn.	5,31 bn.	5,48 bn.	4,95 bn.	5,07 bn.	4,62 bn.	4,74 bn.
YOY Growth%	1,0	0,8	1,8	3,2	4,0	3,5	10,1	4,2

Table 1. Overview of the adoption and year-on-year growth of connected devices and services (Kemp, 2022a, 2022b)

Research has shown that the younger generations tend to use SN platforms more frequently than older generations as they are more inclined to adopt new technologies and are seen as more “tech-savvy.” However, as older generations become more accustomed to technology, the age distribution of social media users is expected to widen. (D’Arienzo, Boursier, & Griffiths, 2019; Eyal, 2014; M. D. Griffiths, Kuss, & Demetrovics, 2014; Ortiz-Ospina, 2019). As of now, the vast majority of social media users worldwide are 39 years old or younger, with the most significant demographic being 20-29 year olds (Figure 2; Kemp, 2022a). This growth opens a lot of possibilities for companies and platform designer.

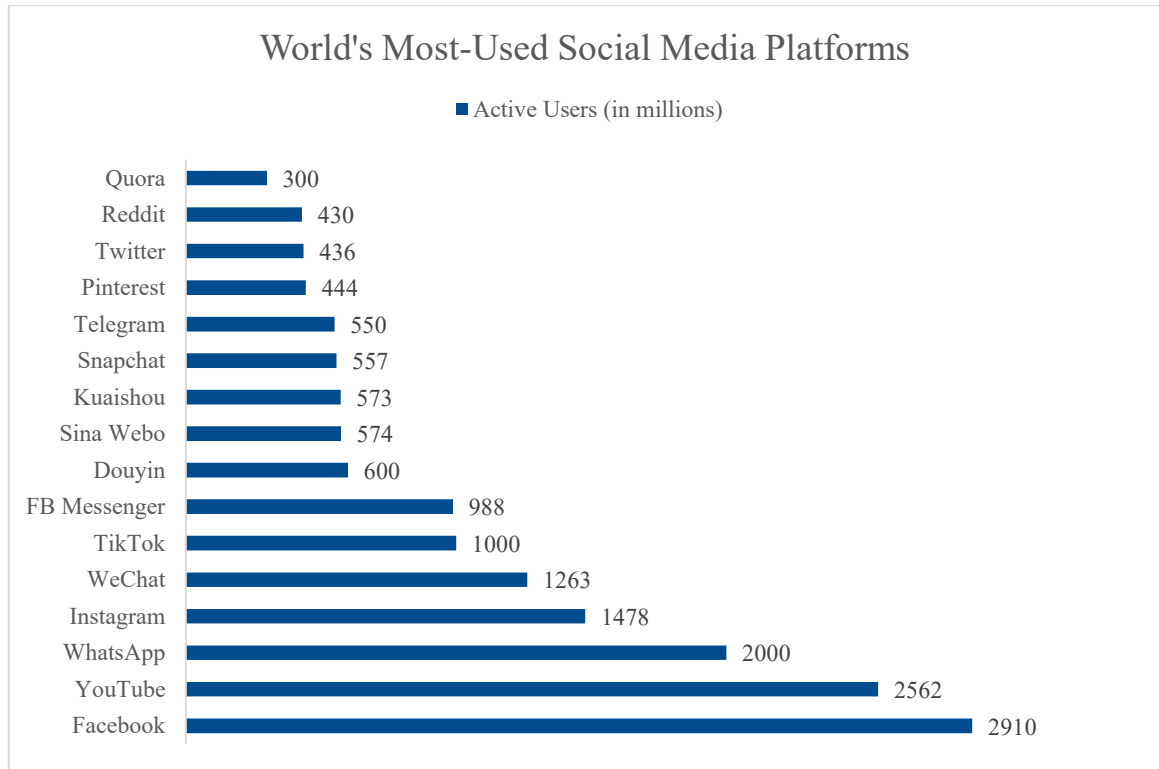


Figure 1. The world's most-used social media platforms (Kemp, 2022a)

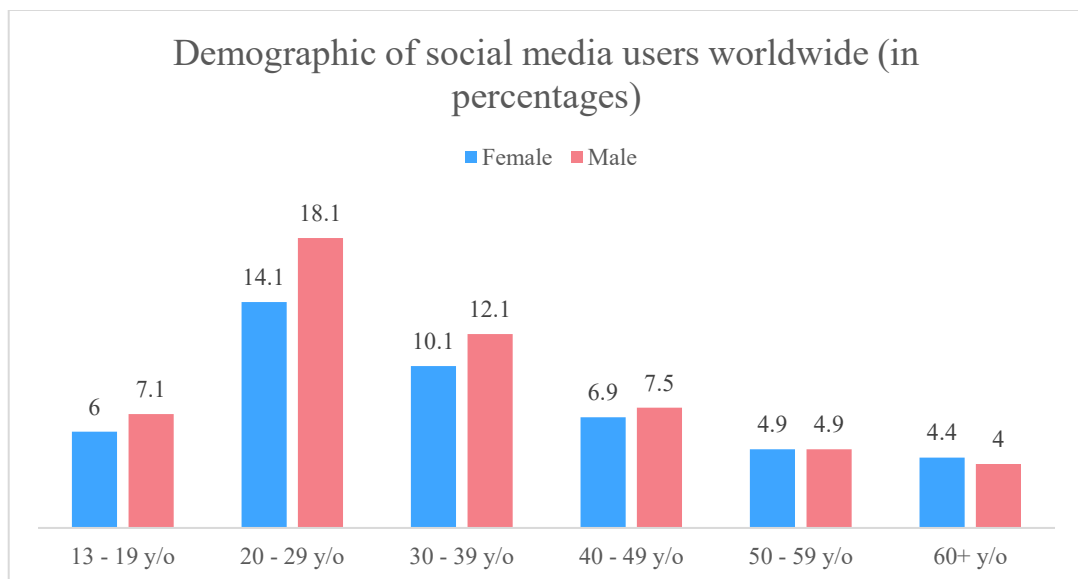


Figure 2. Demographic of social media users worldwide (Kemp, 2022a)

While the increasing number of active users in the SN market presents opportunities for growth, it does not guarantee success for SN companies and platforms. These users still need to be made aware of and attracted to the company's platform, which can be challenging with the high volume of platforms being released daily and intense competition for users' attention. Furthermore, the market is already dominated by large, established corporations such as Facebook, Google, and ByteDance, which control the most widely used social network platforms in the world, such as

Facebook, WhatsApp, Instagram, YouTube, and TikTok (Figure 1). This makes it difficult for new companies to establish successful and sustainable platforms in the market. While the technical aspects of designing SN platforms have become more accessible due to advancements in the field, building a successful business around them remains a challenge.

For social network companies and platform designers, the paramount aspects for creating a successful SN platform are distribution (getting the product to users), user engagement (getting users to use and keep using it), and monetization (making money from those engaged users) (Eyal, 2014; B. Fogg, 2009; Tunguz, 2019; Langvardt, 2019). While distribution and monetization are necessary for a platform's success, the strategies and techniques used to achieve them are already widely researched and conceptualized across the SN industry and hence excluded from this research. However, user engagement is the crucial factor that differentiates a successful SN platform from the rest. It is essential in keeping users coming back, which is paramount for long-term success and profitability (Eyal, 2014; B. Fogg, 2009; B. J. Fogg & Euchner, 2019; Lehmann, Lalmas, Yom-Tov, & Dupret, 2012; O'Brien & Toms, 2008; Sam, 2016).

This is why SN platform developers, resembling slot machine designers, aim to maximize user engagement, also known as "time on device," by designing habit-forming products that utilize similar behavioural design strategies used by the casino industry. While these designs can enhance users' enjoyment and sense of reward, many users end up spending more time on their devices than they would like with a minority of users developing behavioural problems similar to problem gambling. (Langvardt, 2019) However, SN platform designers have seen success in increasing user engagement through these design strategies. According to an American research company Dscout Inc., (2016), the average American uses their phone 76 times per day and touches their phone 2,617 times during these sessions. This trend is also reflected globally, with the world average time spent on mobile during January 2022 being 4 hours and 48 minutes, as reported by Kemp, (2022a) (Table 2 below). This issue has also been recognized by the World Health Organization (WHO) in 2018 when they included "gaming disorder" as a behavioural addiction, in its International Classification of Diseases (ICD) (WHO, 2018). The potential harms and ethical concerns surrounding this issue will be further discussed in the discussion section of this thesis.

	Percentage of total smartphone time spent in different social platforms				
Average time spent per day	Social Media	Photo & Video	Games	Entertainment	Other categories
4h 48min	43.0%	25.4%	7.7%	3.1%	20.8%

Table 2. Mobile time by activity worldwide (Kemp, 2022a)

All in all, user engagement is a crucial metric to understand for all online services and social networks, including social media, social streaming services, and social games for instance. For this purpose, within this thesis, the term "*social network platform*" is used to encompass all services mentioned in this paper and to refer to any other forms of service, application or platform that facilitates social interactions, and content and information sharing between users. The in-depth description of the definition process of SN platforms can be found in sub section 3.1.1.

For companies, user engagement is often linked to profits. Since modern consumers have grown accustomed to SN platforms and other means of media they consume online being typically free to use, SN platform revenue is mainly generated through monetizing user data to be leveraged by marketing and advertising agencies for instance (Langvardt, 2019). As a result, SN companies are forced to find ways to better engage with their users in order to extract more value from them without charging them. The more effectively a SN platform can engage its users, the more user data it can gather, followed by the ad revenue it can generate. Advertisers are willing to pay more for ads displayed on a platform with high user engagement, as it increases the chances of their ads being seen and clicked on. This is why social network companies obsess over increasing user engagement, as more interactions and time on device leads to more captured value from users.

## 1.1 Research Objectives and Research Questions

The purpose of this master's thesis is to investigate and synthesize existing academic research on user engagement and user habit formation within SN platforms in the form of a comprehensive exploratory literature review. The aim is to surface, conceptualize and present the underlying principles influencing user engagement and user habit formation within SN platforms, with this research delving into the psychological, behavioural, sociological and motivational principles of SN users and into the practical design features and platform parameters of SN platforms. In addition, this research also aims to offer practical illustrations on how these principles are currently being used by large-scale SN platforms and present all noteworthy and distinctive characteristics.

The objectives of this master's thesis are four-fold. Firstly, to answer the research questions, this thesis looks to develop a conceptual framework consisting of all the paramount principles, models and theoretical viewpoints being used by individual SN platforms and highlighted in industry literature that promote increased user engagement and habitual behaviour in users within SN platforms. This framework could then be utilized by both academics and practitioners in their research and designs of SN platforms. Secondly, this thesis looks to surface and present practical, conceptual and actionable models and applications for SN practitioners to leverage in their SN platform designs. One prominent research field is the realm of persuasive technologies, which

focuses on designing, developing, and evaluating interactive technologies that employ persuasion and social influence techniques to shape human behaviour (Fogg, 2003; Hutchings, 2017; Kosner, 2012b). Thirdly, this thesis looks to investigate and surface relevant theoretical viewpoints influencing behavioural change within SN platforms and SN users. Behaviour and network economics, as well as reliability view will be observed, and all noteworthy and distinctive characteristics will be presented in relations to SN platforms and SN users. Finally, this thesis also looks to take part into the ethical discussion related to SN usage and behaviour altering SN designs. As frequently discussed in contemporary media, the growing popularity of the SN industry has led to an array unintended and unfavourable consequences, especially among adolescents, with users spending excessive time on these platforms and some developing behavioural issues resembling to those found in gambling addictions. Hence, a discussion on how these persuasive and behaviour altering principles and designs might affect user autonomy and overall well-being, and what potentially can be done to alleviate the negative effects is paramount.

This thesis aims to answer the following primary research question: *What are the principles of increasing user engagement and building habit-forming social network platforms?*

The supporting questions answered in this thesis are:

- a) *How can platform providers increase the user engagement of their social network platforms?*
- b) *What psychological theorem can be found in building habit-forming behaviour in social network platforms?*
- c) *How are these principles in increasing user engagement and building habit-forming behaviour modelled within the industry literature and showcased in current, large-scale social network platforms?*

In order to grasp the content of this thesis effectively, it is crucial for the reader to possess a fundamental comprehension of social networks, including the various different branches and applications of it, such as social media (e.g., Facebook, Instagram, Twitter etc.), social streaming (YouTube, Twitch etc.), social messaging (WhatsApp, WeChat etc.) and social games (e.g., freemium mobile games) to name a few. Having prior experience with using SN platforms will enhance the reader's ability to engage with and comprehend the research and illustrations presented in this study.

## **1.2 Scope of Research**

The central scope of this thesis is an in-depth exploration of social network platforms, with a specific emphasis on the strategies, trends, patterns, and effective principles employed by

platform designers to enhance user engagement and foster habit-forming behaviours. By drawing from existing academic research, this study aims to address broader research questions and uncover the underlying principles that influence user engagement and habit formation.

In this pursuit, the thesis refrains from providing precise, technically specific action points in SN platform design, recognizing the diverse nature of platforms and their distinct user bases. Instead, the research delves into the foundational principles that can be applied universally across SN platforms of all sizes and types, including social media, social messaging, social streaming, and social games platforms. To achieve a comprehensive understanding, the research remains limited to a conceptual exploration of principles rather than implementation. By focusing on overarching design considerations and the psychological, behavioural, sociological and motivational irrational behavioural tendencies of SN users, the thesis aims to contribute valuable insights to the field, offering a useful resource for platform designers and researchers seeking to enhance user engagement and retention in SN environments. In addition, as part of its illustrative approach, this thesis showcases how the proposed principles and models manifest in large-scale and successful platforms such as Instagram, Facebook, and Twitter.

It is essential to clarify that the purpose of this thesis is not to empirically verify or experimentally prove the proposed findings. While the study does not delve into the technical aspects and applications, such as algorithmic optimization for habit formation, it validates its findings by building upon and synthesizing acclaimed academic research and empirical findings from relevant fields. To substantiate and empirically verify the proposed principles and applications for increasing user engagement and forming habits within SN platforms, further research becomes imperative. This study serves as a starting point, offering valuable insights and directions for future investigations in this dynamic and ever-evolving field.

### **1.3 Structure of the Research**

The structure of this thesis is as follows. Chapter two will present the methodology of this research. It will introduce the conceptual research framework developed for the purpose of this research as well as delve into the justifications and parameters of the explorative literature review nature of this thesis. Chapter three acts as the primary chapter of this research, comprising of the explorative literature review on the research topic. It occupies the largest portion of this thesis, consisting of multiple sections and sub sections. The literature review chapter begins by presenting a comprehensive overview of the fundamental concepts relevant to the research's scope and topic. These concepts are subsequently defined to facilitate the reader's understanding of the key terminology employed in the study. Next, the thesis delves into the exploration of essential features and principles concerning SN habits and their formation process. To exemplify these

principles and demonstrate the impact of habit formation within SN platforms, an exploratory case example on Twitter is provided, drawing upon prominent prior academic and empirical research focusing on habit formation within the context of Twitter. The aim of the exploratory case study is to present previous SN platform specific empirical research as well as highlight and discuss the validity of the different principles found in those studies. Subsequently, the thesis investigates the underlying theoretical and economic viewpoints that influence SN platforms, namely behaviour and network economics, and the reliability view. Finally, the research question is analysed through the lens of persuasive technologies. This analysis offers valuable insights and principles for creating habit-forming products and designs in order to increase user engagement and continuous usage, introducing four distinct models and applications of persuasive technologies, providing practitioners and researchers with practical applications for behaviour and habit-forming design in both present-day applications and future research endeavours.

Chapter four consists of the discussion sections of this research, also consisting of multiple sections and sub sections. The first section within this chapter serves as a synthesizing and reflective analysis of the research outcomes and methodology. The subsequent section evaluates the practical implications of the research findings as well as proposing avenues for future research. An examination of the limitations encountered during the study is also provided within this chapter. Lastly, as an essential aspect of this discussion, the ethical ramifications of persuasive and habit-altering design features on user autonomy and well-being will be thoroughly addressed.

## 2 Methodology

Literature reviews hold significant importance in the realm of academic research, as science relies on the accumulation of knowledge, making it an indispensable tool for practitioners, academics, and graduate students (Brocke et al., 2009). A literature review serves as a comprehensive, critical, and purposeful analysis of existing and relevant research that pertains to the research question under investigation (Luft, Jeong, Idsardi, & Gardner, 2022). These reviews aid in the discovery, evaluation, and synthesis of empirical and conceptual papers, and their utility extends to various purposes, such as identifying existing literature on a subject, discerning trends and patterns related to a particular field or research topic, combining results from empirical studies to promote scientifically supported practise, constructing novel frameworks and theories, as well as pointing out domains requiring additional investigation. (Paré, Trudel, Jaana, & Kitsiou, 2015).

In this master's thesis, the chosen methodology and form of literature review represents a valuable research contribution in and of itself (Paré et al., 2015). Instead of serving as a basis for the author's own work, it establishes a strong foundation for anyone interested in the specific area or topic (Paré et al., 2015). Referred to as the "review research approach," this type of academic paper aims to combine and harmonize relevant academic research without conducting primary and empirical research (Green, Johnson, & Adams, 2006; Paré et al., 2015)

When conducted appropriately, the review research approach produces valuable information sources, in form of research articles and other academic literature, for practitioners seeking research-based guidance within their managerial decision-making process and professional procedures (Paré et al., 2015). Moreover, thorough and top-quality reviews regularly appear as immensely referenced publications that academics refer to when conducting their own empirical investigations as a means to tap into relevant academic literature (Cooper, 1988; Rowe, 2014). In addition, according to studies that measure the effect of academic publications, review-based research publications were observed being more frequently referenced and retrieved compared to other research methods (P. Cronin, Ryan, & Coughlan, 2008; Montori, Wilczynski, Morgan, Haynes, & Team, 2003; Paré et al., 2015; Patsopoulos, Analatos, & Ioannidis, 2005; Rowe, 2014). The popularity of review based research papers can be attributed to their ability to provide readers with an overview or detailed understanding of a particular field, as well as a collection of references pertaining the most pertinent academic sources within the research topic (P. Cronin et al., 2008). However, while conducting review articles does not come without challenges and critique, completing such a comprehensive review is a significant service to the academic community (Paré et al., 2015; Petticrew & Roberts, 2015).

## 2.1 Research Framework

Given the relatively new and limited theoretical research frameworks in the field of social network platforms and persuasive technologies, this thesis takes a unique approach by developing and employing a conceptual research framework specifically tailored to this study. The decision to utilize a conceptual research framework, rather than an existing theoretical framework, stems from the distinctive purpose and definition associated with conceptual research frameworks. According to Luft et al. (2022), a conceptual research framework represents the researcher's understanding of the key concepts being investigated, and it is constructed by the researcher themselves and encompasses the hypothesized relationships among the concepts, while addressing the gaps identified through literature reviews. The conceptual framework draws upon literature reviews, experiences, or experiments, and may incorporate novel ideas that have yet to be firmly established in the existing literature. Importantly, it aligns coherently with the theoretical foundation of the paper and articulates the phenomenon under investigation through written explanations and/or visual representations. (Luft et al., 2022)

The primary focus of this thesis is to investigate and explain the underlying principles that contribute to the enhancement of user engagement and the formation of habits in social network (SN) platforms, to ensure the continued usage of social networks among its users. The concept of SN continuance usage, derived from Limayem et al.'s (2007) research on continued information system (IS) usage, provides a framework for understanding users' transition from conscious and intentional usage to habitual and automatic usage as the system becomes integrated into their daily routines. In alignment with the principles found in IS literature, this thesis adopts and extends Limayem et al.'s (2007) construct of IS continuous usage to the social network context, introducing the concept of SN Continuance Usage to the information system and social network literature.

The conceptual research framework depicted in Figure 3 follows two distinct paths, both influencing the formation of SN continuance usage: the implicit and explicit intention path and the persuasive technology path. The implicit and explicit intention path begins with a separation of individual differences among users from social network specific differences. This is done because even though both subgroups affect the implicit and explicit intentions of SN users, for platform designers and providers, it is paramount to separate the subjective user associations and differences (individual differences) from platform related metrics and offered functionalities, interfaces and applications (social network specific). Within these subgroups, explicit and implicit

user intentions are identified as key factors for sustaining continued use within SN platforms, alongside persuasive technologies.

Explicit intentions are explored based on the academic work of Barnes & Böhringer (2009), Bhattacharjee (2001), and Limayem, Hirt, Cheung, & Hirt (2007), which examine users' conscious intention to continue using a social network (SN continuance intention). To explain continuance intention, Bhattacharjee's (2001) IS Continuance Model, rooted in the expectation-confirmation theory (ECT), is considered. This model asserts that user satisfaction, confirmation, and perceived usefulness significantly influence the likelihood of continued product repurchase or system usage. Implicit user intentions to continue using a SN platform are examined in relation to habit formation and habitual usage within social networks and information systems. The key concepts of habit formation, habit automaticity, and mental context-action associations will be thoroughly introduced and discussed in sections 3.1.4 (Definitions of Habit and Habit Formation) and 3.2 (Building Social Network Habits).

On the right side of the conceptual research framework, the study delves into the factors influencing long-term user engagement and habit formation in social network platforms through the lens of persuasive technologies. Three key viewpoints, namely the Network and Behavioural Economics, along with the Reliability View, are introduced and investigated in the literature review. Drawing inspiration from these viewpoints, persuasive technologies encompass technologies designed to modify user behaviours through social influence and persuasion. These technologies find application in various domains of human-computer interaction, such as social media, online communities, and social games, with a primary focus on interactive technologies like mobile devices and internet-connected platforms. By integrating theories and methodologies from behavioural psychology and economics, network and information economics, as well as the human-computer reliability view, this thesis introduces three influential persuasive technology models for developing habit-forming platforms and increasing user engagement within social networks: Fogg's Behaviour Model and Captology (B. Fogg, 2009; B. J. Fogg, 2003), Fogg's & Hreha's Behaviour Grid (B. J. Fogg & Hreha, 2010) and Nir Eyal's Hook Model (Eyal, 2014). In addition, gamification is added as the fourth discussed application of persuasive technologies as it has been considered the most prominent design stream of motivational design (Hamari, Hassan, & Dias, 2018). These models and applications have played a pivotal role in advancing the field of social networks and information technologies in amplifying user engagement and fostering habitual usage. Further details on these models and their introduction can be found in section 3.3 (Prevalent Economic Views and Persuasive Technologies) and beyond.

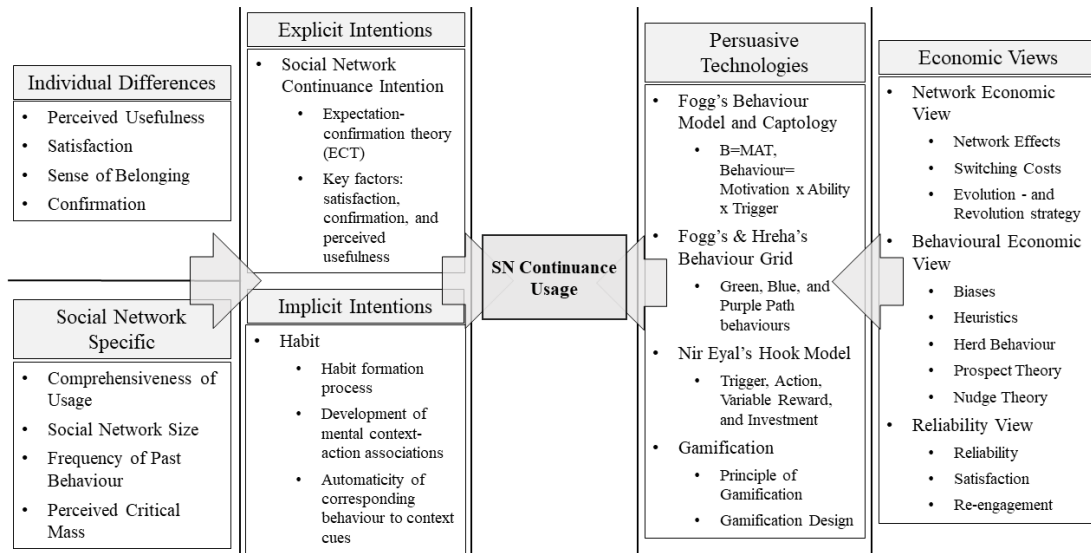


Figure 3. Conceptual Research Framework Visualised.

## 2.2 Conducting the Literature Review

The primary objective of this thesis is to advance existing knowledge and research by establishing connections between current studies in adjacent fields, such as information system science, psychology and sociology, persuasive and gamified design, and economic theory, and direct research within the realm of social networks. To ensure the credibility of the findings, greater emphasis was placed on studies and papers with higher citation counts. The majority of relevant literature in this field was published between 2008 and 2018. In the exploration of social network platforms and related fields, the significance of papers was evaluated based on direct citations and the authors' influence in the field. Essential sources encompassed the foundational aspects of social network platforms, information systems, user engagement, habit formation, persuasive and gamified technologies, economic theories, and behavioural psychology and economics as well as sociology. Additional sources, including web articles from reputable news outlets, were also consulted to provide supplementary information and support or challenge the theories and models presented in this thesis. In total, this thesis references over 200 items, ranging from academic papers, journal articles, academically redeemed books, relevant websites, and other online content in total, all relevant to the research topic at hand.

The research process commenced with an initial exploration of existing literature on the topic to identify theoretical perspectives for further investigation. Two primary databases, Scopus and Google Scholar, were utilized due to the amount research available within these databases as well as due to the ease of use. The main search terms employed were “user engagement,” “user behaviour,” “social network,” “network behaviour,” “information system behaviour,” “habit formation,” “social network habits,” information system habits,” “persuasive technology,”

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"behavioural economics," "network economics," "network effects," "network reliability," "gamification," "social media," "multi-sided platforms" and "social network platforms." These search terms were also combined to yield more specific and targeted search results. Consequently, potential models and principles associated with these identified viewpoints were discovered. The literature review section was meticulously structured to present a comprehensive overview of the current practices and principles employed in the field of social networks. Ultimately, this thesis seeks to establish a solid foundation for future research endeavours.

### 3 Literary Review

The literature review chapter is structured into four sections. Firstly, the thesis provides a comprehensive overview of the fundamental concepts related to the scope and topic of the research. These concepts are then defined to help the reader better navigate the key terminology of the research. Secondly, this thesis introduces and explores the essential features and principles related to social network habits and their habit formation process. At the end of the section, an exploratory case example is provided to better illustrate the principles and influence of habit formation within social network platforms. This exploratory case example is done by reviewing prominent prior academic and empirical research on the case example company with focus on habit formation. Thirdly, the thesis explores the underlying economic views and theories that influence social network platforms: the behaviour and network economics, and the reliability view, as a means to enhance user satisfaction and engagement. Lastly, the thesis examines the research question through the lens of persuasive technologies, offering valuable insights and principles for building habit-forming products and increasing user engagement. This section will introduce four distinct models and applications of persuasive technologies for practitioners and researchers to offer valuable applications for behaviour and habit-forming design, either in practise or future research.

#### 3.1 Important Definitions

In this section, this thesis provides a comprehensive overview of the fundamental concepts related to the research topic. These concepts will be highly mentioned and built upon within the rest of the thesis, hence properly defining them aims to help the reader better navigate the key terminology of the research as well as build a solid foundation towards the rest of the research. The key concepts defined in this section are social network platform (SNP), user engagement, social network continuance as well as habit and habit formation.

##### 3.1.1 Social Network Platform

Eisenmann, Parker, & Van Alstynne (2006) define a platform as a service or application that brings together groups of users into a multi-sided network. A multi-sided network consists of a platform that facilitates direct interactions between distinct user groups, enabling them to provide network benefits to one another (Eisenmann et al., 2006; Hagiu & Wright, 2011): one side of the platform supplies what the other side demands, forming a mutually beneficial exchange (Constantiou, Marton, & Tuunainen, 2017). SNPs are considered as multi-sided platforms (Boyd & Ellison, 2007; Eisenmann et al., 2006; Hagiu & Wright, 2011; Obar & Wildman, 2015). Typically, a SNP is seen as a two-sided network, where there is a “subsidy side,” the number of active users of the platform who, when attracted in volume, are highly valued by the “money side,” like advertisers

and content creators (Eisenmann et al., 2006; Hagiu & Wright, 2011). The attractiveness and allure of each side for users either on the same side or the other side of a SNP, as well as the perceived value of a SNP, is highly influenced by network effects.

