



PHD

EMOTIONAL RESPONSES TO THE FACEBOOK NEWS FEED: MEMORY, UTILITY AND INTERESTINGNESS

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**EMOTIONAL RESPONSES TO THE FACEBOOK
NEWS FEED: MEMORY, UTILITY AND
INTERESTINGNESS**

Submitted by

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For the degree of Doctor of Philosophy

of the

University of Bath

Department of Computer Sciences

October 2020

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Abstract

‘Why is social media so compelling to so many users?’ There is no single, simple answer to this question. The uses and gratifications theory has been used to explore this question, but this theory has examined and analysed human motives in terms of broad features which are at the same level as design. In this thesis, we explored some psychological mechanisms that might provide an explanation for the attraction of Facebook browsing, with particular focus on emotional experiences and how emotional experience is associated with memory.

In this thesis, there were four experiments which took a self-report-based quantitative approach. In the first study, we explored how people retrospectively judge the overall emotional experience of browsing Facebook compared with their emotional judgements of the threads they encounter. The key findings from the first study showed an overall emotionally positive experience of browsing Facebook. The overall emotional valence could be predicted by the peak (most emotional) and the end thread that were encountered: this is the peak – end rule. The recall of threads exhibited a classic serial position effect. In the second study, we focused on the effect of the end experience in an attempt to shift the overall retrospective judgement. The experience of the end thread was depressed by asking the participants to quit browsing after a negative experience. However, the second study showed that there was no evidence of an end-effect on the retrospective emotional judgement, which we attribute to a methodology in which individual thread emotions were polled and reported during the initial browsing episode.

In the third study, we further investigated the peak – end rule by exploring how precise emotion-type labels can reveal further aspects of Facebook browsing experience and, at the same time, by investigating the effect of the medium of Facebook posts on user’ memory and emotions. We found that the interested emotion label played a big role in the emotional experience of Facebook browsing. The medium of video and the medium of text on Facebook posts were better recalled than the picture medium posts. In the final study, we further investigated the interested label in terms of Facebook experience. We found that the main reasons for people being interested in posts on

the news feed were closeness of reader to a poster, amount of prior knowledge, and amount of information acquired.

Taken together, the findings offer several insights into the appeal of the Facebook's news feed for its users. Reading most threads is a positive emotional experience, the overall memory for browsing several threads is even more positive, because it is so influenced by the peak thread; the emotional experience is varied, but the most common response is 'interested', which is itself promoted by the closeness of thread-posters, and by the relation of the threads' topics to the background knowledge of the users.

Publications

The contribution of the work presented in this thesis has been recognised through peer-reviewed publication, which provided the basis of Chapter 3 and some of the review text in Chapter 2:

Nontasil, P. and Payne, S.J., 2019, April. **Emotional Utility and Recall of the Facebook News Feed**. In Proceedings of the 2019 CHI Conference on Human Factors in Computing Systems (p.22). ACM.
<https://doi.org/10.1145/3290605.3300252>

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CHAPTER 1

INTRODUCTION

1.1 Chapter Overview

There are currently several social media platforms, including Facebook, Twitter, and Instagram, among others. At the time of writing, Facebook is the most popular social media site. Statista.com (2020) reports that there are 2.50 billion active users, with potential increases every year. The modal Facebook users is 18 – 25 years old and of 54 percent are female. They have, on average, 155 Facebook friends and spend around 144 minutes on the site each day. As Pempek, Yermolayeva, and Calvert (2009) stated that users spent more time reading contents on their news feeds rather than posting new contents. Therefore, in this thesis we investigated why people spend so much time browsing Facebook or reading their news feeds (despite possible and widely publicised negative impacts). This question has been explored in different ways and there is no single answer to this question. In the literature review of this thesis, we explored some of previous research that relates to this question, organised under six general theoretical themes.

First, and most commonly in the literature, the uses and gratifications theory (U&G) has been employed to explore why people use Facebook. This theory is a popular theory for understanding mass communication which asks two questions: what do people do with the media? and why do they use them? (Ruggiero, 2000). Previous studies have investigated in the aspects of compelling affordance of using Facebook features for social interaction. The pattern of Facebook usage indicated that people use Facebook for social searching (i.e. maintaining old relationships) rather than

social browsing (i.e. creating new relationships) (Lampe, Ellison and Steinfield, 2006; Joinson, 2008). However, the U&G theory has been explored in terms of Facebook design perspective. This issue leads to the second theoretical theme.

Second, Facebook can be seen as an example of deliberately persuasive design. Persuasive design has become one of the most important factors that influences people to change their behaviours and then, over time, these behaviours are performed in a habit loop (Fogg, 2003; Comber *et al.*, 2013). To perform a habit loop, people would be triggered by cues such as Facebook notifications. These cues motivate people to access Facebook and search for the information prompted by the notifications. People then receive preferred rewards. It seems that people often receive a reward regardless of whether they have a positive or a negative emotional experience while browsing Facebook. It is also easy to form habitual behaviours through a routine of browsing Facebook and receiving rewards.

Third, Facebook will sometimes provide its users with emotional rewards. The frequency of these rewards will influence the persistence of their Facebook browsing behaviour and contribute to habit formation. Partial reinforcement schedules are used to describe the characteristic of Facebook rewards, namely uncertain and unexpected rewards. Similarly, Facebook users might receive interesting posts as a reward on their news feeds. The users will continue browsing Facebook, even though some of the displayed posts are not interesting as they are hunting for the next reward. This suggests that Facebook users are influenced by a partial reinforcement schedule. Moreover, this reward schedule has a more powerful effect on changing behaviour.

Fourth, gathering information rewards when browsing Facebook can be considered a form of information foraging, and this perspective allows some insight into how users might decide which threads to read fully, and when to quit browsing. A decision to quit will be made using the foraging theory framework (Pirolli, Peter and Card, 1999). Foraging theory argues that people will leave an information source when the rate of encountering information at that source has decreased (Payne and Reader, 2007). This

leads us to hypothesise that people might leave Facebook as an information source when their emotional experience is diminished.

Fifth, receiving rewards in a sequence during an episode of use is likely to create a memory bias. The memory bias is a theory for explaining addiction behaviours. For instance, gamblers continue playing, despite fewer occasional wins. In such cases, gamblers may remember their wins better than their losses. Therefore, the overall utility of the gambling experience is overstated in the remembered utility (Keren, Gideon and Wagenaar, 1988; Rachlin, 1990). Rachlin (1990) also stated that a single episode of gambling might be encoded in memory as a string of gambling if the ending result is a success. The final success affects to the remembered utility in what is called a recency effect. To apply this concept to our study, people might receive and remember preferred rewards when reading posts on their news feeds. Accordingly, they may estimate the overall experience utility as a high valence experience. High valence experiences are more likely to impact remembered utility, as some prior studies have claimed that people remember more emotionally valenced experience better than neutral ones (Rubin, 1999; Dolcos, LaBar and Cabeza, 2006).

Finally, the rewards that Facebook users experience can be characterised as Emotional Utility, and this perspective opens important questions about how emotions are processed and remembered.

Consequently, our approach explored the impact of memory and emotional utility on browsing the Facebook news feeds. The emotional experience of browsing the news feeds might influence people's memory and lead them to continue browsing their Facebook news feeds. People might receive emotional experiences as preferred rewards and then might expect to receive these rewards in the future when browsing Facebook. In short, the retrospective emotional experience of browsing the Facebook news feed might influence future experiences, due to the memory. This assumption is related to the peak – end rule. This theory attempts to explain how people summarise an experience that varies over time and suggests that they do this based on how they felt at the peak intensity of the emotional experience and how they felt at the end of

the emotional experience of the event. Rather than using the average of the emotional experience of the event, people evaluate their experience based on these points during the event. This theory is clearly related to our idea that the news feeds might be attractive because of the remembered utility and emotional utility.