According to Eisenmann et al. (2006), there are two primary categories of network effects: "cross-side" and "same-side" network effects. Cross-side network effects occurs when users on one side of the platform benefit from an increase of users on the other side of the platform whereas same-side network effects occur when more users of the same side make the service more valuable and attractive to each existing and potential user on that side. For example, in SNPs, it is evident that both effects occur simultaneously. The more relevant people join a platform, it encourages other people in their network to join the platform as well. On the other side, the increase of users on a platform increases advertisers' willingness to pay and increase the number of advertisers on that platform. The value of a platform increases when it effectively meets the demand from both sides of the platform. This phenomenon, known as a snowball effect in economics, often leads to SNP's exponential growth (Eisenmann et al., 2006). As a result of these network effects, successful platforms often benefit from economies of scale and enjoy increasing returns.

Social network platforms, as defined by Boyd & Ellison (2007), are online services that facilitate the creation of public or private profiles, enabling users to establish connections with other users on the platform. Users have the ability to curate a list of connections, explore their own network of connections, and navigate the connections of others within the platform.

Obar & Wildman (2015) later updated this definition, aiming to offer a more comprehensive explanation by analysing literature and identifying commonalities among SNPs. They found four unique features characterizing SNPs: 1) they are commonly Web 2.0 internet-based services, 2) they are reliant on user-generated content such as posts, photos, and comments, 3) they facilitate user-specific profiles, and 4) they allow the capacity to connect users' profiles with those of other users or groups online in order to facilitate social network development. (Obar & Wildman, 2015)

However, the expanding diversity of stand-alone SNPs within the different online environments makes offering a singular and permanent definition difficult. With the development of Web 3.0 and the variety of definitions, often times the prior definitions found in academic literature are outdated or too broad. This is why this thesis will offer its own definition to the concept of a social network platform. Within this thesis, the concept of social network platforms will incorporate connected branches and applications of social networking such as social media platforms like Facebook, Instagram, and Twitter, social streaming platforms like YouTube and Twitch, and social instant messaging platforms like WhatsApp and WeChat. In other words, the concept of SNP incorporates all online services, applications and platforms that facilitates social interactions

and content sharing between different users and between users and the platform. The reason to redefine and reconceptualize a social network platform is to offer a more holistic overview and serve a wider audience of practitioner and researchers. Noteworthy, the concept of social network platform will also incorporate all social network sites, that do not offer a downloadable application for users. This is to clear all confusion with the common misconception that a platform and an application (an app) are the same, as they are often used interchangeably in contemporary media. Henceforth, this thesis offers the following definition to a social network platform:

1. Social network platforms are interactive, multi-sided network services that leverage the benefits of network effects and are typically based on either Web 2.0 or Web 3.0 technologies.
2. Social network platforms enable users to generate content, such as posts, photos, comments, and engage in communication with other users.
3. Social network platform users are also able to create platform-specific, public or semi-public profiles that the platform provider hosts, facilitates and maintains.
4. The primary function of social network platforms is to facilitate the development of social networks online by connecting users with other individuals or groups via their online, platform-specific profiles.

### 3.1.2 User Engagement

Engagement is a highly desirable and essential human response to activities conducted through computer-mediated platforms (Laurel, 1993). Within academic literature, user engagement has been approached and defined in various manners. O'Brien and Toms (2008) undertook an exploratory study that encompassed users of web search engines, online shopping platforms, online streaming/webcasting services, and online gaming applications, with the objective of developing an operational definition of engagement and identifying its key components.

According to O'Brien and Toms (2008), engagement is a multifaceted construct consisting of four stages: point of engagement, engagement itself, disengagement, and re-engagement. The point of engagement is triggered by factors like aesthetics, novelty, user motivations, and the ability to interact within a given timeframe (O'Brien & Toms, 2008). For example, on WhatsApp, initial adoption depends on visual appeal, ease of use, and seamless messaging.

During the engagement period, attention and interest are sustained through positive emotions, customization, timely feedback, connectedness with the technology or other users, and a sense of control (O'Brien & Toms, 2008). These factors contribute to maintaining users' engagement with the platform. Disengagement occurs when users decide to stop using the platform and can be

influenced by usability challenges, environmental distractions, and positive or negative emotions. Positive disengagement arises when needs are fulfilled, leading to a sense of accomplishment, while negative disengagement results from frustration or feeling overwhelmed. (O'Brien & Toms, 2008) However, disengagement does not necessarily indicate the end of the engagement journey. Users often cycle through the engagement stages multiple times, leading to re-engagement. Re-engagement can be driven by distractions, personal needs, or positive past experiences with the platform. For example, in the context of O'Brien's and Toms's (2008) research, they found that users frequently disengage temporarily from the platform and spread out their usage over an extended period. Shoppers engage with multiple online shopping platforms and websites to compare product costs and features. It is important to note that re-engagement may be temporary and short-lived.

The research conducted by O'Brien and Toms (2008) aimed to provide both conceptual and operational definitions of user engagement, going beyond the platform's technical usability and performance. Summarized by O'Brien and Tom (2008), user engagement encompasses qualities such as challenge, aesthetic and sensory appeal, feedback, novelty, interactivity, perceived control over time, awareness, motivation, interest, and affect.

Lehmann, Lalmas, Yom-Tov, & Dupret (2012) conducted a notable research project titled "Models of User Engagement" to enhance understanding of user engagement and develop engagement measurement methods within online services. According to their findings, user engagement represents the quality of the user experience and focuses on positive aspects of interaction that motivate individuals to use a web platform. The study revealed that user engagement varies across different web platforms, such as news outlets and social networks. Lehmann et al. (2012) identified three primary approaches to measure user engagement: self-reported engagement, cognitive engagement, and online behaviour metrics. While the first two approaches have limitations related to user subjectivity and restricted scope, respectively, the use of online behaviour metrics emerged as a promising method for collecting engagement data from a large number of users. The researchers concluded that higher and more frequent platform usage serves as an indicator of greater engagement. Consequently, a platform with two million daily users can be considered highly engaged. Metrics such as popularity (total number of users), activity (average clicks per visit), and loyalty (frequency of user return) are employed to estimate and determine the service's level of user engagement. It should be noted, however, that not all sites possess both active and loyal users, and engagement can manifest differently based on the specific characteristics of each site (Lehmann et al., 2012).

In the realm of the technology industry, particularly within social network platforms, user engagement is commonly regarded as a combination of the aforementioned definitions. The first

definition presented by O'Brien's and Toms' (2008) offers valuable insights into user behaviour, while the second definition provides a more data-driven perspective. To comprehensively comprehend the factors contributing to increased user engagement on SNPs, this thesis adopts the definition proposed by O'Brien's and Toms' (2008), which pertains to individuals' experiences with technology and offers a holistic understanding of user engagement dynamics.

### 3.1.3 SN Continuance

Previous studies on the acceptance of information systems have concentrated mainly on the adoption of information systems during its initial stages, assuming that the usage of an information system is primarily determined by the user's intention (Limayem et al., 2007). While this assumption might hold true for the initial adoption of information systems, it may not be applicable to the for the continual utilization of information systems, because as stated by Limayem et al. (2007), frequently enough performed behaviours, even though intentional at first, tend to become habitual and automatic over time. Noteworthy, even though the majority of research discussed in this sub section focuses and is based on research investigating the usage of information systems, the same principles and findings can be related into social network research (Barnes & Böhringer, 2009).

#### 3.1.3.1 *Continuance Intention*

This thesis examines Bhattacharjee's, (2001) IS Continuance Model to elucidate the concept of continuance intention. In essence, Bhattacharjee's, (2001) IS continuance model aims to explain users' intention to persistently use an information system, with satisfaction, confirmation, and perceived usefulness identified as key factors. The model is predominantly founded on the expectation-confirmation theory (ECT), which asserts that the probability of users repurchasing a product or continuing to use a service is mainly dictated by the users' satisfaction with prior usage (Barnes & Böhringer, 2009; Bhattacharjee, 2001; Limayem et al., 2007). The ECT process involves four steps:

1. Prior to making a purchase, users establish an initial expectation for a particular service.
2. After accepting and using the service, users develop perceptions about its performance during the initial consumption phase.
3. Users then determine the service's level of confirmation by evaluating the perceived difference between the perceived performance of the service, and their initial expectation.
4. Based on this confirmation level, users form a satisfactory or dissatisfactory response.

Ultimately, satisfied users tend to express an intention to re-engage with the service, while dissatisfied users discontinue further use (Bhattacharjee, 2001). According to Bhattacharjee (2001), the ECT process is highly comparable with IS users' decision to continue using and re-engage with an IS. This is because both decisions have the same three features: 1) both decisions follow an initial decision to accept using a service, 2) both decisions are influenced by the initial experience of using a service, and 3) both decisions have the potential to result in a reversal of the initial continuance usage decision after future usage (Bhattacharjee, 2001; Limayem et al., 2007). In other words, a user's decision to continue using an IS will depend on their experience of using it and how it meets their needs and expectations. Even if after the initial acceptance to use and positive initial usage experiences, a negative usage experience down the line may influence users to stop using the IS and switch to a different one. More on SN Continuance Intention in section 3.2.1 SN Habit.

### **3.1.3.2** *Continuance Usage*

Bhattacharjee's (2001) IS Continuance Model relies solely on intention as the primary factor for predicting continued IS usage. However, according to Limayem et al. (2007), this limitation means that Bhattacharjee's (2001) IS Continuance Model's ability to predict continued IS usage is restricted because the model does not consider the possibility that behaviour may become habitual over time and no longer be under volitional control. To address this issue, Limayem et al. (2007) incorporated the influence of habitual automaticity in defining and explaining continuance usage. By including habitual behaviour tendencies in addition to the intentional ones offered by Bhattacharjee (2001), Limayem et al's. (2007) construct of continuance usage can account for habitual usage patterns. More on habitual behaviour and habit formation in the next sub section 3.1.4.

Limayem et al's. (2007) construct of IS continuous usage describes the phenomenon of users continuing to use an information system beyond its initial adoption where information system use shifts from conscious and intentional usage to habitual and automatic usage as the system becomes integrated into the user's daily routine. This behaviour is characterized as a longitudinal and continuous form of post adoption behaviour that results from a series of repeated decisions to continue using the system, rather than a one-time event like the initial adoption decision (Limayem et al., 2007). After a user adopts an IS, they must continue to make decisions about whether or not to use it, and if the users choose to use the IS repeatedly in response to the same situations (context cues), their usage is observed to become more automatic and habitual (Limayem et al., 2007). This is known as IS continuance usage and it continues until the user decides to stop using the system altogether (Limayem et al., 2007). More on SN Continuance Usage in sub section 3.2.1 SN Habit.

### 3.1.4 Habit and Habit Formation

#### 3.1.4.1 *Habit*

According to Lally, Van Jaarsveld, Potts, & Wardle, (2010), as behaviours are performed in the same environment consistently, they become increasingly more efficient, requiring less conscious thought as control of the behaviour is transferred to environmental cues that trigger an automatic response: a habit. As so, habits are an integral part of human and animal behaviour. Important frameworks have been developed by psychological and neurobiological researchers to better understand habits and habit formation (K. S. Smith & Graybiel, 2016). Early definitions of habit in academic literature can be traced back to the turn of the 19th century with William James in 1890, the "Father of American psychology", proposing that as living creatures, we are all just bundles of habits and that habits make up a major part of our behaviour and cognitive lives (James, 1890). According to James, (1890), repeatedly engaging in a sequence of mental action tends to result in the development of a persistent and a lasting characteristic or trait, and we can find ourselves acting in the same way in similar situations without any conscious purpose or expectation of the result (James, 1890). B. R. Andrews in 1903 also defined habit as a relatively stable pattern way of thinking, willing, acting, or feeling acquired through repeated exposure of a mental experience, showing that habitual behaviour is often taken for granted and can go unnoticed by those exhibiting it (Andrews, 1903).

To this day, academics debate over how habits should be defined and conceptualized. However, in their research, Lally et al., (2010) offer a suitable consensus on how habits are formed, stating that habits are formed by gradually strengthening the association between a specific situation (context cue) and a corresponding action. Through this repeated behaviour in a consistent context, the automaticity or reflexiveness of the behaviour increases when encountering the same situation (the same context cue) (Lally et al., 2010). One of the key elements of habit building in academic literature is the conceptualization of automaticity: behaviour that displays efficiency, lack of awareness, unintentionality and uncontrollability, either some or all of them at once (Bargh, 1994; Lally et al., 2010; Wood & R niger, 2016). As of today, the Meriam-Webster Dictionary provides a technical definition for a habit, stating that a habit is a consistent behaviour pattern that is developed through frequent repetition or physiologic exposure that shows itself in regularity -- nearly or completely involuntary (Meriam-Webster Dictionary). However, like Meriam-Webster and other dictionaries, the definition lacks the inclusion of context and automaticity features, and solely measures habit formation as a product of frequent behavioural repetition. However, such an interpretation may be considered oversimplified, as it assumes a linear relationship between repetition and automaticity. This notion was challenged by Lally et al., (2010), arguing that this

is unlikely, as it would imply that any repetition of a behaviour would uniformly increase the level of automaticity, regardless of the stage within habit formation at which the repetition occurs.

Gardner & Rebar, (2019) on the other hand, offers a definition where habits refer to a process in which contexts trigger automatic actions through the activation of mental associations between contexts and actions, which are learned through prior behavioural outcomes in the same contexts. In this process, Gardner & Rebar (2019) illustrate how habitual behaviours can be activated through an impulsive process that does not require much cognitive effort or awareness, control, or intention. This transfer of action initiation from conscious motivation to context-cued impulse-driven mechanisms occurs when a goal-directed behaviour becomes habitual.

For the purpose of this thesis on how SN platforms can form repeated and close to involuntary habitual usage, this paper does not assume a linear relationship between repetition and automaticity when it defines habit as follows: *“a behaviour process in which contexts trigger automatic actions through the activation of mental context–action associations learned through prior performances -- nearly or completely involuntary.”* This definition builds upon Gardner & Rebar's (2019) definition by including the aspects of involuntary and lack of cognitive effort. This definition gives a highly informative, condense and simpler alternative, while including all of the key features of habitual behaviour. Hence, this thesis will adopt this definition of habit.

#### **3.1.4.2 Habit Formation**

As previously mentioned, habits are formed through repetitive actions in specific contexts, where the consistent presence of a cue strengthens the connection between the cue and the corresponding action (Gardner & Rebar, 2019; Lally et al., 2010). Over time, the habitual response becomes the automatic default, making other options less easily accessible (Gardner & Rebar, 2019). In this sub section, this thesis will investigate and help conceptualize the habit formation process.

One valuable tool for studying habit formation is the Self-Report Habit Index (SRHI) created by Verplanken & Orbell (2003), which measures various indicators of habitual behaviour, including repetitive performance, mental efficiency, and lack of awareness. In a study conducted by Lally et al., (2010), SRHI was used to explore the relationship between habit formation and repetition in a group of 96 participants over a 12-week period. The results of the study revealed an asymptotic curve of habit formation, with the earliest repetitions yielding the greatest gains in the formation of habits and lower marginal gains in future repetitions, eventually levelling off to a plateau state (Lally et al., 2010). Figure 4 illustrates this relationship. The extent to which habit formation reached its peak varied among participants, with some achieving high scores on the automaticity index while others peaking below the average of the scale (Lally et al., 2010).

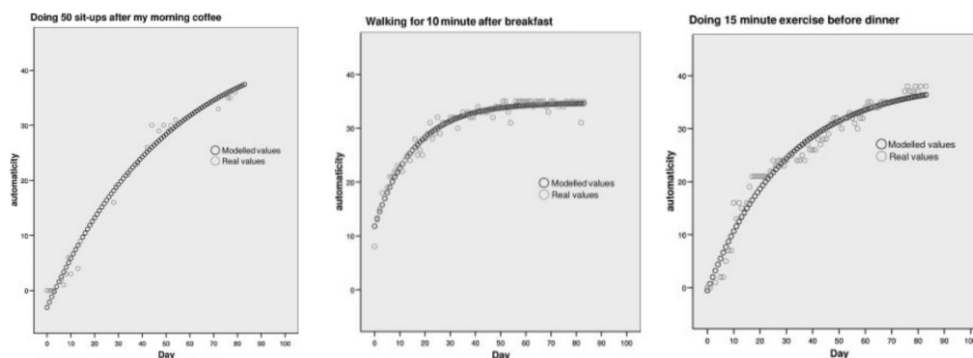


Figure 4. Three examples of automaticity increases in Lally et al's., (2010) research.

These studies also demonstrated that the process of habit formation is not a linear one but rather a dynamic one, characterized by an asymptotic growth curve (Gardner & Rebar, 2019; Lally et al., 2010). With the earliest repetitions yielding the greatest gains in automaticity within the habit formation process, Gardner, Lally, & Wardle, (2012) suggests viewing the habit formation process as a construct of four interconnected phases, stipulating that habit formation occurs when a person: 1) decides to act; 2) takes action on that decision; 3) repeats the action (repetition) in a way that, 4) fosters the development of cue-action associations. The authors group the first two phases together as the pre-initiation stage and the latter two phases as the post-initiation stage.

Gardner & Lally (2018) builds upon this process, positing that habit formation can be facilitated by a range of variables, with each impacting one or more of the four distinct phases (P):

1. increasing motivation to initiate the behaviour (P1);
2. enhancing action control to initiate the behaviour (P2);
3. modifying motivation and other action control processes to continue performing the behaviour (P3); and
4. strengthening cue- behaviour associations (P4). (Gardner & Lally, 2018)

Importantly, the same variable may impact habit formation in different parts of the framework (Gardner & Lally, 2018). For example, the anticipation of social rewards can motivate individuals to initiate the behaviour (P1) and to continue performing it (P3) (Radel et al., 2017), while receiving social rewards can accelerate the learning of cue- behaviour associations (P4) (Gardner & Rebar, 2019). Gardner & Lally (2018) highlight in their research that certain design techniques can aid users progress through the different phases of habit formation. For instance, during the initial phase, people are likely to be more motivated to initiate a behaviour when they anticipate positive outcomes and believe that they have the capabilities necessary to indulge with the habitual behaviour (Gardner & Lally, 2018). Hence, providing details about the likely positive

outcomes or directing users' attention towards high reward actions can amplify motivation and expedite the development of habitual behaviour (Gardner & Rebar, 2019).

The notion that rewards and the anticipation of rewards increases users' motivation to act, which then leads to further repetition, which then strengthens the users' context-action associations is also supported by Wood & R nger (2016). They highlight how at the neural level, this reinforcement process is facilitated by the midbrain dopamine system, which signals reward prediction errors when the anticipated and the perceived rewards differ. However, while repeated exposure to rewards or to the pursuit of rewards initially promote habit formation, over time the dopamine infused neural signals decrease with each repetition if the reward becomes routine (Wood & R nger, 2016). Consequently, Wood & R nger (2016) found that habit formation accelerated when rewards are provided on a random interval schedule, meaning that rewards should not be constant and predictable, heightening the importance of the anticipation of rewards in habit formation. These findings are in line with the principles of operant conditioning and variable rewards and they have massive implications in building user engagement and habit formation in SNPs. More on these topics in sub sections 3.2.3 and 3.4.4.3.

## 3.2 Building Social Network Habits

This section of the thesis delves into an in-depth exploration and analysis of the significant factors and processes that impact users' habits and habit formation when engaging with an information system (IS) and a social network (SN) platform, adopting an affective theoretical perspective. As evident in the preceding section, the process of habit formation is inherently complex and encompasses various direct and moderating factors. Additionally, within social contexts such as social network platforms and other networked environments, as well as information system environments, the number of influencing factors expands significantly. Factors such as platform usefulness, satisfaction, perceived value, social presence, and sense of belonging exert a substantial influence on user decisions and preferences. To facilitate a comprehensive understanding of these factors and their interrelationships in the habit formation process, a conceptual illustration, presented below in Figure 5, has been developed in this thesis. The purpose of this visualization is to succinctly summarize the key factors and findings from this section, explain and highlight the relationships among different factors, and demonstrate their impact on the continued usage of social network platforms. In order to provide a thorough examination of IS and SN habit formation, this section extensively reviews relevant and reputable literature, discussing the crucial factors and their interconnections. By the end of this section, the conceptual visualization presented herein will aid readers in conceptualizing the important factors as they carry over to subsequent sections of the thesis.

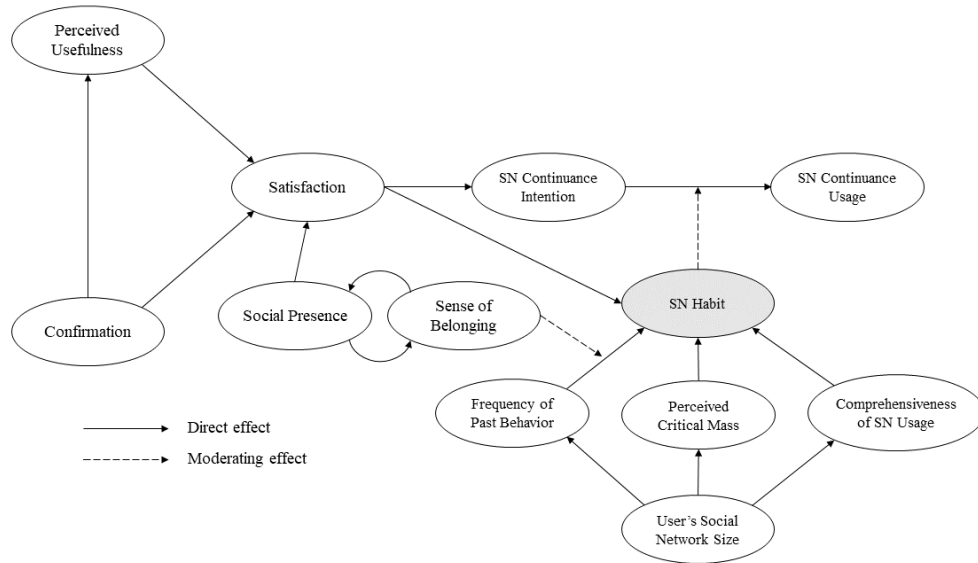


Figure 5. Conceptual illustration of all key factors affecting SN habit formation.

The rest of this section is divided into four parts. First, we will introduce and define the concept of Social Network (SN) habit based on previous research in the realms of SN and Information System (IS). Within this segment, we will also explore the stacking nature of SN habits. Secondly, we will examine the role and significance of a sense of belonging in the SN habit formation process. Thirdly, this paper will dive deeper into the literature on building and deconstructing habits by introducing the concept and influence of operant conditioning. Lastly, to exemplify some of the aforementioned topics in practical terms, a case study will be presented, with Twitter being chosen as the selected case company.

### 3.2.1 SN Habit

According to academic literature in the field of information systems (IS), the process of sustained information system use involves the development of motivating behaviours that become habitual and automatic over time, in addition to behavioural intention and expectation (Goh, Xin, & Jin, 2019). Furthermore, as illustrated below in Figure 6, Limayem et al., (2007) discovered that habit formation in the context of IS usage is promoted by a higher occurrence of past behaviour and satisfactory experiences with the IS. In addition, Limayem et al., (2007) highlights the importance of comprehensive IS usage towards the formation of an IS usage habit, which pertains to the extent to which users utilize the various applications and interfaces available within a single information system. In other words, they assert that users who employ an information system in multiple ways are more likely to develop stronger habits in relation to its usage compared to those who use the IS in a more limited manner (Limayem et al., 2007). Interestingly, their study also

revealed that habit acting as a negative moderator between IS continuance intention and IS continued use explained IS continuance usage better than habit as a direct factor, indicating that users showed less behavioural intention over time while simultaneously increasing their information system use.

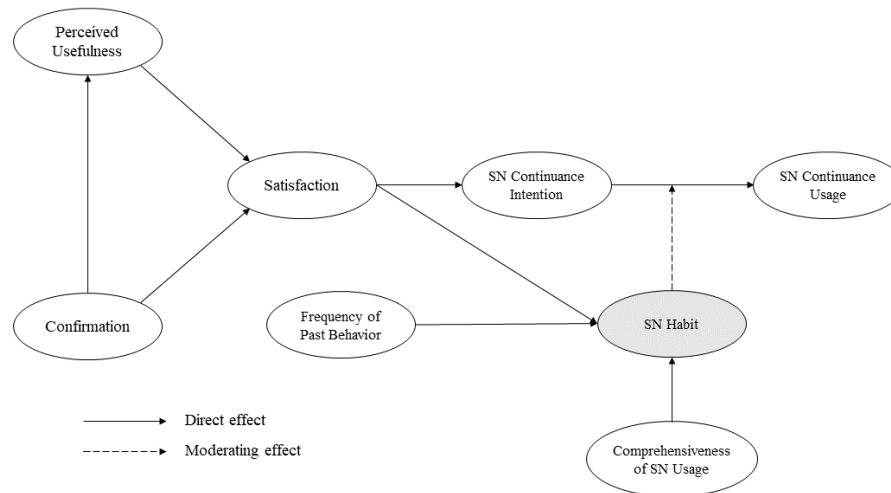


Figure 6. Illustration of Limayem et al.'s. (2007) research framework.

To explain the role and effect perceived usefulness and confirmation has on satisfaction and IS continuance intention, Limayem et al.'s., (2007) utilized Bhattacharjee's, (2001) IS Continuance Model in their analysis. To reiterate, Bhattacharjee's, (2001) IS Continuance Model finds satisfaction as particularly crucial in building and retaining a loyal IS user base as it reinforces user IS continuance intention, while perceived usefulness was observed to solely influence users' IS continuance intention throughout both adoption and post-adoption phases. In addition, higher confirmation levels were observed to increase satisfaction and perceived usefulness based on the ECT. (Barnes & Böhringer, 2009; Bhattacharjee, 2001; Limayem et al., 2007)

Yang, Wang, & Lu's (2016) research suggests that the experience of enjoyment significantly impacts both engagement and addiction behaviours on SNPs, with habit acting as a mediator variable clarifying the relationship between the enjoyment, addiction, and engagement variables. This means that SN enjoyment can affect addiction and engagement directly and indirectly via habit strength. In addition, Yang et al. (2016) observed that social self-efficacy<sup>1</sup> has a direct influence on users' perceived enjoyment on SNPs, and an indirect influence in enhancing users' engagement and mitigating addiction behaviours in a significant manner.

<sup>1</sup> Self-efficacy is the level of individual's confidence in their ability to engage in the necessary social interactional tasks for initiating and maintaining interpersonal relationships (Yang et al., 2016).

Hu, Stafford, Kettinger, Zhang, & Dai (2018) conducted a survey with 518 SN users to explore the development of habits concerning the use of SNPs. Their study revealed compelling evidence that habit plays a significant role in predicting future behaviour, observing that as users become more deeply engaged with their SNP, they tend to continue using it in the future. Hu et al's. (2018) research also discovered the significant role of past behaviour in the formation of SN habits and that higher levels of perceived value towards a SNP were associated with greater SN habit formation. In addition, and in line with previous observations, positive feelings and satisfaction derived from SN use significantly contributed to the formation of strong usage habits.

Most recently, Bayer, Anderson, & Tokunaga (2022) recently demonstrated in their research how technical features within SNPs can contribute to the acquisition and activation of habits. They found that technical cues, such as notifications (more in the Persuasive Technologies section), and social rewards can increase users' sense of belonging (more in section 3.2.2), which in turn reinforces SN habits. These technical cues, like pop-up notifications and reminders, are designed to redirect the user back to the platform. Over time, these cues manifest into contextual cues, automating the user's behaviour and reducing the need for conscious effort (Bayer et al., 2022).