1.2 Research Questions

The aim of this study is to explore the appeal of social media, more particularly, the appeal of reading the Facebook news feed. The following general questions have been formulated and will be addressed in this study:

The general research question for our thesis is: **‘Why are social media platforms so compelling?’ What accounts for such high level of use of social media such as Facebook?** In this thesis, we explored how people form habits, particularly regarding Facebook browsing behaviour. Habits are formed by cues, behaviours and rewards. Therefore, we are interested in the rewards of Facebook browsing that might be a reason why people keep browsing Facebook and what the rewards of Facebook browsing are. We investigate, in particular, the positive emotional experiences while browsing Facebook. Also, we assume that people do not receive the rewards all the time. However, if they do not receive a reward every time then why do they continue to browse? Therefore, another question is **‘How is the emotional experience of browsing Facebook remembered?’** To explore each research question, we narrowed down these general questions to specific research questions. The following specific research questions are formulated and addressed in this thesis:

RQ1: What emotions do people remember shortly after reading Facebook and how is this affected by their emotional response to individual threads?

RQ2: Do people remember threads as following the classic serial order effects?

The first two research questions are addressed as follows throughout the thesis. The main objective of this thesis is to investigate the potential of memory bias for emotionally positive threads. We will test whether Facebook users experience positive emotions such as happiness, and pleasure, from contents on Facebook and whether their memory of social media interactions is biased toward the positive. Chapters 3, 4, and 5 present experiments that help answer these questions.

In that study, we found the overall retrospective judgement was rated positively. We assume that the distortion of the overall retrospective judgement might occur by the peak judgement which was more positive. Therefore, we hypothesise that the overall retrospective judgement could generate better calibrated emotional memories if the end judgement is depressed. This leads to the research question: RQ3 that will be tested in Experiment 2.

RQ3: Can overall retrospective judgements be reduced if the emotional response to the end thread is depressed?

RQ4 and RQ5 are addressed in Chapter 5 (Experiment 3). We explored inside the peak – end rule effect and the emotional evaluation of the news feed by investigating users' precise emotional responses as well as their valence. Additionally, Facebook content contains different types of media (i.e., texts, pictures and video). We explored the effect of various types of contents on user's recalled and forgotten threads.

RQ4: What do people most commonly feel when browsing the news feed? and do some of their emotional-type labels play a bigger role in their memory and the retrospective judgement than do others?

RQ5: Does the medium of Facebook posts affect the likelihood of threads being recall or the emotional response of browsing the news feed?

In that study, we learn that ‘interest’ is a key emotional response to news feed threads. Consequently, a final study was designed to explore whether theories of interestingness might allow insight into which threads are most attractive to users, and therefore are likely to produce the peaks that influence their overall emotional response.

RQ6: What aspects of a new feed thread determine its interestingness?

1.3 Research Methodology

A quantitative approach, which we used in this study, involves the systematic empirical investigation of observable behaviour (Palys and Palys, 2002). We used this method to explain the relationship between users’ behaviour and their emotional experiences. Thus, we will test the relationship between one and more variables, testing on the hypotheses of this study.

We therefore designed an experimental method and a questionnaire method. The experimental method was unusual to the extent that participants browsed their own Facebook pages – so that the “stimuli” were not identical across participants. Screens were recorded during interaction, but only so that the participants themselves could look back at their experiences, to mark their own recall performance and to judge the threads that they had read.

We used self-report questionnaires to ask participants about their social media behaviour and emotional experiences. We used Likert-type scales to collect quantitative data, especially emotional experience data.

Social science researchers often use Likert scales to evaluate subjects’ attitudes (Croasmun, 2011). While even and odd response rate categories have been employed in various studies, researchers have expressed concerns about the reliability of the response rate of both (Armstrong, 1987; Hartley and Maclean, 2006; Lee and Ma,

2012). Considering these aspects, and the need to clearly distinguish positive from negative emotions, and to allow a neutral response, this thesis uses +10 to represent the most positive emotional experience, -10 to represent the most negatively emotional experience, and 0 to represent a neutral emotional experience.

In this thesis, multiple regressions and ANOVA were used to analyse data that came from the Likert scales. The Likert scale is a set of ordered categories which is suitable for non-parametric statistic (Jamieson, 2004). However, some statistics scholars claimed that the Likert scales (probably called the Likert rating) can be analysed with parametric statistic if the scales have at least 5 points and appropriate sample size (i.e. not too small) (Glass, Peckham and Sanders, 1972; Carifio and Perla, 2007; Schwartz, Wilson and Goff, 2018). The interval values between each point should be approximately equal and it would be interval data that can be used in parametric statistic.

Additionally, there were earlier studies of the peak – end rule which used the Likert scales to collect participant's emotional experience of an episode and also used parametric statistic, especially multiple regression models to predict the retrospective judgement (Fredrickson and Kahneman, 1993; Kahneman *et al.*, 1993; Geng *et al.*, 2013). Because the work in this thesis contributes to this tradition, similar analysis techniques are performed. Due to this, a multiple regression, ANOVA and Pearson correlation coefficients are reported in this thesis.

1.4 Research Ethics

The experiments in this study included no hidden procedures and no deception was involved. Participants were informed that their data being would be collected, and it was made clear that such data would be recorded anonymously and could not be traced back to the individual. Participants were also informed that the results of the study might be published in an anonymised form. Additionally, participants could withdraw from the experiments at any time without any reason. Each study in this thesis

received the ethical approval by the University of Bath. (EIRA1 No: 3210, PREC No: 19-268, PREC No: 20-163).

For the purposes of managing our research data, we also created a Data Management Plan. This plan explains how we collected, stored, shared and preserved data in this thesis (see in Appendix A)

1.5 Thesis Outline and Contributions

This section provides a summary of the content and contributions made in each chapter of this thesis.

Chapter 2

This chapter provides an overview of the published research literature to date and outlines many theories related to the appeal of Facebook to its users. We begin with the narrative of Facebook as a Service, which explores how people use Facebook and how Facebook's algorithm functions. We then move to explore how people are motivated to Facebook by investigating the users and gratification theory (U&G). Due to the Facebook's features, Facebook's persuasive design may be a problem in making Facebook so attractive. The discussion then moves to interactions with information on the internet in particular, social media in terms of information foraging theory. Finally, we delve into emotional utility and memory bias theories to investigate the possibility that users retain overly positive memories of the experience.

Chapter 3

In this chapter, we explore the effect of memory bias along with the emotional utility of reading a Facebook news feed on overall retrospective judgements (**RQ1–RQ2**). Experiment 1 of this thesis was conducted in a laboratory at the University of Bath. Participants were individually invited into the laboratory. Participants were asked to browse Facebook for around 10–15 minutes and choose when to stop. They later rated the overall emotional experience of browsing and then attempted to recall the threads

they encountered. By looking over the video of their interactions, they were able to report the threads they had forgotten and to provide an emotional rating of every thread that they had encountered.

The contribution of this study was our finding that there were overall more positive emotional experiences of browsing Facebook. The recall of threads followed the classic serial order effect: participants better remembered the order of the first three and the last three encountered threads. The findings also showed that the more positive and higher-valenced threads were more likely to be recalled. Most importantly, that study confirmed that the peak–end rule can predict the overall retrospective experience of browsing Facebook.