Through our analysis of habit-related research within the realm of information systems and social networks, it was evident that repetition, including the amount of past behaviour and continuous use, and the frequency of them, was identified as the primary precursor in fostering habit formation in individuals. This was agreed by both Limayem et al. (2007) and Hu et al. (2018) as the most influential deciding factor. Furthermore, as seen in Hu et al's. (2018) and Yang et al's. (2016) studies, users' satisfaction/enjoyment was also found to be a considerable factor influencing the development and establishment of habits related to social network usage.

### *3.2.1.1 Context Cues that Activate Habitual SN Usage*

The notion of habit inherently necessitates the presence of contextual elements that consistently accompany the behaviour during the habit formation process. Without these contextual elements, the mental context-action associations necessary for the habitual behaviour fails to develop, leading to the inability to activate the behaviour automatically (Schnauber-Stockmann & Naab, 2019; Wood & R nger, 2016). In their research, Anderson & Wood (2021) identify four distinct categories of context cues capable of activating habitual SN usage: mood and emotional cues, platform design cues, technology cues, and location and activity cues.

The mood and emotional cues relate to the user's emotional states that have been developed over time to associate with SN usage (Anderson & Wood, 2021). For instance, research by Meier, Reinecke, & Meltzer (2016) found that US university students who experienced uncertainty in

completing university assignments tended to procrastinate by checking Facebook. (Meier et al., 2016). Their research also observed that the use of Facebook for procrastination and delaying important tasks increased academic stress levels among students, thereby impacting their well-being beyond the academic domain. Moreover, a study examining daily smartphone usage found that boredom was a significant predictor of phone usage, with 93% of surveyed smartphone owners aged 18-29 admitting having used their phones at least once to alleviate boredom, with an average being 5.4 times, over a one-week period (Smith, 2015). In the same study, it was found that 47% of smartphone users between the ages of 18 and 29 used their phones as a means of avoiding interactions with those around them (Smith, 2015). Furthermore, studies have indicated that individuals who experience negative emotions such as anxiety, social stress, or lack of self-regulation were found to positively influence addictive smartphone usage (Van Deursen, Bolle, Hegner, & Kommers, 2015). Thus, specific emotions, particularly negative ones like boredom, anxiety, and loneliness, tend to automatically trigger the use of smart devices, subsequently leading to engagement with SN platforms.

Platform design cues encompass the features and elements of the SN platform's design that are intended to automatically trigger and prolong SN usage (Anderson & Wood, 2021). An example of such cues is push notifications, which have been found to enhance habit formation and increase the frequency of platform visits among habitual users in comparison to both habitual users who did not receive such notifications and users with lower levels of habituation (Anderson & Wood, 2021; Bayer et al., 2022). Incorporating platform design cues have also been observed to tap into classical conditioning, wherein users learn through repeated exposure to associate behaviour rewards with auditory or visual cues (Anderson & Wood, 2021; Schonberg et al., 2014). Many prominent SNPs leverage this by incorporating unique sounds, push animations, and layout designs into their notifications. Furthermore, some platform design features aim to drive SN habit formation by persuading user to prolong their engagement with the platform by offering behavioural rewards in variable and random intervals. For instance, numerous SNPs have employed endless and randomized newsfeed designs, and content autoplay features, to compel users to continuously scroll and consume displayed content with the hopes being rewarded with relevant content, ultimately extending their time spent on the SNP. (Alter, 2017; Eyal, 2014)

Technology cues pertain to the technical aspects involved in accessing the SN platform, such as the device used, the operating system employed, and the different interfaces provided within the platform itself (Anderson & Wood, 2021). Notably, Schnauber-Stockmann & Naab (2019) and Oulasvirta, Rattenbury, Ma, & Raita (2012) found that pre-existing smartphone habits facilitated the formation of SN platform habits. This is due to the fact that the utilization of SN platforms is intricately linked to the technical aspects of the device, and well-established smartphone habits

serve as "gateway habits" that pave the way for the development of SN habits. Gateway habits refer to previously learned habits that are necessary prerequisites for the performance and establishment of new habits within the same technological (context) cue (Oulasvirta et al., 2012; Schnauber-Stockmann & Naab, 2019). For instance, proficiency in operating a smartphone, such as scrolling, tapping, and opening/closing apps, is essential for engaging with an SN platform on a device. Consequently, it is crucial for platform designers to optimize the platform's compatibility with various technical cues, such as different operating systems and devices, in order to facilitate habit formation and avoid conflicts where learned gateway habits are not applicable within a specific SN platform and technological cue (Bayer et al., 2022; Oulasvirta et al., 2012; Schnauber-Stockmann & Naab, 2019). The concept of gateway habits is closely related to the phenomenon of habit "stacking," where habits reinforce one another by capitalizing on the automaticity acquired in adjacent or overlapping contexts (see Bayer et al., 2022). Further details on the habit "stacking" process will be discussed in the subsequent sub section 3.2.1.2.

Lastly, location and activity cues are associated with how real-world environments and activities can trigger the usage of SN platforms (Anderson & Wood, 2021). Various contexts, such as being in bed after waking up, during meals, while using public transportation, or even in the bathroom, can serve as cues for smartphone and SN platform engagement. For instance, according to a survey conducted by NordVPN, 65% of the 9,800 adults surveyed reported using their phones in the bathroom (Šimkevičiūtė, 2022). In some sense, this behaviour can be viewed as a manifestation of location and activity-related gateway habits, as people have historically engaged with books and magazines in such settings. Furthermore, a survey conducted by Snapchat and Murphy Research, involving 1,005 social media users aged between 13 and 44, aimed to explore the reasons and locations for using different social media platforms. The results revealed that Snapchat was the preferred platform for users while hanging out with friends and during commuting, whereas Facebook was predominantly used when respondents had trouble sleeping or while they were at home (Medium, 2019).

To summarize, an effective strategy for optimizing the habit formation process in SN platforms involves platform designers comprehending and leveraging the various context cues that impact user behaviour. Facilitating increased repetition within these contexts is vital for these cues to ultimately trigger habitual SN usage (Anderson & Wood, 2021). In the next sub section, we will continue the discussion of gateway habits by further investigating the habit "stacking" process via Bayer, et.al's. (2022) Levels of Habit Analysis.

### 3.2.1.2 “Stacking” of SN Habits

In this section, we investigate the premise set by Bayer et al's., (2022) research of viewing social network habits as a combination across multiple levels. Their viewpoint is rooted in the concept of habit "stacking," where habits are reinforced by one another, leveraging the automaticity learned in adjacent or overlapping contexts (Bayer et al., 2022). In their study, they propose that a social network habit can be described as a fusion of five levels: platform, device, interface, behaviour, and motor.

Figure 7 illustrates Bayer, et.al's. (2022) Levels of Habit Analysis. For instance, any given social network action, e.g., liking an Instagram Reels video involves platform, device, interface, behaviour, and motor processes. The first three levels represent the users' habitual context (blue), while the latter two levels represent their habitual response (green).

Starting from the highest level, as users engage more with a specific SN platform, they develop habits specific to that platform, which impact their expectations towards other platforms. This includes factors like shared elements (e.g., appearance and functionality of different platform aspects). (Bayer et al., 2022) Getting to the second level, these platform habits are also influenced by the device and operating system used to access the platforms (e.g., iPhone OS vs Android OS). Optimizing the platform for each operating system is crucial to prevent issues and platform designers should understand these differences to avoid habit conflicts, where users apply learned habits incorrectly in interface contexts. (Bayer et al., 2022) Lastly, the interface level encompasses immediate contexts, including messaging, feed, and profile interfaces, each with distinct behaviours and functionalities. These interfaces enable users to interact with the platform and serve as landing interfaces when opening the platform on their device, prompted by technical or habitual cues. (Bayer et al., 2022)

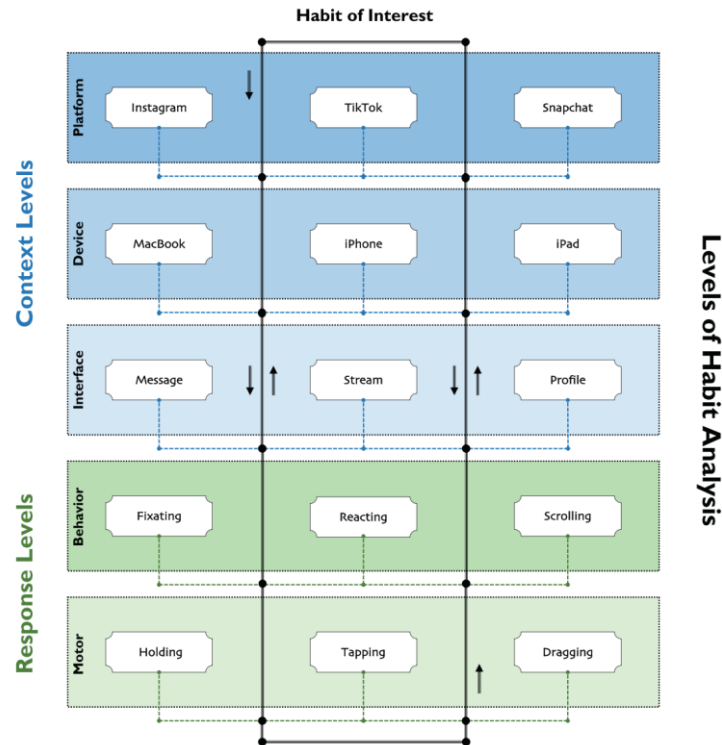


Figure 7. Bayer et.al's. (2022) Levels of Habit Analysis.

Moving to the habitual response, Bayer's, et.al., (2022) distinguish the response levels from the context levels to analyse how users respond to contextual cues. The behavioural level encompasses general actions driven by motivations and goals, such as responding to comments or messages, or scrolling through personalized news feeds. These actions can then be further divided into basic motor habits like tapping, dragging, and holding on the device screen. While users' motivations and behaviours may be conscious, these motor habits operate automatically below their conscious awareness. Platform designers should recognize the importance of these motor habits in facilitating a smooth user experience and building habits applicable to other actions. (Bayer et al., 2022)

In essence, Bayer, et.al's., (2022) framework demonstrates that social network habits are composed of combinations of smaller habit sequences, utilizing automaticity learned in adjacent or overlapping contexts across different habit levels. This framework serves as a valuable tool for practitioners and platform designers to understand automatic processes, contexts, and their influence on user behaviour and habit formation within social networks. Moreover, when applied correctly, the framework can provide a new approach for accurately quantifying social network habits in real-world contexts.

To further explore the stacking ability of social network habits, Bayer, et.al., (2022) presents in Figure 8 a demonstration of the stacking nature of social network habits. The illustration

showcases three overlapping habitual responses, each interacting with different platform interfaces and varying probabilities of receiving rewards. The habit pathways (A, B, and C) operate in a decision tree-like fashion, where the first response triggers the second if unsuccessful, and so on.

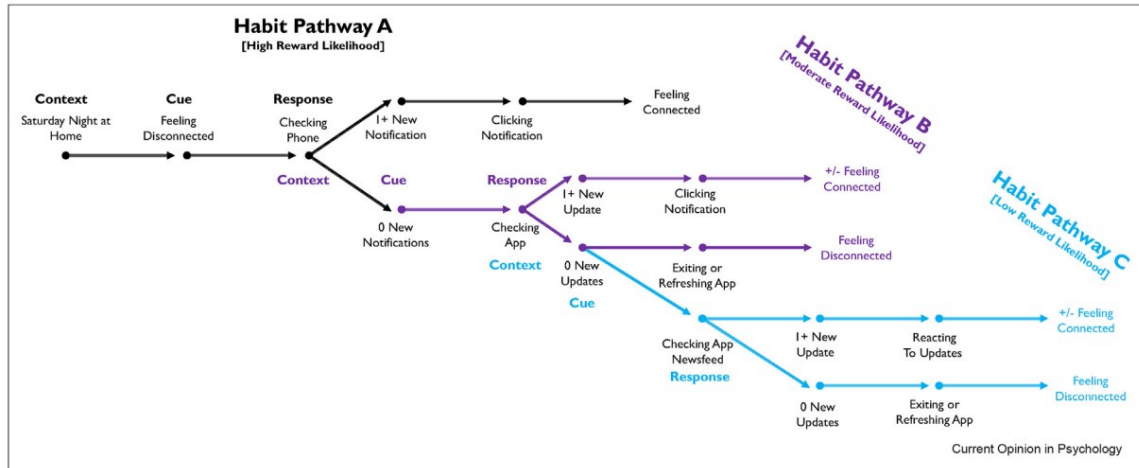


Figure 8. Bayer et.al's. (2022) Illustration on how SN habit sequences stack.

Using Instagram as an example, let's explore a hypothetical scenario. The user, feeling lonely at home, initiates the habitual behaviour of checking their phone for notifications (Pathway A) to alleviate their loneliness. If no notifications are present, they proceed to open the Instagram app and search for updates within the platform's notification dashboard (Pathway B), offering a moderate likelihood of connection. If no updates are found, the user resorts to repeatedly refreshing the app's feed in hopes of receiving rewards (Pathway C), despite the low likelihood.

This cycle of constantly checking for updates exemplifies SNP over-usage (Bayer et al., 2022). It's important to note that users may go through these pathways multiple times a day within the same platform or across different platforms. For instance, if Pathway C fails to provide the desired reward, the user might switch to another platform and initiate the cycle again. Additionally, the cycle can occur in a looping manner, where after not receiving a reward from Pathway C on the subsequent platform, the user may feel compelled to return to the initial platform or access a third platform. This repetitive cycle is influenced by the strength of the habitual reaction to context cues, such as the negative emotional state of feeling lonely in this illustration.

### 3.2.2 Sense of Belonging in Social Network Habit Formation

According to psychological research, belonging is a subjective emotional or evaluative experience, or perception, that is internal to an individual. (Hagerty, Lynch-Sauer, Patusky, Bouwsema, & Collier, 1992). As per the findings of Hagerty et al. (1992), the sense of belonging

encompasses two key aspects: Firstly, sense of belonging encompasses the individual's (or user's) feelings of being valued, needed, or significant in relation to other individuals, groups, and environments connected to them. Secondly, sense of belonging encompasses the individual's sense of alignment and compatibility with other individuals, groups, and environments based on shared or complementary characteristics. (Hagerty et al., 1992)

The sense of belonging among users reinforces the tendency to choose the same behaviour when faced with similar situations in the future, increasing the likelihood of recurring usage behaviour, as stated by Q. Liu et al. (2018). Verplanken (2006) also suggests that repetitive engagement in a certain behaviour driven by sense of belonging can lead to the behaviour becoming more automatic over time (increased automaticity). On the other hand, as shown by Koh & Kim (2003) and Q. Liu et al. (2018), in online communities, such as those found in social network platforms, a sense of belonging refers to an emotional connection and shared belief among members that their needs will be fulfilled through their dedication to the (Online) group. According to Zhao, Lu, Wang, Chau, & Zhang (2012), users' sense of belonging in social networks is linked to higher loyalty towards the communities they are part of, leading to repeated use of social media as users care about one another.

In their research, Liu et al. (2018) investigated how individuals' sense of belonging impacts the formation of habits, and consequently, via habits, to continuance behaviour, in social network (SN) platforms. Their empirical research studied a large sample size of Chinese users of a Chinese social networking platform Renren (594 users studied), and a Chinese microblogging platform Weibo (608 users studied). The authors hypothesized that trying to affect individuals' continuous behaviour, usage habit, and the formation of it, would be a significant driver and best associated with it. Furthermore, the notion that usage habit, and the formation of it, is a significant driver and strongly associated with continuous behaviour is backed by a variety of academic research, such as Hsiao, Chang, & Tang, (2016); Kim & Malhotra, (2005); Lee, (2014); Limayem et al., (2007); Liu et al., (2018), and Venkatesh, Thong, & Xu, (2012). Hence, studying the link between sense of belonging and usage habit formation is paramount.

Liu et al. (2018) revealed the significant positive impact of users' sense of belonging on the strength of their usage habits, subsequently influencing their continuance behaviour in a positive manner. Furthermore, their research highlighted the crucial role of users' sense of belonging in moderating the relationship between the frequency of past behaviour and the development of SN habits. This moderation acts as a trade-off, where a higher sense of belonging reduces the influence of past behaviour on SN habit formation. As a result, over time the significance past behaviour decreases after a certain point, whereas simultaneously users' sense of belonging was observed to enhance the automaticity in the development of SN habits. However, Q. Liu et al.

(2018) still highlights the importance of repetitive usage for the formation of SN habits. They argue that without frequent previous use, it is extremely difficult to form any kind of social network habitual behaviour. But the moment users have reached a sufficient level of frequency in their past behaviour, social network platform designers should prioritize nurturing users' emotional connection, particularly their sense of belonging, towards the social network environment, such as towards other users and user groups.

Lindström et al. (2021) also support this notion, as their research demonstrates that individual/user behaviour on social network platforms aligns with the principles of reward-based learning. Reward-based learning has been defined in a multitude of ways, with Berridge (2000) stating that reward-based learning mainly involves the direct process of strengthening or weakening of behaviour through the consequences that occur after the behaviour has been conducted. In addition, a more recent definition from the National Institute of Mental Health defines reward-based learning to encompass the learning process where individuals, and in the context of social networks being users, gain knowledge through stimuli, actions, and contexts that are associated with positive outcomes. It also involves modifying behaviour when unexpected rewards occur, or when outcomes exceed the individuals expectations (National Institute of Mental Health). In other words, reward-based learning (reward learning) encompasses the process of individuals learning from experienced outcomes, positive or negative, after a certain behaviour and modifying their behaviour based on those outcomes, either by strengthening or weakening the behaviour.

In addition, Lindström et al's. (2021) research also found that through reward learning, SN users tend to aim for maximizing their overall social rewards when sharing content on SNPs, for example the amount of "likes" and positive comments received by the post. When studying the brain images and neural responses, these social rewards have been shown to activate similar motivational mechanisms and neural responses in the brain as more fundamental rewards like nutrition or monetary gains (Lindström et al., 2021).

In conclusion, summing up Lindström et al. (2021) and Q. Liu et al. (2018), it can be argued that SNPs should prioritize and promote sense of belonging by generating activities and features that highlight to users of their successes and accomplishments, as well as building users' sense of being valued by other users and relevant communities. Moreover, the results of Lindström et al. (2021) provide robust evidence that user behaviour on SNPs adheres to the principles of reward-based learning and (social) reward maximization, constantly modifying SN users to repeat behaviours in hopes of future positive (social) rewards and outcomes. Via this notion, Lindström et al., (2021) demonstrates the state of current SN user habitual behaviour and user engagement as a contemporary version of B.F. Skinner's Skinner Box (operant conditioning chamber).

### 3.2.3 Operant Conditioning – The Skinner Box

In short, the Skinner Box is a laboratory contraption used to study operant conditioning: an outcome-based learning process aiming to modify future behaviour via the resulting consequences/outcomes of set behaviour (Nickerson, 2023). This behavioural change is accomplished via the use of reinforcements and punishments as outcomes/consequences of different behaviours (Nickerson, 2023), and through this process, behaviours that are rewarded often encourage the user to repeat the same behaviour in the future, especially in similar contexts, whereas behaviours that have negative outcomes and are punished often discourage the user to repeat the behaviour in the future. In addition to the role of reinforcements and punishments in habitual behaviour, Skinner & Ferster (1957), and behavioural psychologists ever since, discovered that reinforcements rewarded in different schedules, or in different patterns, affected the strength and consistency of the operant conditioned behaviours substantially, with some reinforcement schedules having faster learning curves, and/or a higher resistance to extinction than others. Resistance to extinction refers to the extent that the target behaviour continues to be acted upon after the behaviour is no longer being reinforced (Lim, 2023). Skinner & Ferster (1957) and behavioural psychologists emphasize the use of five categories of reinforcement schedules:

1. Continuous reinforcement: every act of target behaviour is rewarded with a reinforcement.
2. Fixed-ratio: after a fixed number of completions of the target behaviour, a reinforcement is presented. For example, after every five completions.
3. Variable-ratio: a reinforcement is rewarded after random and unpredictable number of completions of the target behaviour. This is a common reinforcement schedule in the casino gambling environments, especially in slot machines.
4. Fixed-interval: assuming that there has been at least one completion of the target behaviour, a reinforcement is provided after a fixed time interval has passed. For example, an hourly reinforcement.
5. Variable-interval: assuming that there has been at least one completion of the target behaviour, a reinforcement is administered at irregular and unpredictable time intervals. (Skinner & Ferster, 1957)

In general, the reinforcement schedules that exhibit unpredictable reinforcement patterns showcase higher levels of extinction resistance compared to predictable/fixed reinforcement schedules, with VR-schedules possessing higher extinction resistance than FR-schedules and VI-

schedules possessing higher extinction resistance than FI-schedules (McLeod, 2023; Skinner & Ferster, 1957). Out of all the reinforcement schedules, the variable-ratio reinforcement schedule showcased the highest resistance to extinction, whereas the continuous reinforcement schedule had the lowest resistance to extinction (Lim, 2023; McLeod, 2023; C. Nickerson, 2023; Skinner & Ferster, 1957). In addition, when comparing the response rates (responses per unit time) of target behaviour between the different reinforcement schedules, ratio-related schedules tend to result in better response rates as opposed to interval-related schedules. Furthermore, when observing the variance of response rates between the different reinforcement schedules, variable schedules tend to generate more consistent response rates in opposed to fixed schedules. (Lim, 2023; McLeod, 2023; C. Nickerson, 2023; Skinner & Ferster, 1957)

Based on the studies conducted by Skinner & Ferster (1957) and behavioural psychologists after them, the variable-ratio reinforcement schedule showcases the most amounts of extinction resistance and highest response rates compared to the other schedules. This is why variable-ratio reinforcement schedules can be predominantly found in high engagement and strong habitual environments, such as in casinos and social network platforms. This thesis will continue the discussion on variable-ratio reinforcement schedules and their merits within 3.5.4 Nir Eyal's Hook Model, when investigating the concept and gravitas of "variable rewards" in building habits and user engagement in social network platforms.

### 3.2.4 Case Example: Habit Formation in Twitter

To provide a tangible illustration of habit formation within the context of social networks (SNs), the present section undertakes an in-depth examination of Twitter, serving as an exploratory case study. The primary objective is to investigate and analyse the predominant factors that exert influence on the development of habits within SNs. By scrutinizing existing academic research and its empirical findings pertaining to Twitter, this section aims to identify key principles that shape the process of habit formation in social network environments. These principles will subsequently be introduced and thoroughly discussed herein to corroborate their integration into the conceptual framework of the present research. In essence, the purpose of this section is to discern essential principles from prior academic investigations concerning Twitter, elucidate their impact on the habit formation process within SNs, and duly substantiate their incorporation into the overarching conceptual framework of this research endeavour.

Two main research articles were found discussing the habit formation process within Twitter: Barnes & Böhringer, (2009) and Liu, Lee, & Cheung, (2011). To structure this section and highlight the key principles found from both research articles, a visualization of the research framework of both studies is presented below in Figure 9. Based on these two studies as well as

incorporating insights from previously discussed findings, this section aims highlights the importance of satisfaction, frequency of past behaviour, comprehensiveness of usage, perceived critical mass, and social presence as influencing factors within the SN habit formation process, as was seen in Twitter. However, it is worth noting that convenience was excluded from the scope of this research as it highly resembled the previously discussed perceived usefulness, with perceived usefulness offering a better suitability out of the two for the purpose of this research.

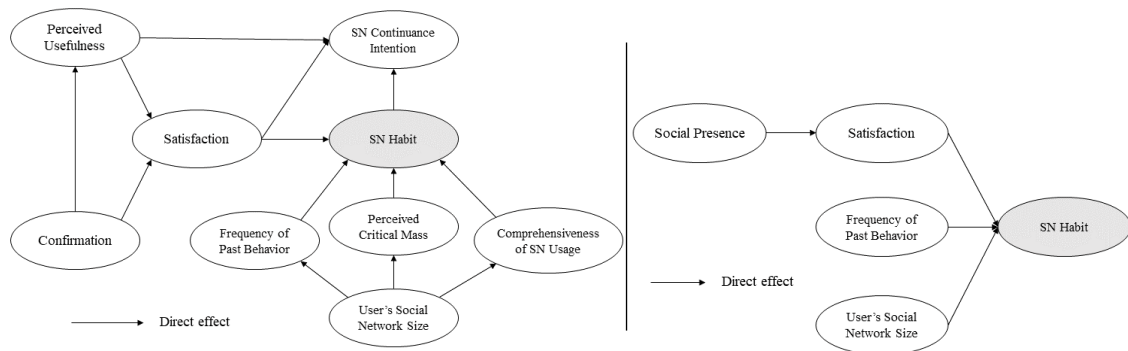


Figure 9. Illustrations of Barnes & Böhringer (2009, left) and Liu et.al. (2011, right) research frameworks.

Twitter is an online social networking platform that provides users with the ability to share texts, images, and videos via public "tweets." Users who are registered can actively engage with content by tweeting, liking, retweeting, and sending direct messages to other users. As of December 2022, Twitter had over 368 million monthly active users worldwide (Lebow, 2022).

#### 3.2.4.1 Satisfaction and Frequency of Past Behaviour.

Within the realm of Information Systems (IS), Limayem, Hirt, Cheung, & Hirt, (2007) put forth a definition of IS habit as the degree to which the use of a specific IS becomes automatic in response to certain situations. Commonly, researchers in the field of Information Systems (IS) concur that when individuals consistently engage in a specific behaviour (such as using an IS), their future behaviour is predominantly influenced by habit rather than deliberate reasoning (Liu et al., 2011). As per the findings of Limayem et al., (2007), as previously discussed in section 3.2.1 SN Habit, IS habit formation is influenced by three main factors: satisfaction, the frequency of past behaviour and the comprehensiveness of IS usage. Satisfaction pertains to users' personal positive assessment of the outcomes and/or experiences related to IS usage, the frequency of past behaviour encompasses the potency of usage, including both the duration and frequency of use, and comprehensiveness of use pertains the extent to which users utilize the various applications and interfaces available within a single information system. (Limayem et al., 2007).

Both Liu et al., (2011) and Barnes and Böhringer, (2009) highlight the importance of perceived satisfaction and frequency of past behaviour to the social network habit formation process, with Liu et al's. (2011) research noting a strong direct effect between satisfaction and habit formation and between frequency of past behaviour and habit formation. Barnes and Böhringer's, (2009) research concurs, with their research showcasing a similar strong direct effect between satisfaction and habit formation as well as between frequency of past behaviour and habit formation.

Barnes' and Böhringer's (2009) results also comply with and support Bhattacharjee's (2001) IS continuance model and Limayem et al's. (2007) IS continuance research, as previously discussed in section 3.2.1 SN Habit. In compliance with Bhattacharjee's (2001) IS continuance model, Barnes' and Böhringer's (2009) research showcased a strong explanatory relationship from confirmation towards perceived usefulness and satisfaction, as well as showcasing perceived usefulness acting as a strong driver of satisfaction. Corresponding to Limayem et al's. (2007) IS continuance research, Barnes' and Böhringer's (2009) research showcased that satisfaction is a major determinant of Twitter usage habit formation, along with strong linkages from the frequency of past behaviour. However, in contrast to Limayem et al. (2007), Barnes' and Böhringer's (2009) research showcased a low relationship between comprehensiveness of use and Twitter habit formation, whereas Liu et al. (2011) omits its significance all together.

#### **3.2.4.2 *Comprehensiveness of Use***

According to Liu et al. (2011) and Barnes and Böhringer (2009), because Twitter, classified as a microblogging social network platform, offers a quite limited interface and user application offering compared to other information systems that offer a multitude of functionalities and applications for their users, Liu et al. (2011) omits the effects, and Barnes and Böhringer (2009) highlight the low effects of comprehensiveness of IS usage into the SN habit formation process in Twitter within their respective research models. By simplicity and limitations, the authors imply that Twitter, along with some stand-alone SNPs, offer only a few interfaces and usage applications such as posting and post interaction (likes, comments etc.), scrolling (news feed), direct messaging, and profile modification and -prompting (profile status and story<sup>2</sup> updates).

Despite this, both research highlight that this does not encompass all SNPs, and that every SNP needs to be evaluated separately based on their own merits. For example, Facebook offers a multitude of different interfaces, functionalities and applications for its users to use (marketplace,

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<sup>2</sup> Social media stories are time-constrained multimedia content, including images, videos, and other elements, that disappear after 24 hours. They are designed to enable users to instantly share snapshots of their daily lives. Stories are highlighted on other users' news feed interfaces as profile picture pop-ups of the posting user. (Menon, 2022)

organization and event pages, user groups, digital games, streaming etc. interfaces in addition to the functionalities and applications listed before), increasing the effects of comprehensiveness of SN usage towards the SN habit formation process (Barnes & Böhringer, 2009; Liu et al., 2011).

Furthermore, as the number and global adoption of SNPs keep increasing, users' comprehensiveness of use is being increased by the increasing number of platforms being interconnected under "multiplatform bundles", often by the result of "platform envelopment" (Eisenmann et al., 2006). This occurs when a platform absorbs another platform in order to incorporate and leverage the enveloped platform's functionalities and established user relationships to their existing "multiplatform bundle" (Eisenmann et al., 2006). As stated by Eisenmann et al. (2006): "networked markets, especially those in which technology is evolving rapidly, are rich with envelopment opportunities." This is because most social network platforms share overlapping user bases, or at least overlapping target user segments, the multiplatform bundle provider is able to attract more money side users (paying customers e.g., advertisers, marketplace sellers etc.) compared to stand-alone providers, because they are able to offer lower costs through economies of scale, and more functionality and applications for their users (Eisenmann et al., 2006). Good examples of multiplatform bundle providers in the context of social network platforms are Facebook and Microsoft, with Facebook incorporating three out four most used social network platforms, Facebook, WhatsApp and Instagram, into its vast multiplatform bundle among other platforms, whereas Microsoft offers a wide multiplatform bundle including gaming (Xbox and Activision Blizzard), social networking (LinkedIn, Skype, Microsoft Teams) and hardware (computers, smart phones, gaming consoles).

As multiplatform bundles keep offering existing SN platform users with more functionality and applications, they allow a more comprehensive SN user experience, and as stated by Limayem et al., (2007), users who employ an information system in multiple ways are more likely to develop stronger habits in relation to its usage compared to those who use the IS in a more limited manner.

### **3.2.4.3 Critical Mass**

Critical mass refers to the stage in the adoption of an innovation (such as a social network platform) where there is a rapid increase in its adoption, leading to self-sustainability (Van Slyke, Ilie, Lou, & Stafford, 2007). Some researchers have also defined critical mass as the tipping point of the minimum number of users necessary that enables the rapid and self-sustained adoption of an innovation (Rogers, 1995; Van Slyke et al., 2007). Perceived critical mass, on the other hand, is the subjective perception of an individual user regarding whether this stage has been reached (Lou, Luo, & Strong, 2000). This is extremely vital for user acquisition, as showcased by Markus (1994) and Barnes & Böhringer (2009), because when users perceive a higher level of critical

mass, they are more likely to exhibit habitual behaviour and choose an innovation (social network platform) for interactive communication. In the context of social network platforms, perceived critical mass is when a user feels that the site has a sufficient number of other users with whom they can associate based on common interests or form friendships and other relationships (Sledgianowski & Kulviwat, 2009). This perception is crucial, as even if a social network platform claims to have a large user base, if a user does not perceive enough active members to associate with, then perceived critical mass has not been achieved or maintained for that particular user (Sledgianowski & Kulviwat, 2009).

Furthermore, Van Slyke et al.'s (2007) research highlights that widespread availability of a networking medium plays a crucial role in achieving critical mass. The choice to use a specific interactive platform for regular and routine communication and networking depends on the adoption of the platform by other relevant users in the network and a general social consensus among the relevant users. Hence, the social environment greatly influences the users' choices and as the adoption of an interactive communication platform increases among users and user groups, the platform will be perceived as more advantageous and beneficial for both those who have already adopted it and those who may consider adopting it in the future (Van Slyke et al., 2007). This is the result of positive network effects (Barnes & Böhringer, 2009; Eisenmann et al., 2006; Hagiu & Wright, 2011; Lou et al., 2000; Van Slyke et al., 2007). As discussed before, positive network effects in social network platforms typically occurs on both sides simultaneously, same-side and cross-side network effects, where the more users join a platform, it encourages other users in their network on the same side to join the platform as well. On the other side, the increase of subsidy side users on the platform consequently increases advertisers' or other money side users' willingness to pay and hence increasing the number of money side users on that platform. (Eisenmann et al., 2006) The value of a platform increases when it effectively meets the demand from both sides of the platform.

In conclusion, Barnes & Böhringer (2009) revealed a noteworthy association between perceived critical mass and the process of habit formation. Additionally, their study emphasized the considerable impact of the users' social network size on the development of these perceptions of critical mass. It is important to note that in Barnes & Böhringer's (2009) research, social network size refers to the number of followers and users being followed on Twitter. Furthermore, the size of the social network also influences the extent of usage comprehensiveness, (which was deemed insignificant based on Twitter's lack on functionality and applications).

#### 3.2.4.4 *Social Presence*

In addition to direct factors to SN habit formation, Liu et al., (2011) also highlights social presence as a key determinant to satisfaction in the Twitter habit formation process. It is interesting for the topic of this section, because even though social presence does not directly affect habit formation in Twitter per say, the conceptualization of social presence by Liu et al., (2011) shares a lot of similarities with users' sense of belonging, that was previously discussed in section 3.2.2 Sense of Belonging in Social Network Habit Formation. As found in Q. Liu et al's., (2018) empirical research, their findings showed that users' sense of belonging has a strong positive influence on the strength of usage habits, with consequently usage habit having a positive influence on continuance behaviour. Social presence has even been defined as users' psychological sense of belonging and being connected to others in a way that simulates their minds (Biocca, Harms, & Burgoon, 2003; K. M. Lee, 2004; J. S. Lim, Hwang, Kim, & Biocca, 2015). Hence introducing the concept of social presence from the lens of both Liu et al., (2011) and Q. Liu et al's., (2018) can be beneficial for future practitioners and academics.

As SNPs, like Twitter, have extended the reach of mediated relationships among users and user groups, users are now able to connect and interact in real-time with people from different geographic locations, sharing their own and others' opinions, emotional reactions, and glimpses into their "personal lives" (Kim, Kim, & Yang, 2019; Lim et al., 2015). Academic literature has provided various explanations for the concept of social presence within social networks. One definition, as presented by Oh, Bailenson, & Welch (2018), is that social presence involves the feeling of being in the company of another individual and having the ability to connect with their thoughts and feelings. In addition, according to Kim et al. (2019), in social network environments (such as a SN platform), social presence is the interaction between people and their diverse groups, including those they have pre-existing relationships with, such as friends and family, and those they only interact with online, such as celebrities and online community members. These interactions, whether one-way (scrolling and reading other users' status updates) or two-way (instant messaging on a SN platform), can create a sense of social connection, even though either user is not physically present (Kim et al., 2019). Furthermore, according to Short, Williams, & Christie, (1978) and Liu et al., (2011), social presence refers to the perception of an environment as personable and humanistic, in which higher levels of social presence are associated with increased user enjoyment, which in turn can lead to higher user satisfaction.

According to Short et al's. (1978) social presence theory, communication platforms that offer more cues are perceived as warm, personal, sensitive, and sociable, resulting in a greater sense of social presence. Liu et al. (2011) further elaborate that Twitter's instant and real-time communication cues facilitates high feedback speed, which in turn enables users to engage in

real-time interactions with each other, further enhancing their sense of social presence. In addition, users who perceive high social presence are more likely to engage in social interactions and feel connected with others, resulting in increased user satisfaction (Liu et al., 2011).

Kim et al. (2019) outline two models that explain users' behaviours in social networks in terms of achieving social presence: the social enhancement model and the social compensation model. The social enhancement model suggests that users who feel that their social networks offline are strong are inclined to use the internet and social network platforms to enhance their social resources and expand their social circles even further (Kim et al., 2019; Ross et al., 2009; Valkenburg & Peter, 2007). On the other hand, the social compensation model states that those who do not have sufficient social connections offline tend to make up for it by using the internet, particularly users who are introverted, socially anxious, or shy, to substitute for their lack of in-person social networks (Kim et al., 2019; Rauch, Strobel, Bella, Odachowski, & Bloom, 2014; Valkenburg & Peter, 2007). According to this model, users who experience loneliness tend to utilize social media more frequently than those who do not feel as lonely. This is because social media offers them the chance to engage with others, which may be absent from their in-person interactions. These findings strongly relate to users' pursue of sense of belonging, especially with more lonely users. As per Hagerty et al. (1992), sense of belonging encompasses the users' feelings of being valued, needed, or significant in relation to other users, as well as feeling aligned and compatible with other users based on shared or complementary characteristics.

The findings of Liu et al. (2011) indicate that social presence significantly influences user satisfaction in the Twitter habit formation process.

### **3.3 Prevalent Economic Views and Persuasive Technologies**

In this section and in the sections that follow, this thesis aims to synthesize the current research and pertinent literature to gain insights into the factors influencing long-term user engagement and habit formation in social network platforms from the perspective of persuasive technologies. Persuasive technology represents a dynamic and interdisciplinary research field focused on designing, developing, and evaluating interactive technologies that employ persuasion and social influence techniques to shape human behaviour (Fogg, 2003; Hutchings, 2017; Kosner, 2012b). The literature review conducted herein introduces three major viewpoints that impact persuasive technologies: network and behaviour economics, as well as the reliability (Figure 10). The interconnections among these viewpoints are explored to shed light on how platform designers can enhance user engagement and cultivate habit-forming functionalities.

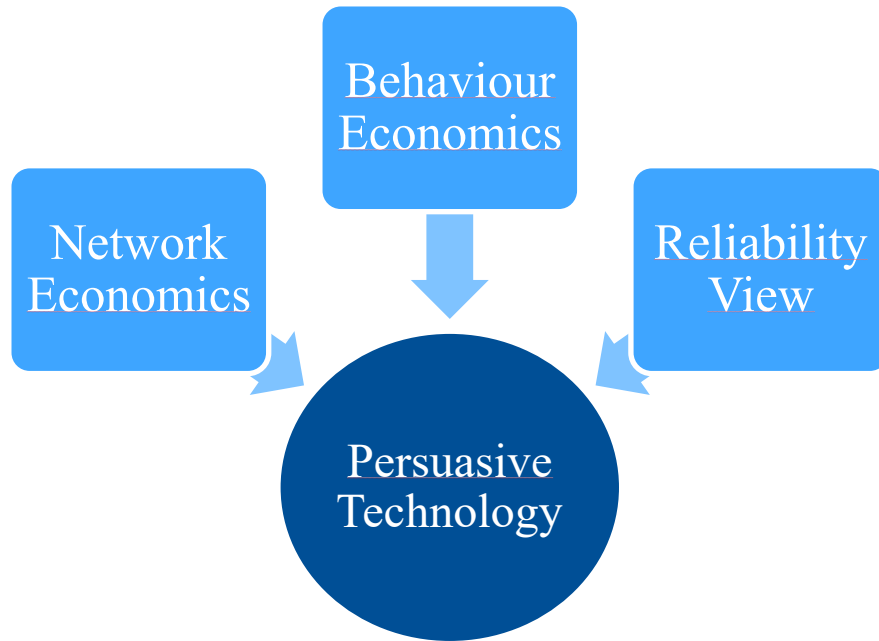


Figure 10. Visualization of the key views impacting Persuasive Technology.

Persuasive technologies draw inspiration from these viewpoints, as it encompasses technologies designed to modify user behaviours through social influence and persuasion. These technologies find applications in various domains of human-computer interaction, such as social network platforms, online communities, and social games. Consequently, the focus of the persuasive technologies lies predominantly on interactive technologies, including mobile and other internet-connected devices, systems, and platforms. It integrates theories and methodologies from behavioural psychology, economics, network and information economics, as well as the human-computer reliability view. In this context, this thesis introduces three prominent models associated with persuasive technologies that formulates and enhances the development of habit-forming behaviour within social network platforms: Fogg's Behaviour Model and Captology (B. Fogg, 2009; B. J. Fogg, 2003), Fogg's & Hreha's Behaviour Grid (B. J. Fogg & Hreha, 2010) and Nir Eyal's Hook Model (Eyal, 2014). In addition, gamification will be added as the fourth discussed application of persuasive technologies as it has been considered the most prominent design stream of motivational design (Hamari et al., 2018). These models and applications have been instrumental in advancing the field, with major platforms like Instagram, the fourth largest social network platform, successfully implementing these models and principles to amplify user engagement and foster habitual usage. Further details on the Persuasive Technologies and the proposed models are presented in section 3.4.

Network Economics aims to explain the strong correlation between user engagement and connectivity, highlighting how social network platforms become increasingly valuable as user

connectivity expands. This view aids platform designers in comprehending the network effects, which posit that the value of a platform rises in tandem with the number of users within the relevant network. Moreover, it facilitates an understanding of potential switching costs that users may face when considering alternative platforms. More in the next sub section 3.3.1.

Behavioural Economics delves into the irrational decision-making processes of individuals, examining the social, cognitive, and emotional factors that influence their behaviour. This perspective assists platform designers and providers in comprehending their target users as irrational individuals driven by diverse motivations and desires to act. An understanding of behavioural economics empowers designers to channel their efforts when targeting specific behaviours, leveraging principles such as gamification. More in sub section 3.3.2.

The Reliability View explores on how platform reliability and user satisfaction can impact users' tendency for re-engagement. It underscores the significance of long-term users to platform designers, as these individuals tend to weigh prior experiences. Positive prior experiences foster a sense of contentment, making long-term users less inclined to switch platforms compared to newer users. This, in turn, enhances engagement among existing users and encourages potential users to engage with the platform. More in sub section 3.4.3.

### 3.3.1 Network Economics

The following chapter aims to delve deeper into the concept of network economics in order to provide further insight into enhancing user participation in social network platforms. Network economic theory asserts that a network structure's (such as a social network platform (SNP)) value is positively correlated with the number of other users in the corresponding network structure. In addition, the network economic approach elucidates the close relationship between user engagement and connectivity, and highlights how social network platforms become more valuable to both current and prospective users through increased connectivity. (Bramoullé & Kranton, 2007; Cusumano, Yoffie, & Gawer, 2020; Eisenmann et al., 2006; Hagiu & Wright, 2011; Jackson, 2008; Knieps, 2015; Ronkainen, 2020; Shapiro & Varian, 1999)

According to Knieps (2015) and Borgatti & Halgin (2011), the term "network" has diverse meanings and definitions depending on the industry and context it is related to, with social networks being defined and referred to the complex and intangible relationships between individuals (or users in the context of SNPs). Social network analysis (SNA) has been widely used by researchers and practitioners to understand and analyse these social networks (Borgatti & Halgin, 2011; Knieps, 2015; Otte & Rousseau, 2002). SNA involves using graph theory to explore and investigate social networks (Freeman, 2004; Otte & Rousseau, 2002; Serrat, 2017),

where graph theory is used to characterize these social networked structures (graphs) in terms of nodes (users, or other mediums within the network) and edges/links (relationships and interactions between users, and/or other mediums within the network) (Borgatti & Halgin, 2011; Knieps, 2015; Serrat, 2017). SNPs are examples of social structures that are commonly visualized using social network analysis (Knieps, 2015).

Shapiro and Varian's (1999) research on network economics highlights the significant impact of network effects on network adoption. Network effects posit that the perceived value of a network structure, such as a SNP, increases as the size of the network grows (Barnes & Böhringer, 2009; Economides, 2006; Eisenmann et al., 2006; Hagiu & Wright, 2011; Lou et al., 2000; Van Slyke et al., 2007). As discussed before, SNPs provide a unique example of benefiting from both cross-side and same-side network effects simultaneously. As more users join the platform on the subsidy side, it incentivizes others in their network to join as well. Additionally, an increase in subsidy side users raises the willingness to pay for money side users, such as advertisers and content creators, attracting more of them to the platform. (Eisenmann et al., 2006)

Shapiro & Varian (1999) present two distinct strategies for platform providers to effectively attract new users to their platforms: the evolution strategy and revolution strategy. The evolution strategy focuses on minimizing switching costs and providing potential users with a gradual and seamless transition from competing platforms (Shapiro & Varian, 1999). According to Shapiro & Varian (1999), even smaller players in the market can employ the evolution strategy on a modest scale. An example of the use of the evolution strategy is Google's inclusion of extensive compatibility features in Google Docs, allowing easy conversion between Microsoft Word files and the Google doc format. This aligns with Farrell & Klemperer's (2007) strategies for network providers to reduce switching costs in order to enhance network efficiency and value. Their strategy suggests that firms offering differentiated products may intentionally ensure compatibility with competing products, either from direct competitors or even their own in-house products, thus eliminating switching costs (Farrell & Klemperer, 2007). By eliminating switching costs, all firms can experience increased demand and, consequently, higher profits (Farrell & Klemperer, 2007). This phenomenon is known as market compatibility, where consumers benefit from the ability to mix and match the best products and platforms from different firms and providers, resulting in efficiency gains, with the platform providers experiencing even greater private gains due to increased prices resulting from compatibility (Farrell & Klemperer, 2007).

The revolution strategy entails introducing a novel and superior technology with significantly enhanced performance, enticing a sufficient number of users to bear the associated switching costs (Shapiro & Varian, 1999). Typically, this strategy begins by targeting customers who place a premium on performance and quality, also known as early adopters, followed by expanding the

reach to attract the rest of the market. For instance, Apple and Samsung's introduction of touchscreen phones is a notable example with high initial prices embraced by a limited group of technology enthusiastic early adopters, followed by widespread consumer adoption as prices dropped over time. These early adopters act as great advocates for the novel product or platform, as their opinion and experiences can persuade the next wave of adopters. This aligns with Farrell & Klemperer's (2007) strategies for network providers operating in environments where competition is driven by cost and/or quality disparities, and user preferences evolve. Within this strategy, Farrell & Klemperer (2007) propose that in markets experiencing disruptive or significantly more efficient market entries, network effects give disproportionate weight to the preferences of pivotal early adopters, making platforms that resonate with them more successful than those appealing primarily to later adopters. Eisenmann et al. (2006) also support this viewpoint, emphasizing the significance of attracting pivotal early adopters, referred to as "marquee users" and that not all users within multi-sided networks should be treated equally. Especially during the initial adoption phases, securing the participation of marquee users plays a vital role in attracting participants to both sides of the network. Marquee users may include major money-side users, such as large advertisement and other agencies, and/or high-profile suppliers such as content creators (streamers, influencers, and celebrities) or platform contributors (game designers and developers) (Eisenmann et al., 2006). Exclusive commitments from marquee users can expedite platform growth, despite the potential cost (Eisenmann et al., 2006; Farrell & Klemperer, 2007).

However, if the novel market entry is seen as incompatible in terms of users' perceived switching cost and network effect preferences, they can discourage user acquisition and sustainable market entry. Incompatible switching costs hinder user switching, while incompatible network effects offer a limited network initially, reducing perceived value. (Farrell & Klemperer, 2007)

Irrespective of the chosen strategy, platform providers face a common obstacle: switching costs. Switching costs refer to the expenses and challenges involved in transitioning between, products, services and platforms, including data loss, compatibility issues, and the need to learn new features. These factors heavily influence users' decisions and can result in lock-in, where users are unable to easily switch to alternatives. (Farrell & Klemperer, 2007; Shapiro & Varian, 1999) Switching costs and lock-in phenomena are widespread in information systems and network economics, presenting challenges for companies and platform designers (Farrell & Klemperer, 2007; Shapiro & Varian, 1999). Shapiro & Varian (1999) categorize switching costs into seven types of lock-ins, as depicted in Table 3 below.

<b>Types of Lock-In and Associated Switching Costs</b>	
<i>Type of Lock-In</i>	<i>Switching Costs</i>
Contractual commitments	Compensatory or liquidated damages
Durable purchases	Replacement of equipment; tends to decline as the durable ages
Brand-specific training	Learning a new system, both direct costs and lost productivity; tends to rise over time
Information and databases	Converting data to new format; tends to rise over time as collection grows
Specialized suppliers	Funding of new supplier; may rise over time if capabilities are hard to find/maintain
Search costs	Combined buyer and seller search costs; includes learning about quality of alternatives
Loyalty programs	Any lost benefits from incumbent supplier, plus possible need to rebuild cumulative use

Table 3: Types of Lock-In and Associated Switching costs (Shapiro & Varian, 1999)

In order to establish a foothold in the market, it is imperative for platform providers and designers to recognize and address the potential switching costs faced by their target users, as highlighted by Shapiro & Varian (1999). This entails facilitating a seamless transition for prospective users, either through an evolutionary approach that minimizes barriers or by offering revolutionary solutions with superior performance. However, the journey does not end with user acquisition alone; companies and designers must also devise strategies to foster user retention and engagement. To achieve this, cultivating lock-in mechanisms to maintain a strong connection between their acquired users and platforms is paramount (Shapiro & Varian, 1999).

### 3.3.2 Behaviour Economics

Behaviour economics is a prevalent economic viewpoint influencing social network platforms. It combines elements from both economics and psychology to comprehend how psychological, cognitive, emotional, cultural, and social factors impact the decision-making processes of individuals or institutions. It aims to understand the deviations of these decisions from what is predicted by classical economic theory. (Hargreaves Heap, 2013; Kenton, 2023; Minton & Kahle, 2013; Teitelbaum & Zeiler, 2018; Vassileva, 2012; Witynski, Thaler, Mullainathan, & Epley, n.d.) On this subject, Vassileva (2012) provides a comprehensive review emphasizing the significance of behavioural economics in enhancing user engagement. To gain a deeper

understanding of the behavioural economic perspective, we will briefly introduce the classical economic view and compare the disparities between the two.

The classical economic theory assumes that individuals are rational agents who strive to maximize their utility or payoff in a world where behaviours result in certain positive or negative outcomes. In this view, the desired behaviours can be encouraged by creating a suitable system of incentives or rewards while not taking to account the diversity of user motivations, treating all participants as utility maximisers who adhere to the same principles of utility maximization. (Becker, 1976; Hargreaves Heap, 2013; Kenton, 2023; Vassileva, 2012; Witynski et al., n.d.). However, according to Hargreaves Heap (2013), Kenton (2023), Minton & Kahle (2013), Teitelbaum & Zeiler, (2018), Vassileva (2012) and Witynski et al. (n.d.), and other behavioural economists, classical economic theory is deemed too simplistic to be applicable in today's information-driven economy.

In stark contrast to classical economics, behavioural economics posits that individuals are prone to irrationality and conducts empirical investigations into the psychological, cognitive, social, and emotional dimensions that shape economic decision-making: why people make certain decisions and what motivates their behaviour (Hargreaves Heap, 2013; Kenton, 2023; Minton & Kahle, 2013; Teitelbaum & Zeiler, 2018; Vassileva, 2012; Witynski et al., n.d.). Vassileva (2012) and Ariely (2008) also highlights that behavioural economics has exposed the psychological invalidity of numerous theoretically sound economic mechanisms, often resulting in their failure when tested with real users. As aptly stated by Camerer & Loewenstein, (2004): “behavioural economics increases the explanatory power of economics by providing it with more realistic psychological foundations.” It is important to emphasize that behavioural economics does not seek to supplant the existing academic frameworks of analysis; rather, it aims to augment them (Ho, Lim, & Camerer, 2006; Vassileva, 2012). Ho et al. (2006) emphasize in their research that the behavioural economics approach does not abandon rational choice and equilibrium models of economic decision making. Rather, it extends upon them.

### **3.3.2.1 *Principals of Behavioural Economics***

The following subsections outline some of the key principles within behavioural economics affecting user behaviour and decision-making.

#### **3.3.2.1.1 Bounded Rationality**

Bounded rationality, a key principle in behavioural economics, acknowledges that individuals make decisions using cognitive shortcuts and limited information rather than exhaustively considering all options. As a result, decisions may not always align with the pursuit of maximum

self-reward, as limited information and cognitive constraints shape the decision-making process. (Gigerenzer & Goldstein, 1996; Gigerenzer & Selten, 2002; Kahneman, 2003; Simon, 1997)

### 3.3.2.1.2 Heuristics

Heuristics refer to mental shortcuts individuals use for decision-making, allowing them to navigate complex environments, make quick choices, and conserve cognitive resources. While heuristics provide efficient solutions, they can lead to systematic errors or biases if applied inappropriately, causing individuals to stick to familiar beliefs or default choices even when better alternatives exist. (J. Chen, 2022; Gigerenzer, 2018; Kahneman, Slovic, & Tversky, 1982; Kenton, 2023; Tversky & Kahneman, 1974)

### 3.3.2.1.3 Biases

Biases are integral to the study of behavioural economics and represent systematic and predictable deviations from rationality or objectivity in decision-making. They stem from cognitive and psychological processes that shape human behaviour, leading to deviations from normative or optimal judgments. (Gigerenzer, 2018) Here are a few examples of behavioural biases that affect social network users' platform usage and on platform behaviour:

- **Cognitive Bias and Discrimination:** Cognitive biases, often unconscious, influence decision-making and can lead to discriminatory behaviours based on favouritism towards certain alternatives. These biases result in distorted perceptions, flawed judgment, and irrational decision-making. (Haselton & Nettle, 2006; Kahneman & Tversky, 1972)
- **Confirmation bias:** Confirmation bias is the tendency to seek information that confirms with existing beliefs while discounting contradictory evidence. It reinforces biases and hinders objective decision-making. (Cartwright, 2011; R. S. Nickerson, 1998; Oswald & Grosjean, 2004)
- **Familiarity- and status quo bias:** Familiarity bias occurs when individuals stick with familiar options due to comfort and previous experience, limiting exploration of new alternatives (Cao, Han, Hirshleifer, & Zhang, 2011). Similarly, status quo bias involves preferring the current state of affairs even when better alternatives are available, hindering decision-making (Dean, Kıbrıs, & Masatlıoğlu, 2017).

### 3.3.2.1.4 Herd Behaviour and Social Preferences

Herd behaviour is a collective behavioural pattern where individuals imitate the actions of a larger group, often disregarding their own independent judgment (Berger, Feldhaus, & Ockenfels, 2018; Charness & Rabin, 2002; Y. Chen & Li, 2009; Levitt & List, 2007; Stein & Scharfstein, 1990).

This phenomenon arises from the human desire for social validation, conformity, and acceptance, leading individuals to align their behaviour with the majority. These social preferences significantly impact economic contexts, including user cooperation, network building, and communication decisions. (Berger et al., 2018; Charness & Rabin, 2002; Y. Chen & Li, 2009; Levitt & List, 2007; Stein & Scharfstein, 1990)

### 3.3.2.1.5 Prospect Theory

Developed by Kahneman & Tversky (1979), prospect theory offers valuable insights into decision-making under uncertainty in behavioural economics. It challenges the assumption of rational decision-making and highlights individuals' tendency to evaluate equal gains and losses differently. When it comes to psychological impact, losses have a more pronounced effect than equivalent gains, causing individuals to be risk-averse in scenarios involving gains and risk-seeking in situations dealing with losses. The theory emphasizes the influence of framing and the choice of reference point on decision-making. (Cartwright, 2011; Kahneman, 2011; Kahneman & Tversky, 1979; Tversky & Kahneman, 1986)

- **Loss Aversion:** Loss aversion is a psychological phenomenon wherein individuals tend to experience the negative emotions associated with losses more intensely than the positive emotions derived from equivalent gains. This results in tendencies towards risk aversion and a preference for evading losses rather than actively pursuing gains. The fear of losses significantly influences decision-making, shaping risk-averse behaviour. (Abdellaoui, Bleichrodt, & Paraschiv, 2007; Barberis & Huang, 2001; Kahneman & Tversky, 1979; Schmidt & Zank, 2005; Tversky & Kahneman, 1991)
- **Reference dependence:** Reference dependence explains individuals' inclination to evaluate outcomes based on a reference point. Decisions involving risk and uncertainty are influenced by this tendency, as people assess gains or losses relative to a specific baseline. The reference point can vary and be subjective, influenced by factors like current status, past experiences, expectations, or social norms. (Dean et al., 2017; Fryer Jr & Levitt, 2006; Hardie, Johnson, & Fader, 1993; Köszegi & Rabin, 2007; Tversky & Kahneman, 1991)
- **Framing:** Framing, a critical aspect of prospect theory, shapes decision-making via the presentation of choices by highlighting the positive or negative aspects of the same decision to influence their perceived attractiveness. Framing operates as a cognitive bias, where positive frames tend to lead to risk-averse choices, while negative frames encourage loss-avoidant alternatives. (Druckman, 2001a, 2001b)

### 3.3.2.1.6 Nudge Theory and Choice Architecture

The nudge theory acknowledges biases, cognitive limitations, and irrational behaviours that can lead to suboptimal choices. Policymakers can use this understanding to design "nudges" within the choice architecture—subtle modifications to the presentation of choices that predictably influence behaviour without removing options or altering incentives significantly. (Hausman & Welch, 2010; Thaler & Sunstein, 2008; Witynski et al., n.d.) Choice architecture refers to the design of how choices are framed and presented, impacting decision-making. Nudges aim to guide decision-making by making specific choices more prominent, appealing, or convenient, while respecting individual freedom. (Halpern, 2015; Hansen & Jespersen, 2013; Hausman & Welch, 2010; Thaler & Sunstein, 2008) By leveraging behavioural science, nudges help individuals align their choices with long-term goals and organizational targets.