Chapter 4

This chapter aims to test whether the overall retrospective judgement can be depressed somewhat (and therefore made more consistent with the average experience), if the end judgment is depressed (**RQ3**).

Before starting the experiment, each participant in the experimental group was instructed to stop browsing Facebook after they had a negative emotional experience while browsing Facebook. To allow this quitting rule, while browsing Facebook, participants were asked to rate their emotional experience of each thread as they encountered it. After the browsing episode, they were asked to rate their overall retrospective emotion and to attempt to recall the threads that they encountered.

As for the contribution of this chapter, we found that there was no evidence in this study that the overall retrospective evaluation could be predicted by the peak judgement and the end judgement. Rather, it was well predicted by the average emotional experience of the whole episode. This was disappointing as a failure to replicate the peak-end rule as well as a failure of our intervention. We reasoned that asking participants to name and judge each thread as they encountered it might lead to an overly analytic approach to threads and to the retrospective judgment of the

episode. Certainly, the method was less naturalistic than that used in the first study, and so that more naturalistic approach was returned to in the next experiment.

Chapter 5

The chapter aims to replicate the peak–end rule in the context of browsing Facebook and asks participants to express particular type of emotions so as to further uncover the emotional experience of browsing Facebook, as well as how different types of media affect the emotional experience of browsing Facebook. The procedure of this experiment builds upon the main procedure of that described in Chapter 3, but this time participants were asked to report their emotion labels and the type of media for each encountered thread after recall. To answer **RQ4** and **RQ5**, we report findings from our quantitative data that offer two contributions: first, we detail what emotional labels are most commonly used for describing the emotional experience of browsing Facebook, and second, we describe the effect of media type on Facebook users' memories.

We found that the *interested* label was a popular emotional label that participants selected to describe their emotional experience, either the overall retrospective judgement or the emotional experience of encountered threads. The *interested* label can play a large role in the overall retrospective judgement and could predict the overall retrospective judgement. In addition, regarding types of medium in Facebook posts, we found that the video medium, and the text medium were remembered better than picture medium.

Chapter 6

This chapter reports the final experiment of this thesis (Experiment 4). In Experiment 3, we identified the impact of the *interested* label on the retrospective judgement of a Facebook browsing episode. Experiment 4 aims to develop insights into the *interested* label: namely, the reasons why people are interested in threads, even if they are not

interested in all of the threads they encounter (**RQ6**). Experiment 4 was conducted on an online platform, making it more similar to a field study. Participants were recruited from Prolific, a participant crowdsourcing platform. In this experiment, participants were asked to browse Facebook. While browsing Facebook, participants were asked to complete a set of questions for each encountered thread. After browsing, they were asked to rate their overall emotional experience of the Facebook browsing episode.

The contribution of this study is its identification of the closeness of the reader's relationship to the poster, the amount of prior knowledge and the amount of knowledge acquired as the reasons that a thread on Facebook is deemed interesting.

All these factors were strongly positively correlated with the emotion 'interestingness'.

Chapter 7

The final chapter provides a review of the findings and the main contributions of this thesis. We also identify some limitation of the thesis and offer the potential direction for the future work.

CHAPTER 2

LITERATURE REVIEW

2.1 Chapter Overview

In this chapter we will review theoretical literature that might help to understand why Facebook is so compelling. We will first briefly explain this in terms of particulars of Facebook use and Facebook's algorithms. We will then turn to literature on the motivation for using Facebook in term of the resources it provides. Next, we move to Facebook's persuasive design approach. The persuasive design might be a leading cause of Facebook's appeal. There are three components of persuasive design; the cues, the behaviour and the rewards. We will explain these components and give some examples which are associated with Facebook design. Finally, we move to consider the issues in terms of general psychological phenomena of utility and remembered utility.

2.2 Facebook as a Service

“Why do people spend so much time browsing social media?” is a common question and many commentators and scholars have sought answers to this question. Digital Global (2018) reported that 4.2 billion people are online (i.e. have ready access to the internet) while 3.03 billions of these users have social media accounts. Also, they reported people spent an average daily time using social media of 116 minutes. Facebook was at the top of social media market shares in 2018 (Figure 2.1). Facebook's number of active users has increased year on year between 2008 and 2018 (Statista, 2018). At least 2 billion people browse at least one Facebook service every

day (Gabrielle Canon, 2018). These statistics show many people join in virtual online communities where they are able to create individual profiles, make a comment, and interact with friends either real friends and virtual friends (Kuss and Griffiths, 2011).



Figure 2.1 The layout of Facebook news feed (Accessed date: 01st January 2021).

Facebook is perhaps the most popular social media because it supports a virtual community (Bechmann and Lomborg, 2015). People are able to access Facebook either from a personal computer in a browser or a smartphone through the Facebook application. To use Facebook a person needs to have a Facebook account and then create their own profile page. In order to build a network, Facebook users need to add friends, either people who are already offline friends or online-only friends who meet on Facebook, by sending a friend request or accepting friends who sent a friend request to them. Users can also follow some organizations, brands and celebrities that they are interested in. After the users build a network, they can share information and interact with other members of the network.

Facebook provides several services as a social media site. These services include creating and sharing content for friends to view, making comments to public posts or posts made by friends, clicking positive and negative emotional ratings of others'

posts via emoticons, chatting with friends and doing live streaming. Facebook is somewhat different from other social media sites. Several others have some common services (e.g., creating, commenting and sharing contents) but fewer services than Facebook. The very range of Facebook services might be part of its appeal to social media users.

The news feed is generally the main Facebook page for users. This is a sample of posts in timeline order, with comments displayed (or displayed on request) under each post (a post and its comments are called a “thread” in this thesis) Users can explore information on their news feed. Each user will see different information on the news feed, depending on a stochastic (and secret) algorithm that Facebook uses to adjust the probability of any thread appearing. Facebook’s content-ranking algorithm tries to estimate what each user will be most interested in and what they are most likely to interact with. Facebook uses content ranking algorithms. There are four factors in Facebook’s approach to content ranking (Swan, 2019). First, the inventory is a list of all contents that are posted from friends and publishers. Second, signals represent information as a trigger that are received from a Facebook user. The signals can be divided into two groups: passive signals and active signals. The passive signals are view time, time posted and searched information on Google while the active signals are likes, shares and comments. Third, predictions represent the positive interaction behaviours of users. Lastly, scores are the final number that are assigned to each piece of content. The scores of each pieces of content will be ranked by algorithm. The piece of content that has a high score will be presented on user’s news feed. It seems that the Facebook algorithm focuses on user experience and is particularly weighted towards positive emotional experience. Facebook users might receive positive emotional experiences when they are browsing Facebook and reading interesting information that is displayed by Facebook. Therefore, the news feed and its content-ranking algorithm might be another important reason why Facebook users are compelled to continue browsing it.

On the other hand, there are some evidences in the design of Facebook-related apps that users are concerned about how compelling Facebook is. For example, there is a range of social media time management applications. On January 2018, Facebook, Instagram and YouTube launched New Screen – Time Management feature to limit social media use (Ranadive and Ginsberg, 2018). This feature shows how much a user spent time on each social media in daily, weekly and monthly. The user can define their browsing time between 15 minutes and eight hours in a day and set the notification when the user spent time browsing social media reach to the limited time. The summer of the same year, furthermore, Apple and Google also launched a tool which has similar social media's functionality but this tool is embedded on IOS and Android (Apple, 2020; Google, 2020). Due to this, this tool takes over social media feature. The operating system (OS) feature can control and notices all applications that are installed on mobiles or tablets. The popularity of such tools suggests that some users try to control and limit their social media browsing time.