For instance, placing fruits at eye level or near the cash register in student cafeterias, or positioning a cracker display next to the cheese aisle in a supermarket, are effective examples of nudges. The former encourages healthier choices among students, while the latter boosts cracker sales. Importantly, nudges are not coercive or restrictive; they don't ban certain foods or impose punishments. Instead, they subtly modify the choice architecture to guide individuals towards more favourable options while preserving their autonomy. (Thaler & Sunstein, 2008; Witynski et al., n.d.) In the realm of social networks, various notifications, reminders, and connection suggestions, such as Facebook's "people you might know" feature, serve as efficient nudges that influence user behaviour in a desired direction.

### 3.3.3 Reliability View

This section aims to address two fundamental questions: Why should platform designers and providers prioritize user satisfaction and reliability? How do these factors influence the level of user engagement and habit formation in a platform context?

In today's competitive landscape, companies increasingly recognize the significance of quality, satisfaction, and loyalty in achieving market leadership. Understanding the underlying drivers of these critical elements, their interconnectedness, and their contributions to a company's overall equity is paramount for success (Cronin, Brady & Hult, 2000).

Complementing the behaviour and network economic perspectives, the reliability view sheds light on the profound impact of reliability and positive user satisfaction on user re-engagement levels (Bolton, 1998; Cronin et al., 2000; Kuo, Wu & Deng, 2009). This section delves into the intricate relationship between user satisfaction and platform reliability. User satisfaction, in this context,

refers to the measurement of user happiness and contentment with a company's platform, while reliability pertains to the quality and consistency of a platform's performance.

Insights from research conducted by Bolton (1998), Cronin et al. (2000) and Kuo et al. (2009), indicate that negative experiences with a platform have a more substantial impact on user satisfaction compared to positive experiences. However, long-term users tend to place greater emphasis on past experiences, particularly positive ones, rather than recent encounters. Consequently, long-term users exhibit higher resistance to switching platforms compared to new users. (Bolton, 1998; Cronin et al., 2000; Kuo et al., 2009) This suggests that once users undergo a series of successful interactions with a platform, habits begin to form. Users become more reliant on the platform and are willing to forgive, to some extent, subpar user satisfaction experiences, thus maintaining their engagement. However, it is important to note that there are limits to users' tolerance for negative experiences.

Furthermore, the lifetime value of a user to a company depends on their tenure and level of investment. Enhancing platform reliability and user satisfaction can lead to financial success and heightened user engagement through the formation of habitual usage patterns and positive past experiences. However, it is crucial to recognize that users are not homogeneous and solely driven by rationality, as users tend to assign greater significance to minor negative experiences and disruptions, as discovered within behavioural economics. (Bolton, 1998; Cronin et al., 2000; Kuo et al., 2009) Hence, companies should invest in improving reliability and user satisfaction. Even if a company has successfully fostered strong user habits through network economics, the emergence of competing platforms offering superior performance may prompt users to switch providers. Therefore, reliability and user satisfaction play a vital role in sustaining user engagement and fostering long-term loyalty. (Bolton, 1998; Cronin et al., 2000; Kuo et al., 2009)

### **3.4 Persuasive Technology**

The insights and frameworks presented in this section align closely with the thesis and research question, offering valuable perspectives on building habit-forming products and fostering user engagement. While practical recommendations for increasing user engagement may not be explicitly provided, these theories serve as guiding principles for platform designers and providers embarking on the development or enhancement of their platforms. By delving into these theories, designers gain a deeper understanding of the fundamental aspects their platforms should address to effectively drive user engagement.

The models and applications explored in this view are specifically tailored to assist platform designers in influencing users' attitudes and behaviours through the strategic utilization of

persuasion and social influence. A prime example of the successful implementation of these principles is Instagram, a platform co-founded by Mike Krieger, a former student of B.J. Fogg, an eminent figure in persuasive technology (Kosner, 2012b). Instagram's astounding achievement of surpassing one billion users and its subsequent acquisition by Facebook for a staggering one billion dollars serves as a testament to the efficacy of these principles in practice.

By integrating the concepts elucidated in this view, platform designers can astutely employ persuasive techniques and leverage social influence to augment user engagement, thereby cultivating the growth and triumph of their social network platforms.

### 3.4.1 Introduction to Persuasive Technologies

In September 2007, a group of 75 American students enrolled into Stanford University's Persuasive Technology Lab programme, led by B.J. Fogg, a group now famously referred to as "The Facebook Class." Over a span of ten weeks, these students collectively amassed over 16 million SN users and generated over \$1 million in advertising revenue. (Helft, 2011; Kosner, 2012b; Stolzoff, 2018) The impact of this class extended far beyond academia, propelling the field of social networks into a new era and setting unprecedented milestones in the business world, as its graduates assumed pivotal roles in influential platform companies such as Instagram, Uber, Facebook, and Google. These graduates delved into the realm of persuasive technology, employing its principles to develop techniques and patterns that captivated users, leading to the widespread success and market dominance of their platforms. (Stolzoff, 2018)

As stated previously, persuasive technology represents a dynamic and interdisciplinary research field focused on designing, developing, and evaluating interactive technologies that employ persuasion and social influence techniques to shape human behaviour (Fogg, 2003; Hutchings, 2017; Kosner, 2012b). This domain encompasses a wide range of interactive computational platforms, including internet services, video games, computers, tablets, and mobile devices. With the rising popularity of social networking platforms, fuelled by the network effect as discussed earlier, persuasive technology has gained significant traction and profitability. It has become the driving force behind the development of the next generation of social network platforms.

The following section will explore the core principles and models within persuasive technology, providing valuable insights into the strategies employed to design habit-forming products and enhance user engagement. Key inquiries, such as methods for fostering user retention, techniques to influence user behaviour in line with design objectives, and the essential factors that motivate users to take desired actions, will be addressed.

### 3.4.2 Fogg's Behaviour Model and Captology

The concept of persuasion, defined by Fogg (2003) as the deliberate attempt to modify attitudes or behaviours without resorting to coercion or deceit, has paved the way for significant advancements in persuasive technologies. Captology, a ground-breaking field also introduced by Fogg (2003), specifically explores the persuasive capabilities of computer-based technologies. It encompasses the integration of psychological principles of persuasion, such as influence, motivation, and behaviour change, with the design, research, ethics, and analysis of interactive computing products, including computers, mobile phones, websites, mobile applications, and video games (Fogg, 2003). The primary focus of captology research is to influence individuals to alter their motivations, attitudes, and real-world behaviours, either for personal benefit or for the betterment of the community and the environment. The proliferation of social networks and the widespread accessibility of smart devices have further fuelled the demand for alternative platform forms, opening up new possibilities for persuasive technology (Vassileva, 2012).

In line with his captology research, Fogg (2009) developed the Fogg Behaviour Model (FBM), which establishes a vital connection between persuasive technology and behavioural economics. According to the FBM, behaviour is influenced by three key factors: motivation, ability, and triggers, each consisting of several subcomponents (Fogg, 2009). The model asserts that for an individual to engage in a desired behaviour, they must possess sufficient motivation, possess the necessary ability to perform the behaviour, and be triggered to initiate the behaviour. The convergence of these three factors at the same moment is crucial for the behaviour to occur. (Fogg, 2009).

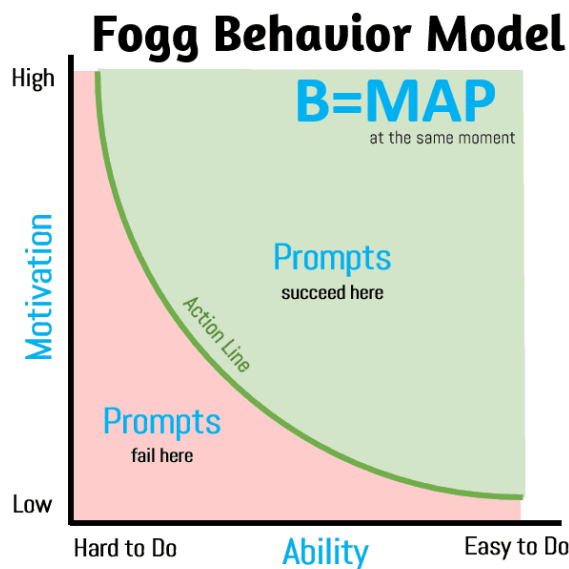


Figure 11. Graphic illustration of the Fogg Behaviour Model (Fogg, 2009)

To provide a practical illustration of the Fogg Behaviour Model (FBM), a visual representation is presented in Figure 11, aiding in its comprehension and application. As Eyal (2014) notes, the FBM graph serves as a valuable tool, particularly within the context of tech start-ups, as it enables product builders to introspect and identify potential reasons why users may not engage in the specific actions intended for them. The FBM posits that for a behaviour to transpire, both motivation and ability must reach sufficient levels. Furthermore, the presence of a trigger is instrumental in eliciting the behaviour. However, if either motivation or ability, or both, are inadequate, the presence of a trigger alone will not lead to the desired behaviour. (Eyal, 2014; Fogg, 2009)  $B=MAT$ , that reads behaviour is the combination of motivation, ability and trigger (Fogg used the term prompt interchangeably with the term trigger, hence  $MAP=MAT$ .)

Illustrating this concept, imagine a situation where you choose not to answer a ringing phone. This lack of motivation becomes evident, despite the phone being nearby and the auditory trigger being present. Similarly, refraining from answering a call during a meeting demonstrates a lack of ability due to the inappropriateness of the action. Another scenario could involve a phone set to silent mode, resulting in the failure to answer it. Although both motivation and ability are present, the absence of an auditory trigger prevents the desired action (answering the phone) from occurring.

Persuasive technology often views behaviour as an outcome that can be influenced or prompted, with behaviour activation serving as a primary goal. (Fogg, 2009) As emphasized by Fogg (2009), the central focus of the FBM lies in enhancing motivation, increasing ability, and effectively triggering behaviour. The subsequent sections will delve deeper into the elements of motivation, ability, and triggers to provide a comprehensive understanding of their significance.

**Motivation:** As defined in self-determination theory, motivation is the driving force behind action, acting as "the energy for action" (Eyal, 2014). Within the FBM framework, three fundamental motivators influence human behaviour: the pursuit of pleasure and avoidance of pain, the pursuit of hope and avoidance of fear, and the desire for acceptance and avoidance of rejection (Eyal, 2014). These motivators exert a significant impact on individuals' inclination to engage in specific behaviours, either amplifying or diminishing their motivation. Marketers and advertisers often leverage these underlying motivators to shape consumer behaviour and influence decision-making processes. (Eyal, 2014)

**Ability:** The ease of task completion plays a crucial role in user adoption and engagement with a technology (Fogg, 2009). As Eyal (2014) states, any technology or product that significantly reduces the steps to complete a task will enjoy high adoption rates by the people it assists. Fogg's FBM model outlines six factors that impact task difficulty: time, cost (financial implications),

physical effort, cognitive effort, social acceptance, and routine disruption (Eyal, 2014; Fogg, 2009). Fogg (2009) emphasizes the significance of simplicity and reducing the cognitive and physical resources needed to perform a behaviour. By optimizing the ease of execution, designers can enhance the likelihood of behaviour repetition and sustained user engagement.

**Trigger (Prompt):** Triggers constitute a pivotal element within Fogg's FBM model (Fogg, 2009). A trigger can be defined as a prompt that elicits an immediate behavioural response from individuals (Fogg, 2009). Understanding the role of triggers is crucial in the design of persuasive products. When individuals possess both the motivation and ability to perform a specific behaviour, a trigger serves as the catalyst for action. However, triggers operate differently depending on the circumstances. (Eyal, 2014; Fogg, 2009) Fogg (2009) identifies three types of triggers: sparks, facilitators, and signals. Sparks function as motivators when individuals lack the necessary motivation, facilitators simplify behaviours for those with high motivation but low ability, and signals act as reminders or indicators for individuals who possess both the requisite motivation and ability. By strategically incorporating appropriate triggers, designers can effectively influence user behaviour within persuasive products, thereby increasing engagement and achieving desired outcomes (Eyal, 2014; Fogg, 2009).

### 3.4.3 Fogg's & Hreha's Behaviour Grid

Fogg's and Hreha's Behaviour Grid has become increasingly indispensable in the evolving information economy, where technology and platforms are strategically designed to influence user behaviour (Eyal, 2014; Fogg & Hreha, 2010). In response to this paradigm shift, the Behaviour Grid method, in combination with Fogg's Behaviour Model (FBM), has gained heightened relevance and necessity in information system and persuasive technology literature (Eyal, 2014). The successful implementation of persuasive technology and the effectiveness of platform designers now hinge upon their ability to define specific target behaviours and devise tailored approaches to achieve them. Operating without such a systematic approach would relegate designers to mere guesswork, resulting in wasted time and energy. (Fogg & Hreha, 2010) Consequently, the integration of the Behaviour Grid, alongside FBM, emerges as a vital tool in the creation of impactful and successful persuasive technologies.

Fogg regards the FBM as a fundamental model that applies universally to human behaviour, transcending cultural and demographic boundaries (Fogg & Euchner, 2019). Building upon the FBM, Fogg and Hreha (2010) introduce the Behaviour Grid as a practical framework for matching target behaviours with appropriate solutions. The Behaviour Grid categorizes behaviour change targets into 15 distinct types, as summarized below in Table 4. It organizes these behaviour types along two dimensions: the desired nature of the change and the intended duration of the change

(Fogg & Euchner, 2019; Fogg & Hreha, 2010). The nature of the change encompasses factors such as the novelty of the behaviour, the intention to start or stop a behaviour, and the desire to increase or decrease the frequency of a behaviour (Fogg & Euchner, 2019; Fogg & Hreha, 2010). The horizontal axis of the Behaviour Grid describes the five categories of behaviour change: Green, Blue, Purple, Gray, and Black, representing different types of behavioural shifts, such as introducing a new behaviour or discontinuing an existing one. On the vertical axis, behaviours are mapped into three duration categories: Dot (one-time behaviour), Span (behaviour with a specific duration), and Path (permanent behaviour change). (Fogg & Hreha, 2010)

By utilizing the Behaviour Grid in conjunction with the FBM, designers gain a comprehensive framework for effectively aligning target behaviours with appropriate strategies. This model empowers designers to navigate the diverse landscape of behaviour change, facilitating informed decision-making in the development of persuasive technologies. (Fogg & Hreha, 2010)

	<b>Green behavior</b> Do <u>new</u> behavior, one that is <u>unfamiliar</u>	<b>Blue behavior</b> Do <u>familiar</u> behavior	<b>Purple behavior</b> <u>Increase</u> behavior intensity or duration	<b>Gray behavior</b> <u>Decrease</u> behavior intensity or duration	<b>Black behavior</b> <u>Stop</u> doing a behavior
<b>Dot behavior</b> is done <u>one-time</u>	<b>GreenDot</b> Do new behavior one time <i>Install solar panels on house</i>	<b>BlueDot</b> Do familiar behavior one time <i>Tell a friend about eco-friendly soap</i>	<b>PurpleDot</b> Increase behavior one time <i>Plant more trees and local plants</i>	<b>GrayDot</b> Decrease behavior one time <i>Buy fewer boxes of bottled water</i>	<b>BlackDot</b> Stop doing a behavior one time <i>Turn off space heater for tonight</i>
<b>Span behavior</b> has <u>duration</u> , such as 40 days	<b>GreenSpan</b> Do new behavior for a period of time <i>Carpool to work for three weeks</i>	<b>BlueSpan</b> Do familiar behavior for a period of time <i>Bike to work for two months</i>	<b>PurpleSpan</b> Increase behavior for a period of time <i>Take public bus for one month</i>	<b>GraySpan</b> Decrease behavior for a period of time <i>Take shorter showers this week</i>	<b>BlackSpan</b> Stop a behavior for a period of time <i>Don't water lawn during summer</i>
<b>Path behavior</b> is a <u>permanent change</u>	<b>GreenPath</b> Do new behavior from now on <i>Start growing own vegetables</i>	<b>BluePath</b> Do familiar behavior from now on <i>Turn off lights when leaving room</i>	<b>PurplePath</b> Increase behavior from now on <i>Purchase more local produce</i>	<b>GrayPath</b> Decrease behavior from now on <i>Eat less meat from now on</i>	<b>BlackPath</b> Stop a behavior from now on <i>Never litter again</i>

Table 4: The Behaviour Grid (Fogg & Hreha, 2010)

In the context of this thesis, this chapter will focus on the Path behaviours of Fogg's and Hreha's Behaviour Grid, specifically the Green, Blue, and Purple Path behaviours, as they are instrumental in increasing user engagement and facilitating habit formation. To effectively utilize this model, the FBM should be employed in conjunction with the Behaviour Grid (Fogg & Euchner, 2019). Once the target behaviour types, in this case Green, Blue, and Purple Path behaviours, have been

identified, platform designers need to align them with FBM and determine how to modify and enhance the ability, motivation, or triggers associated with the targeted behaviour to maximize engagement (Fogg & Euchner, 2019; Fogg & Hreha, 2010).

When aiming for long-term commitment to a new behaviour, the focus should be on Green Path behaviours. For instance, if an individual has never used Instagram before, their adoption of the platform represents a Green Path behaviour. According to the model, the key steps include: (1) boosting motivation if necessary, (2) enhancing ability by simplifying the commitment action, and (3) issuing triggers when motivation and ability are at optimal levels (Fogg & Hreha, 2010).

Blue Path behaviours involves encouraging individuals to engage in familiar behaviours over the long term. These habits, such as brushing teeth, have already been established in our lives. (Fogg & Hreha, 2010; Stanford behaviour Wizard Team, 2015b) While the behaviour itself and its expected outcomes may not require extensive explanation, all three elements of FBM (B=MAT) must be present for behaviour formation. In the case of Blue Path behaviours, the challenge lies in presenting effective triggers and increasing motivation, rather than enhancing the ability as it is a familiar behaviour (Fogg & Hreha, 2010).

For those seeking to intensify or prolong familiar behaviours indefinitely, Purple Path behaviours are the objective. Fogg and Hreha (2010) define Purple Behaviours as existing behaviours that are enhanced in some way, such as increasing their duration, intensity, or effort: increase the users' time spent on a SN platform or increase the number of actions users make within a time period on a SN platform, for example. Many users aspire to achieve Purple Path behaviours, as they may already be using a platform and simply require an extra push. (Fogg & Hreha, 2010) To accomplish this heightened intensity or duration of a familiar behaviour, at least one element of FBM needs to be enhanced (B. J. Fogg & Hreha, 2010; Stanford Behaviour Wizard Team, 2015).

The Fogg Behaviour Model and the Behaviour Grid serve as foundational models for behavioural design and persuasive technology. In an interview with Euchner (2019), Fogg shares his philosophy on utilizing behavioural design and persuasive technologies, offering valuable insights for future platform developers. According to Fogg, there are two key principles that developers should remember to ensure the success of their products or services: 1) Facilitate actions aligned with users' existing desires. Fogg asserts that this is a recurring pattern observed in successful services (Fogg & Euchner, 2019). 2) Cultivate a sense of accomplishment and fulfilment in users. Fogg emphasizes that these simple words are pivotal to sustaining user engagement, fostering habit formation, and promoting continued usage of services (Fogg & Euchner, 2019).

In the subsequent section, we will delve further into the nature of habit formation in SNPs and explore strategies for building habit-forming platforms.

#### 3.4.4 Nir Eyal's Hook Model

Nir Eyal's Hook Model offers valuable insights to platform designers, addressing fundamental questions such as why some platforms achieve widespread engagement while others struggle, what drives users to engage with certain platforms out of habit, and whether there exists a discernible pattern underlying the formation of technological habits within users. Eyal (2014) asserts that successful products, services and platforms, through a series of consecutive Hook cycles, aim to achieve unprompted user engagement. By employing this model, designers can create platforms that encourage users to return repeatedly by fostering repetitive and habitual platform usage without relying on costly advertising or aggressive messaging. While the FBM primarily assists designers in guiding users towards desired behaviours, Eyal's Hook Model serves as a prominent and accomplished framework within the field of persuasive technologies, specifically focusing on transforming behaviours into enduring habits (Eyal, 2014).

In an interview with Sam (2016), Eyal describes habits as impulsive actions executed with minimal conscious thought, typically involving quick and repetitive behaviours. Desirable and good habits, in the context of user engagement, refer to behaviours that users willingly repeat consistently (Sam, 2016). According to the Hook Model, designers seeking to cultivate habitual behaviours should construct platforms or services that engage users through a cyclical process. This process involves triggering an action, providing a variable reward, and fostering continued investment. It is crucial for this cycle to occur frequently enough for a habit to form. (Eyal, 2014; Sam, 2016) Eyal further emphasizes that an effective hook does not necessarily have to yield a concrete outcome; simplicity is key. It is an experience designed to prompt users to interact with a platform on a regular basis, ultimately leading to habit formation. This concept lies at the core of building addictive companies. (Sam, 2016) To provide visual clarity, Figure 12 presents a graphical representation of the Hook Model.

Building on the assumption that habitual use correlates with heightened user engagement, the Hook Model introduces a set of principles and methods to assist platform designers in leveraging user behaviours and needs. By incorporating these principles, designers can establish enduring and rewarding habits among users. (Eyal, 2014) The subsequent sections will provide a deeper exploration of the elements comprising triggers, actions, variable rewards, and investment, shedding light on how they contribute to habit formation within the context of the Hook Model.

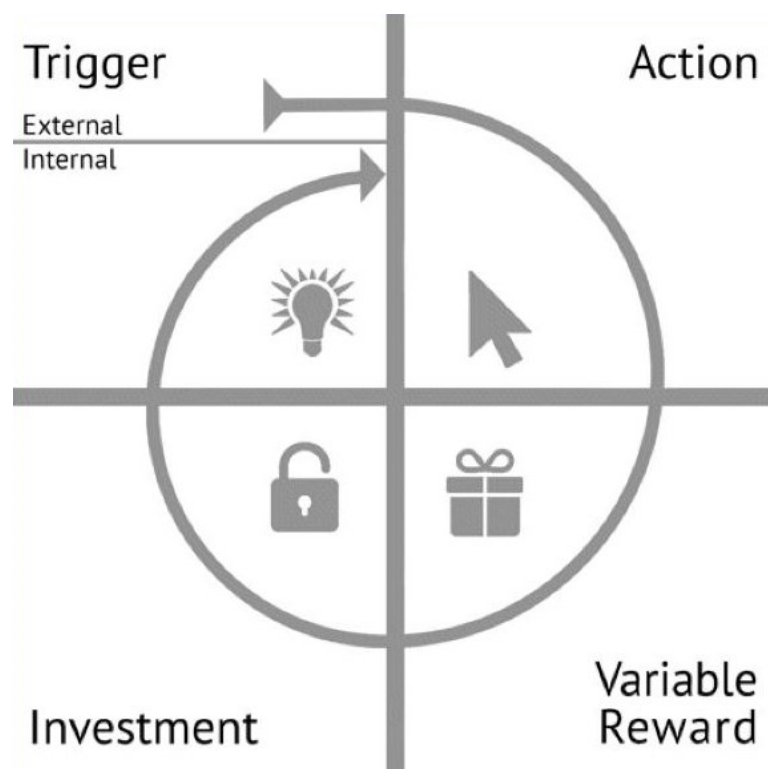


Figure 12. Graphic illustration of Nir Eyal's Hook Model (Eyal, 2014)

#### 3.4.4.1 Trigger

According to Eyal (2014), triggers serve as the catalysts for behaviour, effectively prompting users to act. Building upon the FBM, Eyal incorporates the concept of triggers into the Hook Model but introduces a distinction between external and internal triggers. (Eyal, 2014)

External triggers involve the communication of information visible to the user, guiding them towards the next action (Eyal, 2014). For instance, in an online context, an external trigger might take the form of a button labelled "Join Group," providing explicit instructions on what will occur upon clicking. Platform providers leverage these external triggers to persuade users to engage in specific actions (Eyal, 2014). Eyal (2014) categorizes external triggers into four types:

- **Paid Triggers:** These encompass advertising and search engine marketing, which are typically utilized to acquire new users but come at a significant cost, making them less sustainable for fostering user engagement (Eyal, 2014).
- **Earned Triggers:** While not directly purchasable, earned triggers necessitate investment in the form of time spent on public and media relations (Eyal, 2014). Examples include viral videos, extensive citations, and favourable press coverage.

- Relationship Triggers: Recommendations, word-of-mouth, and platform invitations are all instances of relationship triggers (Eyal, 2014). Eyal (2014) highlights the importance of cultivating an engaged user base capable of sharing their experiences with others to effectively leverage relationship triggers.
- Owned Triggers: These pertain to various forms such as app icons on users' devices, notification pop-ups, and caller ID alerts. By obtaining users' consent to receive these triggers, the responsible platform providers acquire a share of the user's attention. Unlike other external triggers focused on user acquisition, owned triggers aim to foster repeated engagement and habit formation. (Eyal, 2014)

However, external triggers merely constitute the initial phase within Eyal's (2014) model. As Eyal (2014) explains, the ultimate goal of external triggers is to guide users through the Hook Model to a point where they no longer rely on external prompts. At this stage, habits are formed, and users become responsive to a different type of trigger: internal triggers. (Eyal, 2014)

Internal triggers, in contrast to external triggers, arise automatically in users' minds and evoke associations that drive specific actions and behaviours, acting as the underlying motivation for user engagement (Eyal, 2014). This connection between internal triggers and a product is considered the pinnacle achievement in consumer technology, as it taps into users' emotional states and influences their actions, according to Eyal (2014). Negative emotions like boredom, loneliness, and insecurity are particularly potent internal triggers, compelling individuals to seek relief or escape from their offline lives (Eyal, 2014). This trend is especially prevalent among younger generations, who find solace in social network platforms, addressing the emotional void experienced offline. Notably, a study by the Millennium Cohort Study revealed a correlation between increased social media usage among girls and higher rates of depression (Millennium Cohort Study, 2019). The study demonstrated that girls spend more time on social media than boys and exhibit a higher likelihood of displaying signs of depression (Figure 13). Platform providers capitalize on these moments of negative emotions, positioning themselves lucratively as users turn to platforms like Facebook or Instagram for validation during times of insecurity. Such negative emotions trigger a subtle discomfort, prompting individuals to act instinctively and unconsciously to alleviate the unpleasant sensations (Eyal, 2014). Ultimately, to create habit-forming products, platform providers must comprehend the emotional connection users have with internal triggers and skilfully utilize external triggers to stimulate user action (Eyal, 2014).

In the subsequent action phase, the effectiveness of triggers, whether internal or external, relies on their ability to inform users about the ensuing action. The ease of performing the action is crucial, as greater effort required reduces the likelihood of action. (Eyal, 2014)

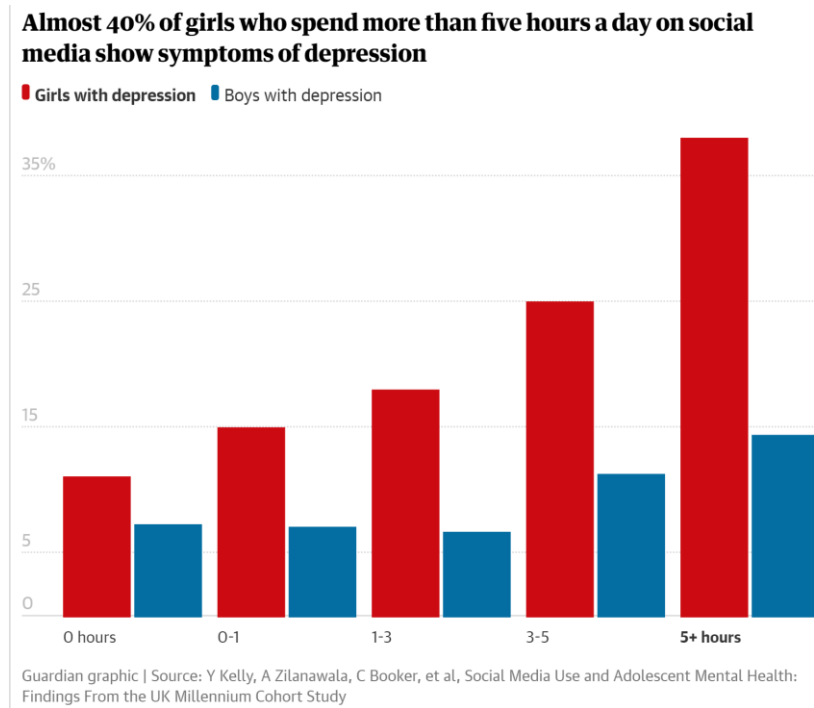


Figure 13. Social Media Use and Adolescent Mental Health (Millennium Cohort Study, 2019)

#### 3.4.4.2 Action

In the context of Eyal's Hook Model, the action phase aligns with the fundamental principles of Fogg's Behaviour Model (FBM), which stipulate that for a behaviour to occur, motivation, ability, and a trigger must be present (Eyal, 2014). This equation is represented as  $B = MAT$  (Behaviour = Motivation x Ability x Trigger), as previously discussed in Section 3.3.3.

As highlighted in the aforementioned sections, simplifying the steps required to accomplish a behaviour increases the likelihood of its occurrence and repetition (Eyal, 2014; Fogg, 2009). However, to sustain user engagement, it is imperative for products to deliver on their promises and be perceived as dependable solutions to users' needs (Eyal, 2014). According to Eyal (2014), the action phase constitutes the simplest form of behaviour performed in anticipation of a reward, aligning with the concepts presented by Fogg (2009). Consequently, the subsequent phase in the Hook Model centres around the notion of variable rewards, wherein users receive rewards and senses of gratification for engaging in the desired behaviours.

#### 3.4.4.3 Variable reward

The concept of variable reward lies at the core of the Hook Model draws upon a significant cognitive study conducted by Skinner & Ferster (1957): the concept of variable schedule of rewards or variable-interval rewards in operant conditioning. As previously discussed, variable-interval rewards, assuming that there has been at least one completion of the target behaviour, are

administered at irregular and unpredictable time intervals (Skinner & Ferster, 1957). Skinner's experimentation involved observing lab mice wherein the mice pressed a lever with the expectation of receiving food. The studies showcased that mice that were subjected to variable reward (food) schedules exhibited heightened levels of lever pressing, displaying greater frequency and compulsion compared to their counterparts who received consistent rewards (Skinner & Ferster, 1957). Recent studies support these findings, revealing that variability and the anticipation of rewards trigger neural activity in the nucleus accumbens<sup>3</sup> and elevate dopamine levels in the brain (Eyal, 2014; Haynes, 2018). Eyal (2014) emphasizes that it is not the actual reward sensation that compels us to act, but rather the desire to alleviate the craving for that reward. Eyal (2014) classifies variable rewards into three distinct categories: rewards of the tribe, rewards of the hunt, and rewards of the self.

Rewards of the Tribe are centred on our reliance on social connections and the validation we receive from others (Eyal, 2014). As Eyal (2014) points out, many SN platform companies are cleverly tapping into this by catering to the need for social approval, with for instance Facebook, Instagram, and Twitter gaining immense popularity by providing powerful social rewards in an unpredictable manner. Users eagerly anticipate social validation in the form of replies, likes, and shares when they post, comment, or update their profiles. This constant pursuit of social validation reinforces positive emotions, strengthens self-image, and allows platform providers to gather data on user interactions. (Eyal, 2014) As a result, when individuals feel insecure or negative emotions, they are driven to engage with the platform again, hoping to experience the same positive rush, which then again establishes a habit-forming loop based on social rewards (Eyal, 2014).

Rewards of the Hunt tap into our instinctual drive to acquire resources essential for survival and meet our basic needs (Eyal, 2014). However, as Eyal (2014) highlights, this has changed in today's economic landscape as basic needs are being met more conveniently to search of monetary value. Today, information has become synonymous with monetary value the same way as necessary resources. For instance, rewards of the hunt are exemplified in slot machines, where players are enticed by the possibility of winning a jackpot through intermittent monetary rewards (Eyal, 2014; Schüll, 2014). Surprisingly, social media platforms employ similar techniques as gambling establishments to create psychological dependencies (Busby, 2018; Eyal, 2014; Schüll, 2014). By utilizing cycles of uncertainty, anticipation, and feedback, these platforms captivate users' attention and encourage repetitive engagement. Features like the feed, with its mix of relevant and irrelevant content, offer a slot machine-like experience. Pull-to-refresh and infinite scrolling

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<sup>3</sup> The nucleus accumbens plays a vital role in the cognitive processing of connecting motivations and actions, enabling the creation of new action-context mental associations that facilitate the attainment of future rewards (Fernández-Espejo, 2000; Setlow, 1997; Valencia Garcia & Fort, 2018).

mechanisms are intentionally designed to keep users searching for variable rewards such as relevant content. (Busby, 2018; Eyal, 2014; Schüll, 2014) As users spend more time on the platform, companies gain valuable data to personalize and optimize the delivery of these rewards, leading to positive emotional responses, increased usage, and higher user engagement.

Finally, Rewards of the Self fulfil individuals' desire for personal gratification, driven by intrinsic motivation derived from engaging in inherently satisfying behaviours (Deci & Ryan, 2008; Eyal, 2014). According to Deci and Ryan's (2008) self-determination theory, individuals naturally strive for competence and are enticed by the introduction of mystery and challenge to their goals. This is exemplified in video and social games, where self-rewards play a significant role, motivating players to improve skills, advance levels, and unlock achievements, reflecting their growing competence (Eyal, 2014). Utilizing these psychological principles, gamification techniques have gained prominence in captivating user engagement (Eyal, 2014; Hassan, 2019; Vassileva, 2012). Gamification integrates game mechanics into non-game contexts to enhance audience engagement, loyalty, and enjoyment (Deterding, Khaled, Nacke, & Dixon, 2011; Eyal, 2014). However, Eyal (2014) advises against a one-size-fits-all approach, emphasizing the importance of aligning these techniques with users' internal triggers, motivations, and the contextual narrative surrounding the product. For a more comprehensive exploration of gamification, refer to section 3.4.5 Gamification.

Fundamentally, the most effective products and platforms, known for their habit-forming nature, leverage one or more of these variable reward types, often presenting users with multiple rewards simultaneously. Mere fulfilment of user desires falls short; instead, products must leave users craving further engagement. (Eyal, 2014) The fourth element of the Hook Model will answer how to effectively engage users by inspiring their continued investment towards a given platform.

#### **3.4.4.4 Investment**

This section explores the significant impact of user investment on social platforms, shaping user behaviour and fostering ongoing engagement. A key premise is that a change in user attitude requires a corresponding shift in how they perceive a social platform (Eyal, 2014). Central to this concept is investment, which involves accumulating stored value on a platform: as users invest more time and effort, the platform gains greater value and becomes more enticing for subsequent re-engagement (Eyal, 2014).

To illustrate the importance of user investment, consider building a social following on social media platforms like Instagram and Twitter. Users invest considerable time and effort to build a substantial following, which when combined with the allure of tribal rewards, serves as a strong

motivator for users to consistently return and engage with the platform, hence increasing its value (Eyal, 2014). Additionally, as users choose to follow or curate a list of users of interest, the platform gains valuable insights to deliver more personalized and relevant content, thereby increasing its overall worth and making the platform more valuable compared to others, leading to more investment and preferred engagement (Eyal, 2014). This creates a self-perpetuating cycle where users develop dependence on the platform, establishing habitual usage patterns (Eyal, 2014). This phenomenon aligns with the earlier discussed network economics perspective, further reinforcing the interplay between user investment, platform value, and sustained engagement.

Furthermore, the investment phase plays a crucial role in paving the way for the subsequent trigger in the hook cycle (Eyal, 2014). Take instant messaging platform WhatsApp as an example. When a user sends a message, it represents an investment with the expectation of a future reward: the anticipation of a reply. Then, upon receiving a reply, an external trigger in the form of a notification prompts the user to re-engage with the platform. Similarly, the online dating platform Tinder effectively capitalizes on the investment phase. Users encounter potential matches presented as cards and make decisions by swiping right for interest or left for disinterest. By simplifying the process of evaluating potential matches, users engage in more frequent swiping, increasing the chances of being matched. Once matched, an external trigger in the form of a notification prompts the user to re-engage with the platform, perpetuating the hook cycle.

This section emphasizes the pivotal role of user investment in a social platform as a key factor in triggering subsequent engagement. Through iterations of the Hook Model, users develop a strong attachment to the platform, relying on it as a solution and forming a habit over time (Eyal, 2014). However, it is crucial to recognize that user loyalty is not indefinite, as new platforms with more appealing hooks may emerge in the rapidly evolving tech industry, including the social network sector (Eyal, 2014). Nevertheless, by strategically investing resources and efforts during the investment phase, companies can raise switching costs for users, making it difficult to transition to alternative platforms (Eyal, 2014).

Instagram serves as a prime example of the Hook Model's effectiveness, with it being the fourth most popular social networking platform worldwide. Instagram entices users to create accounts and invest their time in order to connect with their social network and stay updated on friends and family. Users are encouraged to take action by easily posting photos and updates, receiving likes, comments, and new followers as rewards. The strategic display of users' posts in followers' feeds fosters interaction and tribal rewards, boosting engagement. Instagram's effective use of the feed feature showcases updates from followed accounts mixed with promotional content, encouraging users to scroll for more relevant content and promoting interaction through variable rewards. Users' extensive interactions lead to the investment of time and effort in crafting valuable profiles

with unique posts and a dedicated following. These elements create a loop that entices users to habitually return, making Instagram an integral part of their daily routines.

### 3.4.5 Gamification

Gamification, as a design stream of motivational design, involves designing information systems that aim to emulate the experiences and motivations of games, with the goal of influencing user behaviour (Koivisto & Hamari, 2019). During the 21<sup>st</sup> century, especially within the 2010s, gamification has gained tremendous popularity, resulting in a growing number of gamified platforms, applications, and services, as well as an increasing amount of research (Koivisto & Hamari, 2019). Research has demonstrated that gamification is a powerful application for generating positive experiences like engagement and enjoyment (Hamari, Koivisto, & Sarsa, 2014), and how it has significantly developed and solidified itself within the domain of information systems (IS) sciences (Koivisto & Hamari, 2019). The fundamental idea behind gamification lies in leveraging the psychological effects of games, including aspects like autonomy, competence, and flow. The ultimate objective is to cultivate intrinsic motivation in human behaviour by integrating captivating and enjoyable elements of gaming into non-game settings (Koivisto & Hamari, 2019). Moreover, gamification has demonstrated its efficacy in fostering user engagement and encouraging positive behaviours in SN usage, including boosting user activity, facilitating social interaction, and enhancing repetition of desired behaviours (Hamari, Koivisto, & Sarsa, 2014).

Despite its widespread adoption, there is a prevailing prediction that a significant proportion of gamification implementations will fail due to poor design and understanding (Morschheuser, Hamari, Werder, & Abe, 2017). This gap often manifests into elementary and nonoptimal gamification designs that rely on basic mechanics such as points, badges, and leaderboards (Hamari, Koivisto, & Sarsa, 2014). Gamification is no means easy to design because it involves innovating from a complex and multifaceted source, games, and transferring this holistically into other, non-game, environments, which in particular has proven to be difficult for some practitioners and organizations (Morschheuser et al., 2017). Additionally, gamification requires a deep understanding of game design, and behavioural and motivational psychology to create effective information systems that can influence behaviour (Morschheuser et al., 2017). As the objective of gamification is to encourage behaviour change, this often further complicates the process of designing successful gamification systems due to large heterogenic user groups and lack of necessary resources (e.g., proficiencies, budget, project management) for example (Morschheuser et al., 2017).

Within this section, this thesis looks to investigate relevant academic literature to be able to formulate and list the most profound gamification design principles, from a non-technical standpoint. The scope includes both gamification and persuasive technology literature and the section is structured as follows. First, we will define the concept of gamification, to offer clarity and context. Secondly, this thesis will investigate what are the key gamification design principles found in academic literature on gamification and persuasive technologies. Lastly, this thesis will introduce the gamification design practices, found in Morschheuser et al., (2017) comprehensive exploratory academic and in-practice research. This section as a whole should demonstrate to practitioners and academics a holistic view on what it takes to design gamification approaches, from a non-technical point of view.

#### 3.4.5.1 *Defining Gamification*

In 2008, Brett Terrill coined the term "gamification" to describe the process of applying game mechanics to other online properties to enhance engagement (Huotari & Hamari, 2017). Ever since, the term has had many definitions in different contexts. One of the earlier definitions by Hamari, Koivisto, & Sarsa, (2014) characterizes gamification as a "process of enriching services with "motivational affordances" to evoke experiences akin to playing games and to elicit specific behavioural outcomes by tapping into the same psychological aspects as games do." In contrast, Huotari and Hamari (2017) proposed their own definition of gamification based on their literature review research, defining it as the "process of enhancing a service with affordances for "gameful" experiences to promote users' overall value creation." They aimed to highlight the goal of gamification, which is to increase the likelihood of gameful experiences within users by providing affordances rather than solely focusing on game design elements (Huotari & Hamari, 2017).

In essence, affordances are the properties that enable action between an object and an actor, as described by Gibson, (1977). These affordances are not intended to compel the user to act in any particular way. However, they present the opportunity for experiences or behaviours to occur. (Huotari & Hamari, 2017) "Motivational affordances," on the other hand, are stimuli that are deliberately designed to activate the users' motivational needs and influence their psychological states (Huotari & Hamari, 2017). Examples of such affordances are badges and leaderboards, as outlined by Deterding, Dixon, et al. (2011).

In their later research, Hamari, (2019) continues to define gamification in *The Blackwell encyclopedia of sociology* as "the strategic attempt to enhance systems, services, organizations, and activities by creating similar experiences to those experienced when playing games in order to motivate and engage users." He continues by stating that gamification can be seen to exist and evolve through two primary developments: intentional gamification and emergent gamification.

- Intentional gamification refers to the deliberate process of modifying an activity, system, service, product, or organizational structure in order to provide positive experiences, develop skills, and promote practices that are akin to those found in games.
- Emergent gamification, on the other hand, refers to the gradual and unintentional transformation of cultural and societal practices as a result of increased pervasive engagement with games and gameful interactions. As games continue to play a pervasive role in people's lives, Hamari, (2019) believes that cultural and societal practices will increasingly resemble those found in games, game communities, and player practices.

In addition, according to Gartner: “gamification is the use of behavioural science, game mechanics and experience design to digitally engage and motivate people to achieve their goals.” (Gartner)

For the purpose of this paper on how an SN platform could increase its user engagement by utilizing persuasive technologies, this paper defines gamification “as a strategic process to use game elements to enhance systems, services, organizations, and activities in non-game contexts by utilizing techniques from behavioural science and creating similar experiences to those experienced when playing games in order to motivate and engage users into achieving their goals and target behaviours.” This definition follows closely the definition offered by Hamari, (2019) and Gartner and gives a highly informative, condense and simpler alternative, to the vast array of other definitions while including all of the key features of gamification. Hence, this thesis will adopt this definition of gamification.

#### **3.4.5.2 Gamification Principles**

Deterding, Dixon, et al. (2011) classifies game elements into different levels of game design generalizations, as depicted below in Table 5. These game elements were classified into two categories: game interface design patterns and game design patterns and mechanics. Game interface design patterns consists of common intangible gamification outcomes such as user rewards (points, badges, certifications etc.) and metrics for user comparisons (leaderboards, levels etc.) whereas game design patterns and mechanics refer to fundamental and reoccurring mechanics in game and gameplay design, for example limited resources available for users and time constraints to complete certain tasks etc. Both these categories can be referred to as motivational affordances (Krath & Korflesch, 2021). These motivational affordances, designed to be "gameful," are intended to support and motivate the user towards engaging in the specific behaviours that the gamified design approach aims to target (Huotari & Hamari, 2017). The selection of these motivational affordances is done through game design principles and heuristics, which act as evaluative guidelines for addressing game design problems or analysing existing

game design solutions (Deterding, Dixon, et al., 2011; Krath & Korflesch, 2021). Game models encompass the conceptual framework that underlies the game components, whereas game design methods involve the practices, processes, or steps employed in the process of designing a game (Deterding, Dixon, et al., 2011; Krath & Korflesch, 2021).

<b>Level</b>	<b>Description</b>	<b>Example</b>
<i>Game interface design patterns</i>	Common, successful interaction design components and design solutions for a known problem in a context, including prototypical implementations	Badge, leaderboard, level
<i>Game design patterns and mechanics</i>	Commonly reoccurring parts of the design of a game that concern gameplay	Time constraint, limited resources, turns
<i>Game design principles and heuristics</i>	Evaluative guidelines to approach a design problem or analyze a given design solution	Enduring play, clear goals, variety of game styles
<i>Game models</i>	Conceptual models of the components of games or game experience	MDA; challenge, fantasy, curiosity; game design atoms; CEGE
<i>Game design methods</i>	Game design-specific practices and processes	Playtesting, playcentric design, value conscious game design

Table 5: Levels of Game Design Elements (Deterding, Dixon, et al., 2011)

Gamification represents a subset of persuasive technologies (Böckle, Novak, & Bick, 2020; Deterding, 2014; Hamari, Koivisto, & Pakkanen, 2014; Krath & Korflesch, 2021; Llagostera, 2012; Nyström, 2017; Werbach, 2014). Persuasive technology, as discussed before, is a dynamic, interdisciplinary field of research focusing on the design, development and evaluation of interactive technologies that use persuasion and social influence techniques to influence, reinforce, and shape people's behaviour and attitudes. (Fogg, 2003; Hutchings, 2017; Kosner, 2012a). Hence, as gamification and persuasive technologies are intertwined, this opens up opportunities to utilize gamification design principles to influence user attitudes and behaviours in other verticals than just within game-related elements. Krath & Korflesch, (2021) agrees with this notion, and within their research suggests taking a more holistic approach that incorporates insights from non-gameful persuasive technologies into the gamification design process to achieve even better results, and better pathways to formulate desired user motivation and behaviour. They argue that incorporating gamification and persuasive systems research together is essential for developing effective gamification principles.

Krath & Korflesch, (2021) conducted a systematic literature review examining existing academic literature on gamification and persuasive technologies to find out what are the most prevalent design principles for developing effective gamification approaches. The study included 30 peer-reviewed academic research papers. Their findings gathered 63 different design principles from these sources, with the most notable principle being providing users with informational content to support users to change attitudes and behaviours. Moreover, the majority of the articles suggest the incorporation of behavioural incentives, either tangible (e.g., cash prizes) or intangible (e.g., badges and certificates), and the personalization of the system contents and mechanics. This personalization should be based on the user's personality or type (Krath & Korflesch, 2021). The study also revealed that immediate positive feedback, such as users being able to accumulate points, and compare themselves against other users, via leaderboards for example, are crucial aspects for an effective gamification design approach (Table 6). Additionally, Krath & Korflesch, (2021) acknowledged that some gamification design principles are more prevalent in certain industries (such as healthcare and education) compared to other industries, highlighting that gamification design principles are not one size fits all design elements. Rather, the authors emphasizes that organizations need to evaluate their industry and intended outcomes before finalizing the appropriate design principles. Referencing other gamification approaches within the same industry can help narrowing down the list of feasible principles. A comprehensive list of all the design principles proposed in the reviewed articles is available below in Krath & Korflesch (2021).

Table 6 presents a diverse set of design principles for gamification and persuasive systems proposed by researchers. These principles encompass various aspects of the system's content, mechanics, and context, such as incorporating behavioural incentives, immediate positive feedback, persuasive messages, adjusting difficulty over time, enabling freedom of choice, and involving the target group in co-design (Krath & Korflesch, 2021). However, Krath & Korflesch, (2021) discovered that some of these design principles may contradict each other. To address this issue, they argue that these principles relate to different facets of gamification and persuasive system design. Based on this distinction, they propose a conceptual framework, which is showcased below in Table 6, comprising the most reliable design principles that were supported by at least five of the reviewed articles. This framework also provides examples of how these principles can be implemented to enhance their motivational affordances (Krath & Korflesch, 2021).

Context of the intervention	Gamified system	<i>User-oriented principles for behavioral outcomes</i>	
		<b>Individual behavior principles</b> Provide immediate positive feedback Introduce behavioral incentives Offer informational content Frame the intervention with storytelling Divide content in tasks and steps Guide users with persuasive messages Provide data for (self-)monitoring Visualize progress Provide clear and meaningful (self-set) goals Allow for the evaluation of one's own knowledge Show how behavior relates to the goals	<b>Exemplary patterns / motivational affordances</b> Points, badges, levels, performance stats, progress Achievements, rewards (in-game and real world) Quizzes, assistance, reminders, virtual helpers Narrative, avatar, role play Challenges, missions Reminders, cues, suggestions Tracking, performance stats Levels, status bars, achievements, badges Tasks, goal setting, clear goals Quizzes, questions Impact visualizations, performance stats
		<b>Social behavior principles</b> Allow social comparisons Encourage social collaboration Connect users for social interaction Allow showing status and gaining social recognition Allow social competition Enable social learning Provide community support	<b>Exemplary patterns / motivational affordances</b> Leaderboards, rankings Multiplayer, teams, collective voting Social networking features, teams Peer-rating, profile, medals, trophies Challenges, leaderboards Knowledge sharing (forums) Knowledge sharing (forums), peer-rating, praise
	<i>System-oriented principles for hedonic experiences and affective reactions</i>		
		<b>Hedonic experience principles</b> Personalize the system contents and mechanics Increase and adjust difficulty over time Enable freedom of choice Ensure continuous excitement with new or hidden content Provide multiple paths to achieve a goal	<b>Exemplary patterns / motivational affordances</b> Avatar, character, virtual identity, customization Levels, skill trees, increasing difficulty, timer Missions, challenges, anarchic gameplay Unlockable content, easter eggs, narrative Challenges, missions, nonlinear gameplay
		<b>Context principles</b> Consider the context and location of the intervention Include target group in co-design Prioritize aesthetic design Consider the ethics of design, privacy protection and trustworthiness	

Table 6: Design principles for successful gamification designs (Krath & Korflesch, 2021)

Krath & Korflesch's, (2021) gamification design principles can be broadly categorized into three types: user-oriented principles, system-oriented principles, and context principles (Table 6). User-oriented principles are designed to influence individual and social behaviour outcomes, such as by providing immediate positive feedback (e.g., points, badges and leaderboard gains), introducing incentives (e.g., rewards) or using persuasive messages (e.g., notifications). System-oriented principles aim to create hedonic experiences, such as personalization of the system or offering freedom of choice. Context principles, on the other hand, consider the industry, geo-location, and the target group's involvement in co-design. (Krath & Korflesch, 2021)

The framework proposed by Krath & Korflesch, (2021) for gamification design principles, as presented in Table 6, can be a valuable tool for organizations designing their gamification models. This framework can help them select appropriate mechanics and motivational affordances to achieve intended aesthetics, or emotional responses (Hunicke, Leblanc, & Zubek, 2004), (Krath & Korflesch, 2021). Additionally, it can be useful in defining the objectives of the gamification model and identifying expected user behaviours and player types, and then deploying appropriate game design principles based on the organization's needs and industry (Krath & Korflesch, 2021;

Mora, Riera, González, & Arnedo-Moreno, 2017). Overall, Krath & Korflesch's, (2021) framework aims to bridge the level of motivational affordances with the levels of gamification design methods, helping scientists and practitioners successfully design gamified interventions (Krath & Korflesch, 2021).

#### **3.4.5.3 Designing Gamification**

In their research aimed at enhancing comprehension of best practices concerning the gamification design process, Morschheuser et al., (2017) came to the conclusion that the majority of prominent gamification design models adhere to a comparable and similar process, although there are notable distinctions in the specifics when it comes to individual gamification projects. They divided the gamification design process into seven distinct phases, which are as follows:

**Project preparation:** The initial phase of gamification design involves identifying problems that can be addressed through gamification and deriving measurable goals for evaluating project success (Fitz-Walter, 2015; Morschheuser et al., 2017; Werbach & Hunter, 2012). Designers should assess if gamification is the appropriate solution for the problem, followed by a gamification project plan that outlines objectives, requirements, and project details (Deterding, 2015; Morschheuser et al., 2017; Werbach & Hunter, 2012). Stakeholder support and expectation management are important considerations during this phase. (Morschheuser et al., 2017)

**Analysis:** To effectively implement gamification, a deep understanding of the target audience and the gamified system is crucial as it helps characterize and segment the target group, understand their motivations and needs as well as suitable gamification designs (Morschheuser et al., 2017). Various methods can be used to gather and analyse user information, such as interviews (Deterding, 2015), observations and measurements of actual user behaviour (Werbach & Hunter, 2012), analysing behaviour chains (Deterding, 2015) as well as surveys and focus groups (Marache-Francisco & Brangier, 2013). User personas are commonly used to characterize target groups in the gamification design process and can provide valuable insights (Burke, 2016; Werbach & Hunter, 2012; Morschheuser et al., 2017). However, Morschheuser et al's., (2017) research also revealed a common lack of understanding and importance placed on user analysis in organizations, often resulting in insufficient and ineffective analysis. To be able to generate valuable user analysis, organizations need at least to be able to analyse general user needs and motivations (Deterding, 2015; Huotari & Hamari, 2017; Morschheuser et al., 2017).

**Ideation:** Ideation is a crucial phase in gamification design, as highlighted in Morschheuser et al.'s (2017) research. It involves iterative brainstorming to generate numerous ideas focused on fulfilling user needs, desired behaviour, and target outcomes (Deterding, 2015; Kapp, 2012; Morschheuser et al., 2017). User involvement is emphasized during this phase to ensure user-

centeredness. Within their research, Morschheuser et al. (2017) highlight the widespread popularity among gamification experts of using established design frameworks during the ideation process, with the authors listing five examples: User-Centred Design framework, Design Thinking, the Octalysis Framework, the Playful Experience framework (PLEX), and the Person Artifact-Task (PAT) model.

**Design:** Rapidly designing gamification prototypes allows for continuous testing and refinement of the design approach (Deterding, 2015; Herzig, Ameling, Wolf, & Schill, 2015; Kapp, 2012; Morschheuser et al., 2017). Successful gamification implementations result from an integrated design process where ideas and designs are repeatedly tested until they prove effective in achieving project objectives. This phase aims to create a "development concept" containing all necessary information for implementation (Fitz-Walter, 2015; Morschheuser et al., 2017). It requires interdisciplinary skills from gamification designers, including an understanding of human motivation, game design, business processes, and information system design.