To summarise, the Facebook algorithms and Facebook design, the informational resources it provides are presumably primary reasons for why social media and Facebook in particular is so compelling. In the next section we move to explore some previous studies that explained what the motivations for the usage of Facebook are.

2.3 How Facebook Features Motivate its Users

Uses and Gratifications on Facebook

The “uses and gratifications” approach began as an audience-centred approach to better understanding mass communication from traditional media (e.g., TV, radio) to internet media (e.g., social media, online advertisement). The uses and gratifications approach is used to explain “how” and “why” people use media and not how and/or why social media uses people (Katz, 1974; Ruggiero, 2000; Joinson, 2008). Recently the uses and gratifications approach has been explored in terms of social media. People presumably use social media to fulfil their needs which leads to increased gratification: this body of research attempts to itemise these.

Studies have investigated what the reasons are that keep people using Facebook and how they feel during that usage. The results of these studies reflected the pattern of Facebook usage. Lampe, Ellison and Steinfield (2006) investigated how students use Facebook by focusing on two types of information gathering behaviours: social searching and social browsing. The students, who were studying in Michigan State University (MSU), joined the university group on Facebook to communicate with their friends and classmates. All participants were asked how they use Facebook via an online questionnaire. The results show that keeping in touch with their offline friends and finding out more detail about their offline friends were the highest scoring reasons, while finding new people to date and finding casual sex partners had lower ranking. Based on these results the researchers stated that the students use Facebook for social searching rather than for social browsing. This implies that maintenance of their offline friends' relationship was the primary usage of Facebook for these participants, in the early years of Facebook. This seems contrary to one primary function for using social networks, that is for connecting with unknown people in online communication.

In the first article on social media to directly refer to the uses and gratification approach, Joinson (2008) explored the uses and gratification of Facebook. Two studies were conducted. The first study used an online survey to gather participants' information. The participants were asked about general demographic information and their usage of Facebook such as time spent, number of Facebook friends, history of Facebook uses. Keeping in touch was the main reason why participants use Facebook. The second experiment used open ended questions for collecting data from the participants of the first study. The participants were asked to answer questions with words or phrases to describe how they used Facebook and what they enjoyed about their usage. Statistical analysis of the answers revealed seven factors: social connection, shared identities, photographs, contents, social investigation, social network surfing and status updates. The results of this study confirmed that keeping in touch was still the primary reason why people use Facebook. People use Facebook to see how offline friends and/or old contacts are, how they look and how they behave.

Also, people need to maintain relationships with their offline friends and old contacts whom they may not meet very often. Similar to Lampe, Ellison and Steinfield (2006), social searching and social browsing were found to be the most important reasons why people used Facebook. Social searching is when people have a target to investigate while Social browsing is where people browse randomly to find friends through Facebook.

Papacharissi and Mendelson (2010) focused on the social utility of Facebook. Undergraduate students were recruited for this study. They were asked about Facebook uses and their motivation for Facebook use. In order to establish usage patterns, the participants were asked about their general uses of Facebook. The participants self-reported that their time spent browsing Facebook was approximately 36 minutes a day and 74 minutes per week. 86% of participants accessed Facebook daily. The majority of participants had more than 51 Facebook friends. The researchers analysed the motivation for Facebook usage in term of nine factors: expressive information sharing, habitual pastime, relaxing entertainment, cool and new trends, companionship, professional advancement, escape, social interaction and new friendship. The participants reported that they often interacted with Facebook as a habitual pastime and entertainment such as playing games, posting either new photos or content and writing on their friends' news feed. They also reported that they used Facebook because it is a new trend and increased professional advancement. In order to gain more insight, the participants were asked to answer open-ended questions which revealed they used Facebook for social escape as well as boredom relief. This long list of reasons echoes the comments above about Facebook providing several independent services.

Spiliotopoulos and Oakey (2013) performed another study that attempted to explain motivations for Facebook use by exploring a uses and gratification approach. They claimed that the U&G approach can help researchers gain a comprehensive understanding of user's behaviour from Facebook use. This study aimed to explore Facebook user's motivations for using Facebook by investigating behaviour patterns

and Facebook network structure. For the methodology of this study, these authors expressed a concern with U&G studies, i.e. that the result from self-reporting on either a questionnaire, or through a focus group interview, which were typically used in the U&G studies, could therefore be laden with personal bias and this is an unfortunate limitation. However, this study used more automatic, computationally captured data, instead for relying on self – reporting. This study used the Facebook API to access participant’s information of Facebook use. The finding of this study was analysed by using the seven factors which were identified by Joinson (2008). The results show that users’ motivation of Facebook use can predict the use of different features on Facebook. One factor in this study found the interesting information: the shared identities factor. Joinson (2008) and this study reported the shared identities factor was influenced ‘like-minded people’ to join with the number of groups or events, organize groups and events as well as communicate with other people who belong to the same group or event. Additionally, this study further reported that was the number of links posted was associated with the rated importance of this factor. So, this implied that resharing information was the way for communication in the group or the event.

All above “Uses and Gratifications” studies explored in general term of the pattern of Facebook use-pattern by using self -report measurement. The studies examined how and why participants used Facebook in general and how some users might typically be more important than others. For example, it seems that people might frequently use Facebook to maintain their offline relationship on Facebook (Whether such findings are stable over time in a different matter). However, Facebook provides many features to users. Different features might differ in the aims of use. Therefore, there are some studies which explored in more detail by analysing the uses and gratifications associated with these specific features.

Smock, Ellison, Lampe, Wohn (2011) stated that Facebook is like a toolkit and that it has a user-centred design. Their study investigated motivational predictors for Facebook use by comparing between general features and specific features. The features distinguished for this analysis comprised: status updates, comments, wall

posting, private messaging, chat messaging and groups. Smock et al (2011) compared the motivation for use of these individual features rather than the overall use of Facebook as a whole. Previous studies used overall time spent on Facebook as a measurement but this study used nine surveillance factors in the same way as Papacharissi and Mendelson (2010). Participants completed an online survey, including general demographic questions, Facebook use questions and a set of questions about feature uses as “I use <a feature name> often”. In this set of questions, participants selected a response from a Likert- type with 5 scales from strongly disagreed to strongly agreed. The results show that only three motivation factors (relaxing entertainment, expressive information sharing and social interaction) had positive associations with the general features but the other six motivations were related to specific features. They found that different motivations of use underpinned the usage of different features. Using status update and Groups are an easy way to broadcast information to Facebook friends. Both features can motivate people by expressive information sharing. They reported that people might use these features for self- presentation as well. Additionally, people were motivated by these features to interact with social, exception for groups. They assumed that people used groups for sharing information, rather than building a new relationship. This assumption is similar to Lampe, Ellison and Steinfield’s (2006) assertion that the use of Facebook is to maintain an existing ties. For professional advancement, people will use wall posts and private message. Wall posts are an easy way to find a job and get feedback from Facebook while private message is more comfortable and a more private channel. Consequently, the user’s motivation for using Facebook predicts the usage of different features of Facebook.

Karnik, Oakley, Venkatanathan, Spiliotopoulos and Nisi (2013) explored and extended the scope of uses and gratification of social media with particular attention to Facebook’s group features. This study was different from the previous Spiliotopoulos’s study. The previous study focused on the general feature and asking participants about the overall Facebook use while this study focused on the specific features which was a group feature concerning the management of Groups. The idea

of a Group feature on Facebook is to create a network community so that members in the group have the same interests, for example, this study created a group called “Saturday Morning Classic”. This group functioned in the same way as a forum to post, comment and share views about a classic song. There were 167 members, 833 items of posting, 836 instances of “like” interaction, and 355 of comments in the year after this group was published. Karnik et al.(2013) call this a “medium sized” group. Some members who were in this group took part in this experiment. Twenty participants were asked to generate words or phrases to describe how they used this group and what they enjoyed about their usage. Four factors were identified in the analysis. These factors were contribution, discovery, social interaction and entertainment. However, this paper focused on the content community, so only two factors were relevant: community and discovery. The paper reported that a Facebook group is a unique context, and it shows that this Facebook feature was able to motivate people to use Facebook. Similar to Smock et al. (2011), they concluded that Facebook is a toolkit that provides many features. The motivation of Facebook use is motivated by the appeal of different features.

Krause, North and Heritage (2014) examined the uses and gratifications theory (U&G) of using the Facebook music listening application. This study applied the U&G approach in relation to specific feature use in a similar manor to the above studies. They replicated an experiment from previous studies. Facebook allows users to install third party applications such as game applications and music applications. Due to this, the objective of music applications on Facebook is to share music information on users’ news feed such as their music playlists, and what music they are listening to now. The aim of this study was the detailed explanation of the motivation of using music listening applications on social media such as Facebook. This study identified three factors of the uses and gratifications: communication, entertainment and habitual pastime. Participants who took part in this study were asked to complete demographic, general and specific Facebook feature questionnaire. The finding shows that participants used Facebook music listening to support communication and entertainment gratifications. Additionally, the habitual pastime

gratification of Facebook use is a unique motivation. Generally, the aspect of habitual pastime for general features is sharing links and playing games. However, this study found another aspect. It is easy to create a habit of using the music listening application of Facebook because Facebook provides an easy channel to use this feature.

Quan-Haase and Young 's study (2010) compared the gratification on social media between Facebook and Instant Messaging (IM) by testing the uses and gratifications approach. Participants reported that Facebook and IM had some similar gratification needs such as communication and socialisation needs. All participants used both tools as a pastime activity, having fun, relaxing, and procrastination from their responsibilities. However, there were some different gratifications. Facebook provides more features than IM's features. The participants reported that they used Facebook for searching their friends' activities, and social information. Also, the information on Facebook is asynchronous communication - an online forum - like email whereas IM is a synchronous communication tool. IM allows users to communicate and share personal information to their offline friends. Facebook and IM appear to have different aspects of use. If people would like private online communication, they should use IM. In contrast, if they would like to share their own ideas or explore new ideas, they should use Facebook. This study also shows that the use of Facebook is for social searching and social browsing.

In this section, we reviewed the literature on the uses and gratifications approach (U&G). We found that Facebook is a tool for fulfilling people's needs. This tool allows users to create their own post, share personal information and other information they are interested in, upload their pictures and interacting with friends' posts (Papacharissi and Mendelson, 2010; Lee, Xiong and Hu, 2012) Facebook also provides a large audience consisting of either offline friends of friends or unknown people (Back *et al.*, 2010). Additionally, it develops and maintains social relationships between users (Burke, Moira and Kraut, 2014). People use Facebook for social searching rather than social browsing (Lapides *et al.*, 2015). Across all these studies,

the U&G theory tends to offer explanations at the same level as a straightforward analysis of Facebook functionality from a design perspective. These studies offer limited insight into the psychological mechanisms that underpin Facebook's success.

In the next section, we look at particular aspects of Facebook's interactive design in order to explain how these might relate to psychological mechanisms and help us to understand why features or functions motivate people to browse Facebook.

2.4 Facebook as Persuasive Design

Facebook design seems to follow several principles of persuasive design, with its target being to persuade its users to use it more. Persuasive design is a method of design that focuses on influencing and changing human attitudes and human behaviour (Fogg, 2003). Galdo (2011) states that persuasive design is about usability and that it also focuses on an user-centric approach. Service and product designers understand that emotional experience influences human behaviour and decision making. Persuasive design helps the designers to understand what users need and how users are motivated to use their products. Of course, in terms of social media, the designers design social media platforms by following user's needs. But likewise, they will focus their design on how to keep users using the product by using persuasive design principles. There are four successful behaviour outcomes of persuasive design in social media; (1) a user creates a personal profile page, (2) a user invites friends, (3) a user creates their content and/or shares content and (4) a user returns to the site often (Galdo, 2011).

The Facebook behaviour outcomes seems to follow Galdo (2011). For example, first, Facebook provides a set of group menus to create a Facebook user profile as well as user accessible edit button for amending their information anytime. The information is of a highly personal nature (i.e. mobile phone, sexual orientation, relationship status), users seems to be willing to input their information. Facebook designed the process of creating and interacting with the main profile page to be straightforward. Secondly, Facebook provides an easy feature to find new Facebook friends. Facebook users can input an offline friend's email contact or a Facebook account name on the

add friend's page. Facebook also suggests new friends to users. Thirdly, the users can create a post on the Facebook page into a text box on the top centre of the profile page with a question as "what is on your mind, [user's account name]". The user feels free to create a post, tag their friends and to check in using their location on that post. In addition, if the user's friend creates a new post or comment on their wall, Facebook will send a notification via a Facebook notification or email to the user. This feature leads to the fourth outcome that is the user will return to Facebook as they may feel compelled to check that notification.

A further aspect of persuasive design is the ability to create a habit loop through repetition. There are three components of habitual behaviour; a cue, a routine and a reward (Bargh, 1994; James, 2012). A habit is a behaviour that tends to be initiated and performed unconsciously. It is interesting to consider how Facebook implements these components so as to drive habit formation.

2.4.1 The Cues

The cue is a stimulus which triggers a routine performance and leads to automatically repeated behaviour and habit (Fogg, 2009). The cues are either an internal trigger or external trigger. The internal cues are triggers that are caused by a cognitive or sensory process, whereas the external cues are triggers from the individual's physical environment (Larose, 2010). In terms of social media use, the cues – as triggers – could be social media notifications which are designed to inform and prompt users. The notification is a robust external stimulus that causes the habitual behaviour to be exhibited. Additionally, the internal cue of social media use is an emotion, either positive or negative that will be occur at the same time. Emotions have significant power in driving habitual behaviour. For example, a positively internal cue can trigger user's memory to contribute further positive emotions. A negatively internal cue will be the opposite side of a positive cue and there is one negative cue in particular – fear of missing (FoMO) – that is, according to some studies, very powerful in driving user's Facebook behaviour. The outcome of FoMO can be called a motivated cueing. Wood and Neal (2007) stated that the motivated cueing is a form of the past rewarding

experiences. When a behaviour occurs, and the outcome of the behaviour is rewarding then this reward can be a cue for doing the same behaviour next time. Below we be reviewing the literature on the fear of missing out.

The concept of fear of missing out (FoMO) is that people have a desire to keep up with some information, for example, what their friends are doing, what events will be exhibited soon (Przybylski *et al.*, 2013; Beyens, Frison and Eggermont, 2016; Błachnio and Przepiórka, 2018). People who fear missing out of their friends' information on social media need to keep continually updated with what others are doing on the Facebook news feed. The earlier studies of FoMO were briefly explained below.