**Implementation:** Implementation is the phase where a pilot version of the gamification design is created and field-tested for evaluation (Fitz-Walter, 2015; Morschheuser et al., 2017). It extends from the prototyping phase, and an iterative approach called "development cycles" is recommended to optimize the gamification mechanics through user- and playtesting after each cycle (Deterding, 2015; Fitz-Walter, 2015; Kapp, 2012; Morschheuser et al., 2017; Werbach & Hunter, 2012). The implementation approach can vary depending on whether the gamification solution is developed in-house, by external developers, or adapted from an existing platform. In-house development is the most common choice, followed by using external or client developers. Project management and engagement from gamification experts are crucial, especially when in-house developers lack experience in this domain. (Morschheuser et al., 2017)

**Evaluation:** Evaluation plays a crucial role in ascertaining whether the developed gamification solution aligns with the defined objectives. Various methods, including interviews, surveys, impact studies, A/B testing, and playtesting are viable for evaluation. (Morschheuser et al., 2017) Playtesting, where users perform tasks in a game-like environment, is particularly recommended as it allows for direct observation of user behaviour (Deterding, 2015; Fitz-Walter, 2015; Morschheuser et al., 2017). This approach is considered more effective than relying solely on interviews, as users may struggle to verbalize their experiences. Through careful observation during playtesting, implementors can gain valuable insights into solution effectiveness and identify areas for improvement. (Deterding, 2015; Fitz-Walter, 2015; Morschheuser et al., 2017)

**Monitoring:** Morschheuser et al's., (2017) research highlights the need for continuous monitoring in gamification projects. They emphasize that gamification projects should not be treated as conventional software projects and recommend regular investigation of usage patterns,

identifying irregularities, and evaluating game mechanics. Continuous monitoring and optimization, including the use of A/B testing, are crucial for maintaining user engagement and adapting to changing objectives, ensuring long-term success in gamification projects. Overall, these seven phases provide a useful framework for designing and implementing effective gamification projects.

#### 3.4.6 Goal Setting and Goal Conflicts within Motivational Designs

According to Hamari et al. (2018), in the modern era, the pervasive availability of social networking: to be able to interact with people and users across the globe in real time, has profoundly influenced the modern generation, shaping our aspirations, goal-setting behaviour, and progress towards achieving those goals. The allure of social features lies in the potential for receiving feedback, social support and encouragement, and social comparison from other users communities via social networks, all of which contribute to maintaining motivation towards those social networks and engagement (Hamari et al., 2018). Recognizing the importance of social connectivity among other users and social groups/communities, researchers have increasingly emphasized the role of motivational designs as well as understanding users' goal setting and attainment process (Bouvier, Sehaba, & Lavoué, 2014; Hamari et al., 2018; Locke & Latham, 2013; Mann, De Ridder, & Fujita, 2013). This is why in this section, we will dive deeper into motivational designs, most notably gamification, and users' goal setting processes to better understand and investigate their importance to the persuasive nature of social network platforms.

Motivational design has gained significant traction in the realm of information systems, as it aims to enhance user engagement and foster user commitment towards desired behaviours and system usage, as envisioned by system/platform designers and providers (Deterding, 2015; Hamari et al., 2018; Hamari, Koivisto, & Pakkanen, 2014). Through this increase in popularity, Hamari et al. (2018) anticipates that a vast majority of organizations will ultimately incorporate motivational design principles into their systems. Nonetheless, the implementation of motivational design poses considerable challenges that extend beyond software development, necessitating a comprehensive understanding of diverse fields, including motivational, social, and behavioural psychology, as well as game design (Deterding, 2015; Hamari et al., 2018; Huotari & Hamari, 2017; Morschheuser et al., 2017; Nicholson, 2012).

According to Hamari et al. (2018), developing effective motivational designs encounters a significant challenge: users exhibit diverse goal preferences. In this context, goals determine the different aspirations of individual users' and the corresponding motivational requirements to achieve them, highlighting the necessity to develop motivational designs capable of catering individual users' specific goals (Hamari et al., 2018). For instance, individuals primarily focused

on achieving specific goals, rather than deriving pleasure from the goal attainment process, are more likely to find motivation in features that emphasize desired outcomes and their value, such as leaderboards, points and awards. Conversely, individuals who prioritize the enjoyment of the goal attainment process may perceive limited value in such features, instead requiring alternative motivational elements like messaging and social interaction to enhance their experience. (Hamari et al., 2018) As there is no single universal design solution to adequately serve all users (Fitz-Walter, 2015; Hamari et al., 2018; Kapp, 2012; Werbach & Hunter, 2012), the ability to differentiate motivational design principles and subsequently develop customized services and systems aligned with users' goal profiles can facilitate more precise targeting of system features to individual users, resulting in increased adoption rates and greater value derived by individuals (Hamari et al., 2018). In the following subsections when discussing the role of user goals and goal setting in designing motivational and persuasive designs, this thesis will utilize gamification as a tangible link between goal setting and motivational design, as gamification is one of the most prominent design streams of motivational design (Hamari et al., 2018). This is for the reader to understand how different motivational designs affect different user types with different goal preferences.

This section is structured in two parts. Firstly, this section investigates and introduces the role of user goals and goal setting in designing motivational and persuasive designs, utilizing previously discussed gamification as a tangible reference link for the reader. This sub-section follows and investigates Hamari et al's. (2018) research on how different user goals, goal orientation and goal attributes influence the importance motivational designs. Lastly, we will introduce some conflicts that arise from the interaction between motivational designs and users' goals: how a platform's desired outcomes might conflict with users' desired outcomes.

#### **3.4.6.1 Goal Setting**

Goal setting plays a pivotal role in human behaviour, particularly in activities that demand persistence and strategic planning (Hamari et al., 2018). The concept of goal setting involves the process by which individuals or groups establish desired outcomes they strive to achieve (Hamari et al., 2018; Locke & Latham, 2013). Additionally, goal setting also facilitates self-regulation, which is an ongoing psychological process that enables individuals to assess their performance in relation to their goals, allowing them to make necessary adjustments and stay on track towards their desired outcomes (Hamari et al., 2018; Locke & Latham, 2013). Consequently, the implementation of systems that enable individuals to monitor their progress or provide feedback mechanisms becomes vital for self-regulation and goal attainment (Hamari et al., 2018; Locke & Latham, 2013). Nonetheless, Hamari et al. (2018) acknowledges that individuals exhibit diverse goal types and attitudes towards goal setting, highlighting three significant dimensions of goal

setting that vary among different users: 1) goal focus, 2) the orientation of the goal-setter towards goals, and 3) the attributes of the goals themselves.

#### 3.4.6.1.1 Goal Focus

The concept of goal focus centres on the desired outcomes users strive to achieve or the potential loss they aim to evade (Freund, Hennecke, & Riediger, 2010; Hamari et al., 2018; Locke & Latham, 2013). Goals can be categorized as either outcome-focused or process-focused, where outcome-focused goals prioritize the attainment of specific outcomes (e.g., the number of followers in a social network), and process-focused goals emphasize the engagement and enjoyment of the activities involved in pursuing the goal, regardless of the final outcome (Freund et al., 2010; Hamari et al., 2018; Locke & Latham, 2013). Based on this dual distinction, Hamari et al. (2018) suggests platform designers/providers to utilize different motivational design strategies depending on whether their users prioritize the goal process or the outcomes, as both groups tend to appreciate different forms of incentives to each other.

When deciding the goal focus preferences of gamification designs and features, Hamari et al. (2018) highlights that outcome-focused motivational designs tend to be better equipped to support users in their goal setting by employing easily quantifiable and comprehensible rewards, rather than possibly confusing users' goal setting process by emphasizing the abstract and self-purposeful nature of the goal attainment process. Furthermore, Hamari et al. (2018) notes that outcome-focused gamification designs generally entail less complexity in terms of design and implementation compared to process-focused designs, as user task completion and different reward features (points, leaderboards etc.) can be more easily measured and rewarded, while process-oriented design requires a more comprehensive approach and skillset requirements from platform designers (Deterding, 2015; Hamari, Koivisto, & Sarsa, 2014; Nicholson, 2012).

#### 3.4.6.1.2 Goal Orientation

The achievement of goals is also influenced by the goal orientation of different individuals, where goal orientation reflects the underlying purpose for setting or not setting goals. Common goal orientations include mastery, proving, and avoidance. (Hamari et al., 2018; Locke & Latham, 2013; Mann et al., 2013)

- Mastery-oriented individuals focus on self-improvement, skill acquisition, and personal development rather than seeking external validation (Freund et al., 2010; Hamari et al., 2018; Mann et al., 2013).

- Proving-oriented individuals validate their performance by comparing themselves to external standards or outperforming others, and often seek recognition and social validation through goal achievement (Hamari et al., 2018).
- Avoidance-oriented individuals, on the other hand, avoid goal setting to evade failure or negative consequences due to fear negative evaluations and hence prefer to bypass goal setting altogether (Hamari et al., 2018; Mann et al., 2013).

These goal orientations tend to be stable over time unless intervention is introduced and they significantly impact the goal attainment process and outcomes, thus necessitating their explicit consideration as independent variables in understanding users' goal setting preferences and designing motivational design strategies (Hamari et al., 2018).

With its emphasis on task accomplishments and rewarding such as awards, points, and leaderboards, gamification designs and features tend to attract proving-oriented users, as they are driven by the desire to prove and showcase their competence and accomplishments to other users (Burke, 2016; Hamari et al., 2018; Hamari & Koivisto, 2015). Additionally, users with a mastery-oriented preferences can also derive benefits from gamification, as gamification provides them with a means to visually track and assess their efforts towards self-improvement, utilizing game mechanics like progress bars and completion scores (Hamari et al., 2018).

On the other hand, users with avoidance-oriented preferences are likely to assign little importance to gamification and may even hold negative perceptions towards gamification designs and features, leading them to avoid its usage (Hamari et al., 2018; Mann et al., 2013). Previous research indicates that individuals with a goal-avoidance orientation tend to shy away from setting explicit goals to avoid potential negative judgments from their peers in the event of goal failure (Hamari et al., 2018; Mann et al., 2013). While users with avoidance-oriented preferences may still engage with gamification designs and features for the sake of enjoyment and immersion, these same features often highlight progress and may unintentionally accentuate failures and shortcomings in achieving desired outcomes (Hamari et al., 2018; Mann et al., 2013).

#### 3.4.6.1.3 Goal Attributes

According to Hamari et al. (2018) and Locke & Latham (2013), the two main goal attributes influencing users' goal setting process are goal difficulty and goal specificity. Goal specificity refers to how clearly defined a goal is in relation to the individual and the context, whereas goal difficulty pertains to the perceived and user subjective level of effort required for goal attainment (Hamari et al., 2018; Locke & Latham, 2013). According to Hamari et al. (2018), perceptually

challenging goals positively impact persistence and motivation, encouraging individuals to exert more effort to meet the perceived challenge, if the challenge is within the individuals' abilities.

The evaluation and perception of goal difficulty and goal specificity vary among users, and they influence users' level of effort and likelihood of goal attainment (Hamari et al., 2018). To conclude, Hamari et al. (2018) and Locke & Latham (2013) highlight in their respective researches that motivational designs should aim to tailor the difficulty and competition level of goals based on users' abilities, experience and perceptions, as this would ensure that users' goals are optimally challenging and encourage engagement, while still being attainable within users' capabilities.

In terms of gamification, according to IS literature and goal setting theory (Hamari et al., 2018), one of the main reasons why gamification has such a significant motivational impact to users achieving their goals or attaining target behaviours is by enhancing users' goal setting effectiveness through the SMART framework; enabling the establishment goals that are Specific, Measurable, Attainable, Realistic, and Time-bound (Burke, 2016; Hamari et al., 2018; Krath & Korflesch, 2021; Landers, Bauer, & Callan, 2017; Mann et al., 2013; Werbach & Hunter, 2012). This alignment between gamification and goal specificity attribute tends lead specificity-attributed users to perceive gamification features positively, as they support the pursuit of specific goals, hence leading to continued use of gamification features to support their specific goal-oriented mindset (Hamari et al., 2018).

In game design, matching the difficulty levels of games and gamified features to the abilities and preferences of users is crucial for engagement, as this then ensures that users are able enter a state known as the "flow state" where they are fully immersed in the game and find it enjoyable (Hamari et al., 2018; Koivisto & Hamari, 2019; Locke & Latham, 2013). Gamification attempts to replicate this experience by facilitating user engagement with their goals and making difficult goals seem more attainable (Burke, 2016; Hamari et al., 2018; Hamari, Koivisto, & Sarsa, 2014; Landers et al., 2017). Hence, according to Hamari et al. (2018), users who set challenging goals may appreciate gamification features as they realize the potential for assistance in achieving those goals as well as gamification being able to lower their perceived difficulty of those goals with a sense of playfulness and guidance.

#### **3.4.6.2 Conflicts within Motivational Designs**

As discussed before, users typically engage with motivational systems with the aim of achieving personal goals and/or deriving social rewards, such as awards, points, acknowledgements, higher leaderboard ranking etc. In other words, from the user's perspective, gamification can be seen as

a means to enhance motivation and engagement, making the learning or work experience more enjoyable and rewarding. On the other hand, motivational system providers (such as a social network platform provider) implement motivational designs to drive specific outcomes and target user behaviours aligned with their objectives. Leveraging gamification as a tool for influencing user behaviour and achieving predefined targets has become extremely popular in this regard, as previously discussed. Hence, motivational designs can introduce a dynamic where the goals of users and the goals of organizations can potentially conflict (Andrade, Mizoguchi, & Isotani, 2016; Hamari et al., 2018; Koivisto & Hamari, 2019; Morschheuser et al., 2017; Toda, Valle, & Isotani, 2018; Werbach & Hunter, 2012). This misalignment of goals can lead to various challenges and negative consequences within motivational design contexts.

In their exploratory research, Andrade et al. (2016) highlights the potential negative effects of using gamification designs in the educational context. As a result, their research introduces three issues arising from the thoughtless inclusion of gamification designs:

1. **Off-task Behaviour:** According to Andrade et al. (2016), if the gamification system lacks a direct connection to the parent platforms core focus and target outcomes as well as users' established goals towards the platform, the gamified features can become distracting for the users, even if users enjoy using the system (Toda et al., 2018). For instance, the introduction of social networking designs and features such as direct messaging and forums between users, while promoting a sense of relatedness among users, users may end up investing time in the system without concentrating on the core tasks and target outcomes (Andrade et al., 2016; Hamari et al., 2018; Locke & Latham, 2013; Mann et al., 2013; Toda et al., 2018). Similarly, customization features, which enhance immersion, may also result in spending excessive time on non-learning activities within the system (Andrade et al., 2016; Toda et al., 2018).
2. **Undesired Competition:** Scores, hierarchies and leaderboards, commonly employed to foster competition and a sense of competence, can be detrimental and unmotivating to users with lower performance and self-efficacy, as such designs and features may compel users to compete with their peers, which can negatively impact their self-perception of competence and subsequently reduce their interest and engagement towards such designs (Andrade et al., 2016; Hamari et al., 2018; Locke & Latham, 2013; Mann et al., 2013; Toda et al., 2018).
3. **Addiction and Dependence:** According to Andrade et al. (2016), some by-products of gamification design and features, such as the flow state, have been identified as potentially addictive factors based on existing literature (Chou & Ting, 2003; Jeong &

Lee, 2015). As discussed before, flow, or the flow state, describes a state of peak engagement and concentration during an activity, leading individuals to feel a profound sense of enjoyment and focus (Hamari et al., 2018; Koivisto & Hamari, 2019; Locke & Latham, 2013). In the context of gamified environments, addiction refers to the dependency created by the gamified experiences incorporated to the used system, where “addicted” users may find themselves dependent to the gamified features to progress, for example finding it challenging to study without the presence of gamification features (Andrade et al., 2016).

Given that target behaviours and users’ goal attainment within a gamification application are closely intertwined, it is crucial to carefully monitor the extent of gamification implementation, as overreliance on gamification can easily go unnoticed, highlighting the need for continuous evaluation of user-system interactions and gamification features (Andrade et al., 2016).

Similarly, in their exploratory research, Toda et al. (2018) conducted a comprehensive literature review with the aim of identifying the detrimental effects of gamification within the educational context. Based on the outcomes of their literature review, the authors identified four key negative effects associated with gamification:

1. **Loss of Performance:** Loss of performance occurs when gamification hampers or obstructs users’ goal attainment process, such as the learning process among students (Toda et al., 2018), and it was the most frequently reported issue in Toda et al's. (2018) literature review. In example, Toda et al's. (2018) literature review observed that a) gamification can have a demotivating impact on users, b) users can have difficulties in comprehending the rules of the gamified system which may lead to dissatisfaction with the system if they were to be penalized because of it, and c) users can become overly focused on gamified mechanics and features, resulting in neglectation of the core learning assessment (target behaviour), which had consequently led to worsened performances in comparison in standardized examinations (Toda et al., 2018). All these factors have been observed to lead to decreased performance within gamification (Toda et al., 2018).
2. **Undesired Behaviour:** Undesired behaviour arises when gamification produces unexpected effects, either positive or negative, within the target environment due to inadequate planning or the absence of it, and it was the second most frequently mentioned issue (Toda et al., 2018). Reasons for undesired behaviour, Toda et al's. (2018) literature review observed that a) user dissatisfaction with the gamified reward system and technical problems, b) user demotivation due to excessive competition as a result of gamified mechanics, c) misalignments of user focus (goal setting) and target behaviour,

and d) unfavourable perception and users' frustration with difficult gamified activities, were all highlighted as reasons for undesired behaviour among student users (Toda et al., 2018).

3. Indifference: Indifference arises when gamification fails to elicit any significant impact, either positive or negative, on its users (Toda et al., 2018). Reasons for indifference/indifferent behaviour, Toda et al's. (2018) literature review observed that a) gamification did not substantially improve users' knowledge, cognition, or performance compared to traditional learning methods, b) gamified system being perceived as neither enjoyable nor boring, and c) preference for traditional learning methods over the gamified methods, were all highlighted and linked with indifferent behaviour among test user within the educational context (Toda et al., 2018).
4. Declining Effects: Declining effects refer to the gradual loss of motivation and engagement over time due to the gamification approach (Toda et al., 2018). Noteworthy, as declining effects refer to a gradual loss of motivation, it can lead to loss of performance over time (Toda et al., 2018). Reasons for declining effects among the users, Toda et al's. (2018) literature review observed that a) the gradual loss of user interest and motivation due to gradually increased familiarity with the gamification system, and b) user demotivation due to initial confusion with the rules of the gamified system, led to increased reluctance to engage with the gamified system (Toda et al., 2018).

These negative effects highlighted in Toda et al's. (2018) literature review emphasize the importance of proper strategic planning, design qualifications and skillsets, and the use of instructional motivational design theories in guiding the design and implementation of gamification (Toda et al., 2018). It is crucial to incorporate well-founded instructional design theories that can generate carefully designed gamified strategies with positive impacts on user behaviour and goal attainment.

## 4 Discussion

The outcomes of this master's thesis have provided insights into the constructs and design principles of increasing user engagement and building habit forming applications and design features within social network platforms. The discussed principles stem from prominent academic theorem in information systems, behavioural and network economics, persuasive technologies and captology as well as behavioural, motivational and social psychology. However, the results should be interpreted with minor caution due to the limitations of the current study in terms of scope, empirical verification and lack of relevant technical aspects, discussion, and knowledge from the author. As an exploratory literature review, this research serves as a comprehensive, critical, and purposeful discovery, evaluation, and synthesis of existing and relevant research pertaining the research question under investigation with the aim to aggregate theoretical and empirical findings to support research-based practice and highlight areas requiring further investigation.

This discussion chapter provides reflection on the research results and process. The limitations of the research are further discussed, with recommendations for future research being offered. This chapter will also evaluate the potential implications to practise this research might have. Lastly, this chapter will address the ethical implications and potential adverse effects that persuasive and habit altering design features might have on user autonomy and overall well-being.

### 4.1 Synthesizing the Research Results

The central research question for this thesis was as follows:

1. *What are the principles of increasing user engagement and building habit-forming social network platforms?*

As can be derived from the research, even though the number of habit and habit formation related articles outweighed the number of academic papers on user engagement in the exploratory literature review, a distinct correlation between the two concepts emerged. User engagement, as defined by O'Brien's and Toms' (2008), incorporates aspects of habitual behaviour, operating as a cyclical process consisting of the point of engagement, engagement, disengagement, and re-engagement. As this cycle is repeated frequently, it resembles the habitual process where the point of engagement starts to trigger the habitual automatic actions through the activation of mental context–action associations learned through prior performances, or in this case prior cycles. Hence, the two concepts can be interpreted to co-exist and correlate with each other.

To address the primary and supportive research questions, this thesis developed a comprehensive conceptual framework (Figure 3, page 11) by integrating relevant and well-established academic research from related fields. The explicit and implicit aspects of the conceptual framework focused on explaining the habit-forming process of social network (SN) users, drawing insights from our investigations in information system (IS), SN and IS habit, and operant conditioning research. The investigation resulted in the formulation of an additional conceptual framework (Figure 5, page 23). This revised framework effectively summarizes the relevant factors influencing habit formation and their connection to the development of continued SN usage:

Firstly, SN habits were found to act as a negative moderator between SN continuance intention and SN continuance usage, indicating that users displayed reduced intention over time while simultaneously increasing their SN usage. This observation aligns with the notion that the amount and frequency of past behaviour play a significant role in fostering SN habit formation. As Limayem et al's. (2007) definition states, IS continuance usage is a form of continuous, longitudinal post-adoption behaviour resulting from repeated decisions to continue using the system in response to familiar situations and context cues, eventually becoming automatic and habitual. Designing applications within SN platforms that encourage frequent re-engagement and foster positive SN continuance intention will better the platform provider's probability of forming habitual usage for their users. One key factor in fostering those positive SN continuance intention is user satisfaction towards the SN platform.

Secondly, user satisfaction emerged as a crucial factor influencing SN habit formation. User satisfaction was particularly crucial in retaining a loyal SN user base, as it reinforces SN users' continuance intention. Higher levels of confirmation were observed to positively impact both satisfaction and perceived usefulness, with the latter subsequently leading to further increases in satisfaction. This was explained by both the IS continuance model and the expectation-confirmation theory (ECT), where users' SN continuance intention is influenced via four-part process: 1) establish an initial expectation prior to platform adoption/usage; 2) develop perceptions about the performance; 3) compare the perceived performance to the initial expectation: the level of confirmation, and 4) the confirmation level determines either a satisfactory or dissatisfactory response. Furthermore, social presence acts as a key determinant of satisfaction in the SN habit formation process. As the perceived value of SN platforms derives from network effects and social connectivity, users who perceive higher social presence are more likely to engage in social interactions and feel connected, leading to increased satisfaction.

Through social presence, sense of belonging is able to connect user satisfaction and frequency of past behaviour. As the frequency of past behaviour surpasses a certain threshold, users' sense of belonging was observed to boost the automaticity of usage habits. In other words, even though

frequency of past behaviour is a crucial factor in developing context cue mental associations, over time user satisfaction, driven by social presence, sense of belonging, and positive experiences, becomes the primary reason for re-engagement with the platform. This was also agreed by O'Brien and Toms (2008), stating that during the engagement period, user attention and interest are sustained through positive emotions, and that re-engagement is driven by positive past experiences with the platform. All this emphasizes the fact that in the long run SN platform designers should prioritize nurturing users' emotional connection towards their SN environment.

Lastly, comprehensiveness of platform usage was shown to strongly influence habit formation and platform selection. This association aligns with the investment phase in the Hook Model where users accumulate stored value towards a platform. By interacting with the various applications within a SN platform, user invest and store more and more value and sunk cost towards the platform with each adoption and interaction. For instance, platforms like Facebook offer multiple applications bundled under the same platform, encouraging users to spend more time within it by catering to various different needs under the same platform at once. Perceived critical mass is crucial for user acquisition in SNPs, as users are more likely to exhibit habitual behaviour when they perceive a sufficient number of active users within a SNP for interactive communication. Otherwise, users were shown to either neglect or discontinue platform usage. In other words, amassing a critical mass of users is pivotal for attracting users to a SNP. Once a critical mass is achieved, platform providers can reap more of users' time on device and encourage them to invest more stored value towards their platform.

In addition, supporting questions in this thesis were as follows:

2. *How can platform providers increase the user engagement of their social network platforms?*
3. *What psychological theorem can be found in building habit-forming behaviour in social network platforms?*
4. *How are these principles in increasing user engagement and building habit-forming behaviour modelled within the industry literature and showcased in current, large-scale social network platforms?*

Continuing on answering the thesis research questions, the persuasive technology side of the conceptual framework concentrated on introducing and conceptualizing potential models and applications for practitioners and academics to tap into the habit-forming and user engagement processes of SN users. Given that persuasive technology research focuses on designing, developing, and evaluating interactive technologies that employ persuasion and social influence techniques to shape human behaviour, this study deems it crucial to introduce prominent

economic views relevant to the research questions, namely, the network and behavioural economics, along with the reliability view.

Firstly, network economics posits a positive correlation between a social network's value and the number of users in its structure. SN platforms operate as multi-sided networks, benefiting from interactions among multiple user groups, where through network effects, increased connectivity enhances the platforms' value for current and prospective users. Understanding network effects, achieving critical mass, and leveraging users' switching costs are crucial elements in attracting, engaging, and locking in users to a SN platform. For instance, critical mass leverages both same-side and cross-side network effects, influencing the social consensus among users for platform choice and engagement. Leveraging switching costs and lock-ins helps attract and retain users, making it harder for them to switch platforms. Emphasis on comparability then again can help SN users with their habit stacking process by optimizing the platform to each operating system and by utilizing shared SN platform elements and applications.

Secondly, behavioural economics introduced insights into users' decision-making processes, exploring psychological, cognitive, social, and emotional dimensions that influence users' irrational behaviour. It delved into mental biases, heuristics, and theories to predict and influence decision-making, leveraging on social preference, prospect theory, and nudge theory and choice architecture. When applied to SNPs, four models and applications of persuasive technology were discovered to help practitioners and researchers formulate and tap into increasing user engagement and habit formation:

Fogg's Behavioural Model (FBM) established a vital connection between persuasive technology and behavioural economics, wherein behaviour is influenced by motivation, ability, and triggers. FBM serves as a fundamental model within persuasive technologies, forming the basis for many other models in the field. Captology then again explores the persuasive capabilities of the design, ethics, and analysis of interactive computer-based technologies, encompassing psychological principles of persuasion and behavioural change such as influence, motivation, and goal setting.

Building upon the FBM, Fogg & Hreha's Behaviour Grid provides a practical framework for matching target behaviours with appropriate solutions. This grid comprises 15 distinct behaviour change types, with our emphasis being placed on Green, Blue, and Purple Path behaviours, as Path behaviours aim towards permanent behaviour change. In essence, all behaviour change types follow the rule of FBM:  $B=MAT$ . For instance, the key in achieving Path behaviours is making the behaviour simple to do and finding a way to trigger it. Even if not the most self-explanatory, the duality of these two models is to highlight that undesired outcomes in user behaviour are most

often caused by lack of motivation, ability and/or triggers for the user. For instance, gamification is a suitable application of behaviour economics to influence user motivation and ability.

The Hook Model, also building upon the FBM, seeks to cultivate habitual behaviours and engage users through a cyclical process involving triggering an action, providing a variable reward, and fostering continued investment. Its four stages utilize lots of the previously discussed principles and theorem, with the first two, trigger and action, closely aligning with FBM, variable reward taking influence from operant conditioning, and investment taking influence from social presence, social preference, sense of belonging and comprehensiveness of usage. However, it is crucial to recognize that user loyalty is not indefinite, which is why investing resources and efforts into the investment phase, such as nurturing users' emotional and social connection towards their SN environment is paramount. This way, platforms providers can raise switching costs and form lock-ins for its users, making it harder to migrate to alternative platforms.

Gamification was observed to be highly effective in creating positive experiences, increased user activity and engagement, social interaction, productivity, motivation, and enjoyment among users. This research delved into researching the various design principles and design processes of gamification design, hoping to find commonalities. Even though gamification is a great design application to influence and alter behaviour, it requires a deep understanding of game design, and behavioural and motivational psychology to design effective platform applications that can influence behaviour. There are no one size fits all solutions, and each gamification design needs to be analysed from the perspective of the problem at hand and assess if gamification even is the appropriate solution. However, the majority of gamification projects end up being insufficient and ineffective due to lack of user analysis, project planning or allocated resources. Fortunately, by following the gamification design principles and process outlined in this research, practitioners should be better equipped to formulate their gamification design approach.