Przybylski (2013) and Alt (2015) studied of fear of missing out on the user of Facebook for college students and adults, however, found little evidence of FoMO with social engagement. Alt (2015) concludes that college students might be motivated to use social media as a tool in their classroom. This study assumed that FoMO might be a mediator link between motivation and Facebook use. The result shows that FoMO has a positively significant effect between those variables. FoMO might be an indicator for increasing a level of social media engagement in classroom. Similar to Przybylski (2013), they found that the high level of social engagement is predicted by FoMO, especially in younger participants.

In summary, fear of missing out (FoMO) is more powerful to drive habitual behaviour and is reported to have negative outcomes in the individual user's life such as stress and lower life satisfaction. The level of FoMO in younger people is probably higher than in adults. As a result, the high level of FoMO encourages people to use social media more leading to a high intensity of social media use (Traş, 2019). Higher level of FoMO has been associated with high level of Facebook use. Facebook's notification feature has been created to accelerate the FoMO pheromonal. The feature is as a completion with time, due to information on the news feed is always updated. Many people will come back to Facebook instantly when they receive the notifications. As a result, the outcome of this behaviour is a successful and rewarding

experience as they will gain the information that they prefer to see. From this we can summarise that Fear of Missing out acts an internal cue to habit formation.

2.4.2 The Behaviour as a Routine

Forming the behaviour or repeated behaviour as a routine is the second component of a habit loop. A new repetition of a habit will be performed when a reward was received, and the behaviour was triggered from a cue. Lally et al (2010) experimented on the process of habit formation. Participants were asked to choose a healthy eating, drinking or exercising behaviour and were asked to perform it as a habit. Participants were asked to do the preferred behaviour for 84 days. While performing the behaviour, they were asked to report their performance of the previous day. For reporting the performance, participants were asked to rate their experience on a 7-point Likert scale. The results showed that complex behaviour would take a longer time to become a habit than would simple behaviour.

A repeated behaviour for browsing social media is one that has become habit. When behaviours are initiated for social media usage, conscious decision making will guide the behaviours (Hu *et al.*, 2018). Additionally, if people are learning and also receiving positive feelings from these behaviours, the behaviour will be repeated when they are in the same situation. Past behaviours can influence future behaviours while the current behaviours are automatic replications. These behaviours are developed over time. In this way, habits formed (Verplanken *et al.*, 2006).

Facebook is designed in a way that makes interaction an easy and simple task. For example, when browsing Facebook, people will probably not realise how much information has been absorbed and how long they have spent browsing Facebook. When scrolling down on the news feed new content will always been shown, creating an endless flow. This content is often unexpected. (Lewis, 2017). A scroll down task is a simple behaviour, with little effort and little time consumption. Therefore, Facebook encourages users to continue scrolling to develop a habitual behaviour.

2.4.3 The Rewards

Rewards are the final component of a habit loop. The rewards are represented by personal satisfaction outcomes that can be either extrinsic or intrinsic (Judah *et al.*, 2018). The extrinsic rewards would be things such as financial incentives while the intrinsic rewards can be, for example, a positive emotional experience. If the rewards are high, the rate of the behavioural repetition will be increased (Wood and Neal, 2009; Lally *et al.*, 2010). Therefore, the impact of rewards can improve the frequency of habit performance. Additionally, rewards are part of a behaviour change mechanism known as an “Operant Conditioning” which is a learning process that applies when a desired behaviour is performed and then modified by a reward or a punishment (Skinner, 1990). Learning processes can also explain why reward influences people to repeat their behaviours. Therefore, in the next section, we will explain the effect of reinforcement, in particular partial reinforcement on the motivation for repeated behaviours. Then this discussion will be grounded into the Facebook browsing context.

Reinforcement and Partial Reinforcement

Reinforcement refers to any consequence of a behaviour that makes that behaviour more likely to be repeated (or negative reinforcement makes it less likely to be repeated). Reinforcement is a closely related concept, therefore to "reward". Reinforcement learning is a rich explanatory theory for how animals will behave in the future, controlled by the consequences (or effects) of their current actions (Sutton and Barto, 2011).

Continuous reinforcement is when a behaviour is reinforced every single time it occurs. It is a strong relationship between an outcome (a response) and a behaviour. For example, you might be trying to teach a dog to shake your hand. During teaching, the dog is shown how to shake the hand by ordering. The teaching class will be set a schedule of training. If the dog establishes a behaviour, they will be given a reward. Eventually, the dog will accept the order and establish a certain behaviour every single time.

Partial reinforcement is where a behaviour is reinforced sometimes and not every single time it occurs. For example, imagine, you are teaching a dog to sit by telling him to "sit. In partial reinforcement, sometimes you tell him to do so but do not give him a reward even if he does so. A dog might not follow your order every single time. As Skinner describes, this distinction is one between schedules which 'are arranged by a system outside the organism (fixed and variable interval schedules) and those which are controlled by the behaviour itself (fixed and variable ratio schedules)' (Schoenfeld, Cumming and Hearst, 1956). Thus there are four kinds of partial reinforcement (Shrestha, 2017) see at the Table 2.1. The extensive literature on reinforcement explores how these different schedules affect acquisition - i.e. the locating of a behaviour, and extinction - i.e. how long a behaviour persists if reinforcement is withdrawn. We are particularly interested in a partial reinforcement, and which extends extinction, and which seems relevant to Facebook, in which rewards are delivered irregularly and stochastically amid non-rewarding material.

It seems to me that browsing Facebook behaviour may be associated with partial reinforcement and it has a variable ratio schedule. Users may have received either a positive or a negative emotional experience from an email or a Facebook post. Presumably it is the positive experiences that make social media attractive, but beyond this, the very irregularity of these positive experiences might encourage browsing Facebook behaviour as behavioural routine and, for example encourage people to keep browsing Facebook even if their overall experience is not terribly rewarding. Users may predict that they will feel happiness and enjoyment when on Facebook as well as other social media. This example implies that a response is reinforced after an unpredicted number of pleasant rewards, which includes a high rate of response and a low rate of extinction.

Presently, social media provide many features that have engaged reinforcing signals. These features, for example, "likes", "pull – to - refresh" and the red number over icons that indicate new information might all be expected to encourage repetitive behaviour.

Table 2.1 The four types of partial reinforcement.

Type of Partial Reinforcement	Description
Fixed - Ratio Schedule	A reinforcer is given after a specific number of responses. For example, after students correctly answer three questions, they receive a compliment from a teacher.
Variable - Ratio Schedule	Reinforcement is given after a changing number of responses. For example, a teacher gives candy to students who offer a correct answer but after a varying amount of responses.
Fixed- Interval Schedule	A reinforcer is given after a specific amount of times. For example, every minute a teacher gives students encouragement.
Variable - Interval Schedule	A reinforcement is given after a changing number of times. For example, a teacher gives candy to students every couple minute, but the time between reinforcement is always changing

Likes

Likes as a lightweight action are a good example of receiving positive feedback from Facebook. Facebook users receive likes as a reward of posting their contents and they might feel pleasure when they receive “likes” on their photos, status, and their posts. This feedback is the form of a variable – ratio schedule which is unpredicted rewards. Also, the likes are received at unpredictable times which the posters do not know when they receive them as a schedule. In this case, Facebook and Instagram as social media have tested removal of like counts from the posts because they believe it will reduce envy and dissuade (Leskin, 2019).

However, the study of Scissors (2016) argues that people care more about who likes their posts than how many likes they receive. This suggests that Facebook or other social media do not need to hide the amount of likes on the post. Rather social media should display who likes the post, in particular they are close friends, family and

partners. In summary, likes are a deliberately designed-in kind of reward when using Facebook. People may perceive the rewards. Because of perceiving rewards, Facebook may increase individual positive emotional experience such as happiness, enjoyment which engage them to continue using Facebook.

Pull – to - Refresh

The pull - to - refresh feature is a mechanism which allows users to manually retrieve new information on the news feed, instead of clicking a refresh button. This feature was created by Loren Brichter in Tweetie app and support on touch screen devices (Brichter, 2013). The designers anticipated that the pull – to – refresh feature changes users' behaviour when they are interacting with the application. When a user manually pulls or swipes down, they have no idea what the contents will be displayed. It is this unpredictable reward and whether it will be of interest to them or not. This reward, therefore, leads users to increase the likelihood of using the feature more frequently.

In summary, Facebook implements persuasive design that motivates people to use it. Some specific design features of Facebook are specifically intended to change users' attitudes and behaviour, and to encourage Facebook browsing behaviour to be repeated until it forms a habit loop. These mechanisms are another part of a full understanding of why Facebook is attractive to users.

Nevertheless, the news feed on Facebook contains a set of specific contents - pieces of information in a variety of media such texts, pictures, and video. Surely the specific informational and emotional value of these pieces of content are another aspect of Facebook's appeal. Individual users will actively choose what information to consume and will spend longer on Facebook if this information is more valuable to them. This behaviour can be explained by using information foraging theory.

2.5 Interacting with Information on the Internet as Information Foraging

In a typical day, an individual in our society will seek, gather, share and consume information both in the virtual world, such as the internet or in the real world.

Information foraging theory explains information consumption behaviour by assuming that people allocate their attention to information sources in their complex environment so as to maximise the rate of uptake of valuable information (Pirulli, Peter and Card, 1999). Information foraging was developed very directly from optimal foraging theory in biology, which analyses how animals maximise energy uptake by allocating effort across "patches" of food in their environment.

According to optimal foraging theory, while animals are searching for and gathering food, they maximise benefit per unit effort (or time)(McNamara and Houston, 1985). As Pyke, Pulliam, and Charnov (1977) stated, there are four steps in the optimal foraging theory. Firstly, an animal will choose food that it would like to eat. Then they will seek out where the food is located -- the theory assumes that food is distributed in patches -- i.e. it is more prevalent in some parts of the environment than others. When an animal begins to exploit a food patch its gain per unit effort might initially be high but will tend to fall as the patch is exploited (c.f. "low hanging fruit"). Thus, the animal always faces a decision about when to leave the current patch to invest effort exploring, in order to find another, more productive patch. A great deal of optimal foraging theory has been concerned with how to make this "patch leaving" decision.

According to Zhang (2009), human information foragers must make similar patch leaving decisions. As one text is read and learned from, its value diminishes, and it might be better to find a second text.

Reader and Payne (2007) explored the evidence of adaptive allocation of attention in terms of reading multiple texts in a limited time. They investigated how the reader allocates their time to multiple texts when they have a time limit. Participants were asked to read four texts that were about the human heart on simple web pages. These texts were varied on the levels of difficulty. Each participant was given a reading time of either 15 or 7 minutes. In this experiment, two independent variables (time and level of background knowledge) were investigated. After completing the pre-test questionnaire of the human heart, participants were informed of the instructions of

this study. While reading, participants were not allowed to take any notes. After reading, participants were asked to write an essay about the human heart. The length of the essay was specified to be approximately 250 words. The results of this experience showed an indirect relationship between time allocation and the level of background knowledge. The participants who had more prior expertise about the topic spent a longer time on the texts with a high level of difficulty and vice versa. In this case, Reader and Payne (2007) argued that the readers may have used an information foraging strategy. The participants set their own value of reading (i.e. how much they gained for reading a particular text) and kept reading the text until they found the value of it was reduced. They then moved to next pages or texts.

Information foraging has been applied to the design of World Wide Web. Internet users often access the internet to gain information for improving their decision making and problem solving (Pirolli, 2005). When users interact on a website, an effort – cost analysis will be involved. Continuing to read a website depends on the information forager’s judgment about whether the gain of valuable information outweighs the cost to do so. Likewise, somebody browsing the Facebook news feed will, according to this theory, monitor their gain of valuable information, and use this changing signal to determine whether to continue reading the news feed (and, recursively, a thread within the newsfeed). For example, Facebook users might browse and read some threads, but not all of displayed threads. The users might compare all threads by scrolling the home page. They will evaluate how much useful information that they likely to use or gain. Then they will read the valuable thread and leave the thread when its value has been diminished.

One aspect of Information Foraging theory that is stretched by the context of Facebook is “valuable information”. In most studies of information foraging, this has been operationalized as information that is relevant to particular learning goals. On Facebook, the idea of value or utility seems to need expanding. One possible expansion is to consider the emotional value of information.

2.6 Motivation By Emotional Experience

As reviewed above, earlier studies have explored motivations for using Facebook through the lens of uses and gratifications theory (U&G). This research found that Facebook features can motivate people to use the platform (Joinson, 2008; Papacharissi and Mendelson, 2010; Spiliotopoulos and Oakley, 2013). Moreover, users can maintain social relations by browsing news feeds (Lampe, Ellison and Steinfield, 2006). While this activity was found to be an emotionally-mixed experience (Lapides *et al.*, 2015), it may be the case that emotional experience, associated with reward outcomes, is another reason motivating Facebook use. The partial reinforcement of user behaviour may be achieved via the temporal rewards of Facebook use, such as likes and the *pull-to-refresh* feature. These rewards are accrued with little effort by interacting on the news feed, but their unpredictability may lead to compulsive acts, similar to gambling behaviour (Gilovich, 1983; Rachlin, 1990).

This compulsive aspect of Facebook use may increase the likelihood that browsing episodes will be remembered by users. Some researchers have found that gamblers' wins are better-remembered than their losses (Keren, Gideon and Wagenaar, 1988; Rachlin, 1990) although Gilovich (1983) argued for the opposite viewpoint. In any case, it is likely that recall of more valenced emotional experiences is greater than that of neutral emotional experience (Dolcos, LaBar and Cabeza, 2006). Therefore, the **emotional utility** of browsing the news feed may contribute to the memorability of the experience and increase the attractiveness of the application as a whole.

To understand how utility is experienced while browsing Facebook and how it is judged and remembered subsequently, we review the conception of utility from Bentham (1824, 1996) as well as the conception of the retrospective evaluation from the past episodes, in particular the peak – end rule from Kahneman and other scholars (Kahneman, Wakker and Sarin, 1997; Kahneman, 1999; Read, 2007).

The standard concept of utility was examined by Bentham (1824), who described it as “that property in any object, whereby it tends to produce benefit, advantage, pleasure, good, or happiness, (all this in the present case comes to the same thing) or

(what comes again to the same thing) to prevent the happening of mischief, pain, evil, or unhappiness to the party whose interest is considered: if that party be the community in general, then the happiness of the community: if a particular individual, then the happiness of that individual.”(Bentham, 1996, p. online). This idea that emotional response might itself be utility has been taken up by Kahneman (1993) and followers in a sequence of influential studies. Because emotions vary across experiential episodes, the idea of emotional utility for real behaviours seems to require some account of how a varying sequence of emotions might be summarised and remembered.