Thirdly, the reliability view shed light on the profound impact reliability and positive user satisfaction has on user re-engagement. As observed in this research, long-term users place greater emphasis on past experiences rather than recent encounters, exhibiting a higher resistance to switching platforms compared to new users. This suggests that after a series of successful interactions with a platform, habits begin to form with users becoming more reliant and forgiving towards a platform despite subpar experiences. However, there are limits to users' tolerance for negative experiences. As stated by prospect theory, perceived negative experiences have a more substantial impact on user satisfaction compared equal positive experiences, especially early in the adoption process. Furthermore, these results strongly align with the expectation-confirmation theory, where in both theorems users formulate a confirmation level, either positive which enhances habit formation, or negative which hinders or stops the habit formation process. This

confirmation level further emphasizes the importance of platform reliability and encourages platform providers to evaluate the lifetime value of their users. Valuing users' tenure can help platforms design their methods user investment and stored value to further drive user engagement, habit formation, and eventually switching costs and financial success in the process.

## 4.2 Implications to Practice

The efficacy of social network platforms, both present and future ones, can be comprehended through the application of principles pertaining to habit formation and user engagement (Eyal, 2014). It is evident that a notable shift in the landscape of academic literature has occurred since the author's bachelor's thesis research on this subject in 2019, evident from the surge in relevant research papers and increased citation numbers. This growing interest underscores the recognition among researchers and practitioners of the paramount significance of habit formation principles, such as the acquisition of rewards, reward learning and reward schedules, fostering seamless repetition and adoption, as well as strategically employing cues and forming cue-action associations to elicit user engagement and trigger behaviour, thus facilitating the establishment of a loyal user base and habitual platform usage.

### 4.2.1 Managerial Implications

The research findings present a compelling case for incorporating habit formation and user engagement principles into the very fabric of social network platform design. The conceptual framework developed and offered in this thesis offers actionable insights for practitioners, platform designers and developers to optimise and capitalise on their platform's user interactions and their users' behavioural tendencies to enhance platform success. By adopting the principles of habit formation and persuasive technology, platform designers and providers can refine their platform designs and content strategies, create immersive and personalised user experiences that foster user loyalty and continued engagement, and better understand their users' decision-making processes and motivations.

Furthermore, this thesis highlights the significance of network effects and critical mass in platform success. For this purpose, platform providers should analyse their platform's (user) network structures and dynamics to identify opportunities for fostering network effects. For instance, referral programs and community-building initiatives can accelerate the user base's growth and enhance the platform's overall value proposition by leveraging same and cross-side network effects.

### 4.2.2 Policy Implications

Policymakers and regulators are pivotal stakeholders in ensuring responsible technology usage. The research findings highlight the potential impact of persuasive technologies on user autonomy and well-being. Policymakers can utilize these research findings and work in collaboration with industry stakeholders to establish guidelines and standards that promote ethical practices in platform design and persuasive technology usage. Additionally, encouraging SN platforms to implement robust user consent mechanisms towards persuasive features and providing users with granular control and oversee over their data and data usage heightens the possibilities for users to better self-regulate their SN usage and empower them to make informed choices about their digital engagement. By fostering a transparent and user-centric approach to SN platform design prioritizing user well-being and autonomy, policymakers can safeguard users from manipulative practices while encouraging responsible and transparent platform design.

To dive deeper into the research topic, beyond the findings of this research, policymakers are encouraged to collaborate with researchers, academic institutions and experts in behavioural economics and psychology, and other relevant fields to advance the understanding of persuasive technologies' impact on user behaviour, mental health, and wellbeing. Conducting longitudinal studies and user behaviour analyses, for instance with adolescents, can shed light on the long-term effects of persuasive features, informing the development of evidence-based policies. Other encouraged research areas within SN platforms are data protection, ownership, and monetization, which have gotten a lot of attention in the past years but are still relatively unregulated to date.

### 4.2.3 Future Recommendations and Research

The research presented in this thesis lays a solid foundation for future investigations into habit formation and user engagement in social network platforms. Scholars can delve deeper into specific aspects of persuasive technologies, such as the impact on vulnerable user groups or the implications of persuasive design on societal well-being. Additionally, researchers can conduct cross-cultural studies and analyse the impact of cultural factors on the adoption and effectiveness of persuasive features. Exploring the role of individual differences, such as personality traits and cognitive styles, can also yield valuable insights into the variability of user responses to persuasive technologies.

Further research exploring the interplay between user motivations, platform algorithms, and persuasive features can shed light on the mechanisms that underpin successful habit formation strategies. Researchers can employ advanced analytics and machine learning techniques to uncover subtle patterns and correlations within large-scale user data.

Interdisciplinary collaboration between academia, industry, and policymakers is essential to advancing the ethical and practical dimensions of persuasive SN platform applications and features as well as to facilitate the development of evidence-based guidelines for behaviour altering technology usage. Future research can explore how SN platforms can strike a balance between encouraging user engagement and promoting responsible technology practices. Conducting collaborative research projects with platform providers can lead to more practical and actionable recommendations for industry stakeholders. By fostering partnerships that bring together diverse perspectives, researchers can ensure the development of comprehensive solutions that address the complexities of user engagement and habit formation in social network platforms.

Lastly, with the increasing integration of artificial intelligence (AI) and machine learning in platform design, it is essential to study the ethical implications of utilizing these technologies for habit formation and user engagement. Research should focus on the responsible use of AI algorithms to avoid manipulative practices and ensure user autonomy and privacy. By examining the ethical dimensions of AI-driven persuasive technologies, we can establish guidelines and regulations that protect users' well-being and rights in the digital realm.

In conclusion, the implications of this research are far-reaching and offer a roadmap for stakeholders to optimize social network platforms through habit formation and user engagement principles. By embracing ethical and user-centric design practices, stakeholders can collectively create a digital environment that enriches user experiences, empowers users to make informed choices, and ensures the responsible and sustainable growth of social network platforms in an increasingly interconnected world.

### **4.3 Limitations and Constraints**

While this master's thesis has provided valuable insights, it is crucial to acknowledge the challenges and limitations associated with the study. For instance, specific closely related topics, particularly technical aspects, have not been thoroughly addressed in this research. Additionally, despite the growing popularity and increasing research attention in this field, some might argue that some of the academic sources referenced within this research could be considered outdated due to the rapid advancement of the social network platform industry and information economy in general: the continuous emergence of new technologies, platform designs, persuasive features, and device capabilities in the market surpasses the pace at which academic literature can keep up.

However, it is essential to note that the primary focus of this research was to explore the principles of habit formation and user engagement underlying social network platforms and user behaviour from a more psychological, sociological, motivational and network economic perspective.

Despite the challenges mentioned, this research argues that the principles presented in this thesis and the studies covered in the exploratory literature review remain highly relevant to this day. Based on these claims, this thesis aims to inspire further research and serve as a foundation for future practitioners and researchers to build upon. By conducting up-to-date research, scholars can bridge the gap between technological advancements, design innovations, and the foundational theories within the evolving landscape of SNP industry as well as ensure that future practitioners are well-equipped and effective in meeting the dynamic needs of users and the SN platform environment.

One of the limitations deliberately excluded from the research scope are the more technical approaches to influencing user behaviour and persuasion, notably algorithmic optimization. In essence, algorithmic optimization aims to effectively cater to users' interests, needs, and beliefs by tailoring the content presented to each user and maximizing their perceived content value (Anderson & Wood, 2021; Thorson, Cotter, Medeiros, & Pak, 2021). These machine learning algorithms heavily rely on proficient "social network mining," which entails the analysis, modelling and extraction of actionable patterns from users' social network data (Zafarani, Abbasi, & Liu, 2014). It combines theories and methodologies from different disciplines such as computer science, machine learning, social network analysis, network science, sociology, ethnography and statistics (Zafarani et al., 2014). By continuously analysing users' SN usage, these algorithms adeptly adjust and enhance the appeal and rewarding aspects of the presented content, often utilizing various methods of trial-and-error learning in the process, resulting in extended time on device and accelerated reward learning processes for the user, hence positively influencing the SN habit formation processes (Anderson & Wood, 2021).

Moreover, in contrast to this research, it is essential for future research to prioritize the collection of empirical and primary data, encompassing both quantitative and qualitative insights, in order to provide evidence-based recommendations and validation. For instance, conducting qualitative interviews with SN platform designers and industry experts can drastically enhance and validate the findings of this study and inspire further subsequent research by offering practical and expert insights into the technical and procedural design aspects of social network platforms.

Additionally, future research should aim to better understand the limitations of platform design, particularly in the context of smaller platforms, in comparison to the larger platforms used as examples in this thesis. By conducting case studies involving various companies operating in the social network platform domain would allow researchers to investigate the effects and impact of the different principles and applications proposed in this research in different stages of the platforms, hence providing valuable context-specific insights in support of more effective

implementation. A larger sample size encompassing different types of platforms would contribute to more robust and generalizable findings for platform designers.

To dive even deeper, research focusing on developing a social network platform from scratch, while employing the principles and models presented in this thesis, would potentially yield highly valuable insights. Such an empirical study, undertaken by a research team with the necessary technological capabilities to design and maintain a social network platform, would offer concrete evidence and validation about the applicability of the different principles and applications within the SNP landscape. As technology continues to evolve rapidly, conducting empirical studies with the latest technological capabilities and platform design knowledge would bolster the credibility as well as surface potential limitations of the principles advocated in this thesis. This approach would provide valuable and practical guidance for platform designers and enhance the overall understanding of the application of habit formation and user engagement principles in the dynamic and ever-evolving domain of social network platforms.

## 4.4 Ethical Discussion

Although this research has provided valuable insights into the habit formation and user engagement processes of SN users, it is essential to acknowledge and address the ethical implications and potential adverse effects that persuasive and habit altering design features might have on user autonomy and overall well-being. This section is divided into three sub sections. Firstly, we will introduce the topic by discussing and highlighting some of the main concerns surrounding SNP design within academic literature and contemporary media. Secondly, we will discuss social network addiction, a distinctive and negative by-product of SN usage troubling millions of users around the world. Finally, we will discuss the potential measures and regulations to limit the negative impact of persuasive technologies. It will follow the academic work of Langvardt (2019) in discussing the potential strategies for addressing the risks associated with persuasive technologies and will include sub sections in product labelling, usage monitoring and digital wellbeing designs as well as highlighting two SN design features as case examples.

### 4.4.1 Concerns of Designing Habitual SN Platforms

Academic researchers widely acknowledge that contemporary social network platforms and modern media are not only captivating but intentionally designed to foster addictive behaviours (Aagaard, 2021; Docherty, 2021; Turel & Ferguson, 2021). Publicly traded companies operating these platforms, like Facebook and Alphabet, have a vested interest in cultivating habitual usage patterns to drive engagement, as it is vital for their financial models (Langvardt, 2019). Similar to casino and slot machine designers, platform developers employ behavioural design techniques to maximize user engagement and "time on device," by evoking a sense enjoyment and rewarding

experiences (Aagaard, 2021; Docherty, 2021; Langvardt, 2019; Turel & Ferguson, 2021). Unfortunately, this has led to unintended consequences, with users spending excessive time on these platforms and some developing behavioural issues resembling tendencies similar to gambling addictions (Langvardt, 2019). Despite these concerns, platform designers continue to prioritize user engagement through these design strategies. According to an American research company Dscout Inc., (2016), the average American uses their phone 76 times per day and touches their phone 2,617 times during these sessions. This trend is also reflected globally, with the world average time spent on mobile during January 2022 being 4 hours and 48 minutes, as reported by Kemp, (2022a).

The majority of concerns surrounding the "addictive" nature of social network platforms primarily revolve around the influence of specific cues, contexts, responses, and rewards on the formation of social network habits (Schnauber-Stockmann & Naab, 2019). Algorithmic social rewards, such as notifications, exploit the frequency and variability of interpersonal communication to provide continuous and unpredictable rewards, enticing users to repeatedly engage with the platform (Bayer et al., 2022; Bayer & LaRose, 2018; Lindström et al., 2021). These habits bear resemblance to controversial "loot boxes" found in casinos, especially slot machines, wherein social rewards are dispensed with unpredictable frequency, utilizing the models of variable rewards (Langvardt, 2019; Turel & Ferguson, 2021; von Meduna, Steinmetz, Ante, Reynolds, & Fiedler, 2020). Furthermore, platforms leverage algorithms that automatically identify persuasive cues and immersive contexts tailored to each user's preferences and behaviours (Anderson & Wood, 2021; Bayer et al., 2022; Eyal, 2014; Langvardt, 2019; Lindström et al., 2021).

However, future research could benefit from adopting a more focused approach that examines the mechanisms and design elements underlying social media habits, in order to reconcile the conflicting perspectives on user well-being and problematic behaviour (Bayer et al., 2022; Bayer & LaRose, 2018). By identifying the specific cues, contexts, and responses associated with negative outcomes for users, tailored feedback and interventions can be developed (Bayer et al., 2022; Bayer & LaRose, 2018). It is also important to acknowledge that, according to academic literature, social network habits can also have positive benefits, such as providing social support and informational awareness (Bayer, Triêu, & Ellison, 2020).

By empowering users with digital tools to assess and modify their habits, platform designers can start helping users to identify markers of problematic usage patterns. By analysing user data on screen touches and behavioural responses to triggers, both users and platform providers can gain valuable insights into the user's habit strength indicators. (Bayer et al., 2022; Bayer & LaRose, 2018) This approach allows users to self-reflect on their social network habits without being condemned, providing them with usable and self-rewarding methods to navigate the challenges

associated with these habitual loops and align them with their personal goals. In the following subsections, we will explore the concept of social network addiction, the role of user self-esteem, and delve deeper into potential methods and designs to address concerns related to addictive design methods within social network platforms.

#### 4.4.2 Social Network Addiction

SN addiction refers to the excessive and compulsive use of SNPs, where individuals display self-absorption and an uncontrollable urge to engage with these platforms (D'Arienzo et al., 2019; M. Griffiths, 2000; M. D. Griffiths et al., 2014; Hou, Xiong, Jiang, Song, & Wang, 2019). It is characterized by a decline in self-regulation and an unhealthy psychological reliance on SNPs, leading to symptoms associated with behavioural addiction. Negative consequences of SN addiction include diminished work performance, cognitive difficulties, impaired social relationships, sleep disturbances, reduced life satisfaction, and various negative emotional experiences such as jealousy, anxiety, and depression (Andreassen, 2015; D'Arienzo et al., 2019; M. D. Griffiths et al., 2014; Hou et al., 2019; Sun & Zhang, 2021). Studies have shown that SN use negatively impacts academic performance, with multitasking on SNPs and increased time spent on platforms associated with lower academic achievement (Hou et al., 2019; Lau, 2017). Laboratory experiments have further demonstrated the negative effects of SNPs on real-time learning performance and information comprehension (Bayer et al., 2022; Hou et al., 2019; Sun & Zhang, 2021). It is estimated that approximately 10-12% of social network users in the United States experience SN addiction (Hou et al., 2019; Ricci, 2018; Statista & ThinkNow, 2019).

As highlighted by Hou et al. (2019), self-esteem plays a crucial role in the negative effects of social network addiction, particularly in the context of SNPs. Having low self-esteem has been connected to other psychological problems like depression and anxiety, and it can also negatively affect academic performance. This indicates that self-esteem plays a mediating role in the relationship between SN addiction, mental health, and academic achievement. (Hou et al., 2019) SN platforms, like Instagram and Facebook, often present users with carefully curated and idealized self-representations of others, which can undermine viewers' self-esteem (Bayer et al., 2022; Hou et al., 2019; Sun & Zhang, 2021). Users who frequently engage with SNPs tend to perceive others as happier and more successful, especially when they have limited offline connections with them, leading to upward social comparisons that negatively impact self-esteem (Bayer et al., 2022; Hou et al., 2019; Sun & Zhang, 2021) Furthermore, negative feedback received on SNPs has been found to lower adolescents' self-esteem (Andreassen, 2015).

### 4.4.3 Policing Persuasive Technologies

This section follows the narrative of the Langvardt (2019) research article “*Regulating Habit-Forming Technology*.” The article explores potential strategies and adaptations for platform designers and providers to address the risks associated with persuasive technologies. Following Langvardt's (2019) narrative, this section discusses potential ethical design elements, such as labelling, usage monitoring, and digital well-being features, that can assist users in reflecting and responding to compulsive technology usage. At the end, this section also introduces two examples of addictive design that the author finds questionable in terms of ethics.

#### 4.4.3.1 Product Labelling

One effective moderation tool available to SNP providers is the implementation of labelling mechanisms. These labels serve as indicators on the platform interfaces, conveying information to users about various aspects such as functionalities, associated risks, quality of information, or regulatory disclosures mandated by authorities (Wihbey, Kopec, & Sandler, 2021). Drawing on the example of tobacco regulation, governments, like Finland, employ product labelling to educate consumers about the health risks linked to tobacco use, with the aim of promoting informed decision-making and healthier choices. Within the realm of social network platforms, a similar labelling strategy could require the display of general messages concerning the risks associated with technology addiction and excessive usage, while also tailoring the warnings to the specific risks inherent in a given product (Langvardt, 2019).

For instance, a warning label on a social network platform could explicitly highlight and caution users about addictive tendencies and the associated risks, which encompass mental health issues, social detachment, sleep deprivation, and reduced attentiveness (Langvardt, 2019). An illustrative case is provided by Langvardt (2019) through the implementation of persuasive technology product labelling in Minnesota's loot box<sup>4</sup> legislation of 2018. This law mandates that certain games, whether virtual or physical (such as slot machines), must carry the following label: "Warning: This game contains a gambling-like mechanism that may promote the development of a gaming disorder that increases the risk of harmful mental or physical health effects and may expose the user to significant financial risk" (Langvardt, 2019; Minnesota Legislature, 2018). Additionally, the legislation also prohibits the sale of video games that allow the in-game purchase

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<sup>4</sup> Loot boxes are in-game reward mechanisms which can be redeemed to receive a randomized selection of in-game resources, capitalizing on the principles of variable rewards. They can be obtained through continuous gameplay or purchased via real-world currencies, serving as a fundamental monetization mechanism for online free-to-play social games. (Woodhouse, 2023)

with real currencies of randomized rewards or virtual items that can be redeemed for randomized rewards to individuals under 18 years of age (Minnesota Legislature, 2018).

In light of the increasing significance of awareness among younger generations regarding the potential harms associated with addictive technologies, the implementation of labelling measures becomes paramount. According to the McKinsey Health Institute's (MHI) 2022 Global Gen Z Survey, generation Z youth are more likely than other generations to express negative sentiments about social media and report poorer mental health (Coe, Doy, Enomoto, & Healy, 2022). Therefore, providing information about the potential risks through labelling becomes vital for these platforms.

In essence, the introduction of labels for social network platforms and other social products, including games, serves as a crucial source of information and self-reflection for platform users. Through various forms, these labels inform users about potential risks, present key usage metrics, and offer assistance in managing uncontrollable or addictive behaviours. In addition to labelling, platforms could be required, as suggested by Langvardt (2019), to disclose the user's logged-in time within a specified period, such as 24 hours, and notify the user if the usage surpasses a certain threshold deemed excessive. The objective is to provide users with comprehensive information about their usage patterns, enabling early detection of addictive tendencies and facilitating self-reflection, while also offering avenues for seeking assistance when necessary.

#### *4.4.3.2 Usage Monitoring and Digital Wellbeing Designs*

Beyond mere disclosure requirements, an advanced approach may involve applications actively monitoring usage patterns and intervening with warnings or prompts for breaks at appropriate intervals, as slightly discussed in the previous subsection and by Langvardt (2019). This proactive approach draws inspiration from the voluntary adoption of "responsible gaming solutions" by some casinos in the United States, aimed at preventing burnout and fostering long-term customer relationships (Langvardt, 2019; Schüll, 2014). Such concepts can readily be adapted to social network platforms, given their extensive data collection capabilities and access to data analytics tools.

In 2017, a California-based tech startup formerly known as Dopamine Labs (now rebranded as Thrive Global) faced criticism after openly advertising its ability to make software more addictive, boasting about lifting user engagement and revenue by up to 167% through the delivery of dopamine-inducing stimuli (Langvardt, 2019; Shieber, 2017b). However, in response to the backlash, the company shifted its focus its knowledge on persuasive technologies and forming habitual behaviour towards designing products to help users break free from patterns of

compulsive technology use (Shieber, 2017a). Their product monitors users' device usage for addictive patterns and introduces a delay before opening enticing apps, creating a moment of pause (Thrive Global, n.d.). Notably, other major social network providers like Instagram and Facebook, as well as device manufacturers such as Apple and Android-based companies, have also incorporated usage monitoring and digital wellbeing features into their products and devices. While these features are typically not enabled by default, they offer practical value to users interested in managing their digital consumption. They enable users to track their daily usage, temporarily disable notifications, and set timers to alert them when self-imposed limits are exceeded.

To maximize the effectiveness of usage monitoring and digital wellbeing functionalities, it is essential for platform designers and providers to prominently feature these tools within the user interface, rather than burying them in obscure settings menus. Furthermore, enabling these functionalities by default can significantly enhance the ability of current generations of social platform and product users to gain awareness of their usage habits and respond and reflect upon them more effectively.

#### *4.4.3.3 Addictive by Design Features*

As we discussed previously within this section, regulators have heightened the level of enforcement of mandating platform designers and providers to deactivate various features known to induce compulsive usage, such as loot boxes, which have been referenced as pseudo-slot machines. In resemblance to the slot machines found in casinos, loot boxes dispense rewards in a pseudo-random pattern that is widely acknowledged to induce compulsive behaviour, following the principles of variable rewards (Schüll, 2014; Woodhouse, 2023). Secondly, loot boxes frequently exploit the same psychological fallacies as slot machines by presenting users with artificially frequent "near misses," where these near misses create a false perception that the user is on the verge of winning a significant prize, thereby encouraging further engagement (Schüll, 2014; Woodhouse, 2023). Finally, both loot boxes and slot machines frequently employ tokens instead of actual currency, which acts to deliberately convolute exchange rate between real-life currency and in-game tokens in order to hinder users' intuitive understanding of the monetary value associated with each transaction (Schüll, 2014; Woodhouse, 2023). Based on these concerns, UK's governmental Gambling Commission has raised apprehensions regarding the striking structural and psychological resemblances between loot boxes and gambling, as well as their potential to foster gambling tendencies among children and are now researching potentially including loot boxes to the UK's 2005 Gambling Act (Woodhouse, 2023).

Moreover, social network platforms effectively foster user engagement by capitalizing on social obligations (Langvardt, 2019) and the irresistible appeal of goal-oriented elements that symbolize users' accomplishments, status, or relationships, such as the pursuit of badges (Burke, 2016; Hamari et al., 2018; Hamari & Koivisto, 2015). Within this context, a highly effective goal-setting strategy involves motivating users to maintain a daily "streak" of engagement (Langvardt, 2019). The streak design feature encourages users to check into the platform and perform the required action on consecutive days, enhancing the streak. The streak is often shown to the user and their counterpart (if it is a social streak), and many platforms go as far as offer incentives, such as badges and other rewards, to users who sustain the streak for a specific duration. Snapchat's "streak" feature masterfully illustrates these diverse techniques, creating a compelling fusion of goal setting, social obligation, and randomized rewards. Within this feature, users are encouraged to diligently maintain their streak with other users by exchanging at least one "snap" every day. Similarly, these streaks act as forms of investment towards the platform, making it harder for users to stop using it or to switch to another platform. With Snapchat's streaks involving more than one person, the social obligation and the "fear" of breaking a streak can build up to become an important cornerstone within users' social connections, with especially among younger users breaking a streak can be interpreted as a sign of reduced commitment to the holistic friendship, online and offline.

## 5 Conclusion

The aim of this thesis was to explore and identify principles and models that promote increased user engagement and habitual behaviour, with the ultimate goal of developing a conceptual framework. This framework could be utilized by both academics and practitioners in their research, design, or updates of social network platforms. Through an extensive literature review, this research successfully identified key principles that influence the habit-forming process and continued usage of social network platforms. Additionally, conceptual models were derived, drawing upon persuasive technologies, behaviour and network economics, and information system science. These models offer valuable insights and actionable steps into the engagement and habit-forming processes of social network users. The findings revealed that influencing user engagement and habit formation is a complex interplay of factors, including satisfaction, confirmation, perceived usefulness, sense of belonging, social presence, comprehensiveness of usage, perceived critical mass, and frequency of past behaviour. Notably, these factors demonstrate specific relationships with one another, as well as with users' implicit and explicit intentions toward social network platform usage. Understanding these key factors is crucial for platform designers and providers to successfully differentiate their social network platforms and gain a competitive edge. This research offers a comprehensive resource for future practitioners and academics, enabling them to navigate and focus on the relevant research for each factor, thereby saving time and effort in their endeavours.

To address the primary and supportive research questions, this thesis developed a comprehensive conceptual framework by integrating relevant and well-established academic research from related fields. The explicit and implicit aspects of the conceptual framework focused on explaining the habit-forming process of social network (SN) users, drawing insights from our investigations in information system (IS), SN and IS habit, and operant conditioning research. Furthermore, the key factors identified in the conceptual framework were examined within the context of an exploratory case study conducted on Twitter. The aim of this case study was to demonstrate the real-world impact and influence of these factors in a SN setting. The investigation involved analysing previous empirical academic research on Twitter and other relevant social network studies, resulting in the formulation of an additional conceptual framework (Figure 5). This revised framework effectively summarizes the relevant factors influencing habit formation and their connection to the development of continued SN usage.

The persuasive technology side of the conceptual framework concentrated on presenting and conceptualizing potential models and applications that can be utilized or studied by practitioners and academics to tap into the habit-forming and engagement processes of social network (SN)

users. Given that persuasive technology research focuses on designing, developing, and evaluating interactive technologies that employ persuasion and social influence techniques to shape human behaviour, this study deems it crucial to introduce prominent economic views relevant to the research questions, namely, the network and behavioural economics, along with the reliability view. Each of these views contributes to the thesis, with network economics explaining the significance of understanding network effects and switching costs, behavioural economics on individual biases and inclinations, and reliability view on the role of reliability and satisfaction in individual-to-individual and user-to-platform interactions. Subsequently, four distinct models and applications within persuasive technology were discussed:

Fogg's Behavioural Model (FBM) depicts behaviour as a combination of user motivation, ability, and triggers, which has since formed the foundation for numerous other persuasive technology models. Fogg & Hreha's Behaviour Grid offers a practical framework for matching target behaviours with appropriate solutions. The Hook Model fosters habitual behaviours and user engagement through a cyclical process of triggering an action, providing variable rewards, and encouraging continued investment. Lastly, gamification as a design stream of motivational and persuasive technology design proved to be effective in enhancing user activity, engagement, social interaction, productivity, and enjoyment in information systems, yet requiring a deep understanding of game design and behavioural psychology to influence behaviour effectively.

A comprehensive understanding of these behaviour-altering design principles and the drivers of user engagement in social networks can offer a competitive advantage to platform providers and designers, given the growing importance of these principles in the modern information economy and surveillance capitalism. However, it is crucial for platform designers and providers to acknowledge a level of responsibility in ethically considering the risks associated with exploiting behaviour change and persuasive technologies. As emphasized in this research, if left unchecked by either the platform or the user, these designs may lead to undesirable outcomes and problematic usage patterns. While some ethical concerns were addressed to some extent in the discussion section of this thesis, future research focusing on the ethical implications of habit-forming and behaviour-altering designs and technologies is imperative in order to shed light on the scope of these issues and associated risks. Moreover, such research can identify specific areas requiring interventions. Topics such as social media addiction, the ethics of loot boxes and variable reward designs, algorithmic behavioural change, the role of social network platforms in managing platform usage and content, and the impact of social network platforms on the development of self-worth and self-image among critical user groups all serve as potential avenues for examining the multifaceted ethical concerns involved in this domain.

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