The peak-end rule is such an account, and we argue that it may play a role in social media users' memories of their interactions. The peak-end rule is a psychological heuristic (Kahneman *et al.*, 1993) which states that the overall memory of a sequence of experiences is determined not by the average of those experiences but by some combination of the “peak” experience and the “end” experience. It is a person’s experience of the peak and end of an event, therefore, that dominates attitudes and emotional responses to events of the future.

Kahneman, Fredrickson, Schreiber and Redelmeier (1993) studied the peak-end rule by exploring aversive situations. In his experimental studies, participants were subjected to aversive experiences (cold water immersion) of different durations. There were three parts to the procedure. First, all participants were required to put one hand into a plastic tub of water at 14°C for 60 seconds. They were then required to put the other hand into water at 14°C for 60 seconds as the temperature was slowly increased to 15°C. The participants kept their hand at this raised temperature for 30 seconds. Participants felt discomfort during both trials, but they experienced more pain in the second trial. In the third trial, each participant was required to individually choose between two alternatives: a short interval (14°C for 60 seconds) and a long interval (14°C for 60 seconds and 15°C for 30 seconds). After each trial, every participant was required to report their level of discomfort using a questionnaire and Likert scale. The questions assessed overall discomfort and the emotional experience attached to this,

both during and after the experiments. The Likert scales used to evaluate the overall emotional experience contained negative and positive scales of between -5 and 5, with the lowest number representing the greatest pain, and the higher number, the greatest comfort. In the moment-by-moment instrument, participants had to draw a continuous line to represent their level of discomfort across time. The results showed that there were a significant number of participants that chose the extended interval despite having to endure the pain for longer. It was theorised that they felt better at the end of the longer period because by that point, the water temperature had been slightly raised to a more comfortable level. Therefore, this study suggested that the retrospective judgement of aversive experience affected how future experiences might be evaluated. In terms of the peak-end rule, Kahneman's study demonstrated that the peak evaluation of pain and the level of pain at the end were a more powerful predictor of how the event was judged than the duration of pain. These findings were confirmed by the next study.

Fredrickson and Kahneman (1993) developed two explanations of this finding. Global evaluations can be described by a temporal integration model or a weighted averaging model. Temporal integration focused on the duration of the episode, and people may evaluate the global experience from the intensity of the experience over this period. In contrast, the weighted averaging model is independent of the effect of duration. In this model, the duration is ignored in the model, and an affective point of the episode, i.e. the peak, is selected instead. The peak-end rule is used to explain how the global experience of an event is rated by focusing on a peak and at the end of the episode.

Redelmeier and Kahneman (1996) studied how people evaluate the overall emotional experience of a painful situation. Their study explored the pain of colonoscopy and lithotripsy procedures. Participants were asked to rate their moment-by-moment emotional experience at 60-second intervals while the colonoscopy or lithotripsy was performed. Then, each participant was asked to rate the overall emotional experience within an hour after each procedure had ended. In the final experiment, the participants were asked to give their retrospective evaluations of how many doses of

anaesthetic they would require for the next treatment. The findings of this study showed that the duration of each procedure did not produce a significant effect on the overall emotional experience, thus supporting Fredrickson, Barbara and Kahneman's (1993) findings: the peak and end pain involved in both procedures had a stronger predictive effect on the participants' judgements. This study also compared real-time and retrospective evaluations of pain. A systematic discrepancy between both sets of ratings was found, but this did not carry significant effects on the evaluation of overall pain due to the limits of human memory and judgment.

These three studies explored the peak-end rule in terms of negative emotional experiences characterised by pain, and it may be the case that the sensation of pain as a negative experience might be more memorable than feelings of pleasure are as positive experiences (Baumeister *et al.*, 2001). Generally, however, strong emotional reactions are situationally dependent. For instance, negative relationships or conflictual interaction may be perceived as exerting stronger effects than positive or constructive ones. However, the peak-end rule has also been tested to determine whether it also applies to positive experiences.

Fredrickson and Kahneman (1993) reported another study that experimented the peak – end rule in terms of using both positive and negative experiences. First, the subjects viewed both pleasurable and aversive video clips lasting between 55 and 138 seconds. After viewing these, they had to report their moment-by-moment emotional reactions with a slide affect meter (-7 was the most negative experience and +7 was the most positive experience, with zero representing an emotionally neutral response). Participants first reported their global evaluation, then the duration of each clip that they had seen, and the findings indicated that the length of the clip did not affect how it was globally evaluated by participants. The second experiment was similar to the first, but participants had to rate their overall experience of the clips after a short period of time had elapsed (as in hour). The results showed that the memory of each episode was correlated with the amount of time that had elapsed and retrospective evaluation after the event was reduced because of the short-term memory effect. The

retrospective evaluation could be predicted by the peak evaluation and the end evaluation of the experience.

Diener, Witz and Oishi (2001) studied the effects of the ending of life on quality of life to test and extend understanding of the peak-end rule. There were three experiments in this study. The first study explored how quality of life might be evaluated from an end-of-life perspective. Undergraduate students were asked to read about the fictitious character of “Jen”; they then completed questions about their perceptions of her life. The parameters of the story were varied to understand the effects of duration, peak, and end conditions. Jen was variously 30 or 60 years old, had a happy or miserable life and a sudden or a more prolonged death, which produced eight different narrative conditions (2 ending: nonextended, extended x 2 life conditions: positive life, negative life x 2 ranges of age: 30 years, 60 years) . Participants were asked “How desirable do you think Jen’s life was as a whole?” and “How great was the total happiness or unhappiness of Jen’s life”. Responses were measured on a 9-point scale. The results showed that the age variable had no significant effect on the perception of desirability of quality of life. The positive or negative valence and the type of ending affected quality significantly and interacted: a positive life was more desirable under the sudden death condition, whilst the negative life was not less desirable when the extended condition was added. It thus appeared that the total negative emotional experience was better viewed. The participants did not evaluate their emotional experience from the whole of the experience, but they evaluated it from the intensity of their emotional experience.

The second study explored what effect (if any) the participants’ age had on their perceptions of the story. The participants were 34-63 years old, a similar age to that of the main protagonist, and the procedure of the second study was identical to the first. The results showed that age had no significant effect on the emotional experience. However, participants rated both the positively and negatively configured short life more highly than the long life, even if the end-of-life mild happiness condition was added. The 3rd experiment explored whether participants evaluated

Jen's life by its average overall valence or its end condition. A less-intensely emotional middle age condition was added, leaving six conditions (2 valences: very happy and very depressed x 3 endings: sudden, extended and embedded). The findings show that participants' evaluations neglected the extended middle age condition, whereas the ending of life was an important factor in evaluating Jen's story. The mild intense emotion of the ending of life was had a moderate effect that was stronger than the more emotional life conditions.

Thus, Diener, Witz & Oishi's study differs from earlier research by exploring the peak-end rule in perceptions of longer episodes. The researchers argue that the duration of an episode might affect the strength of the emotion experienced at its end, as well as the memory of it. However, their finding shows that the desirability of the quality of life did not derive from the average of the whole life but was rated on the basis of the most intense moment of life and its end. Therefore, the length of an episode does not affect retrospective evaluations in terms of the peak-end rule.

Another study explored the peak-end rule in multi-episode experiences. Miron-Shatz (2009) compared a normative approach and heuristic approach to examining retrospective evaluation in multiple-episode experiences. In this experiment, participants were asked to report their emotional experiences during a day and the overall emotional experience of the previous day. Each participant was asked to report every single episode (i.e. an event or an activity lasting between 20 minutes and two hours) in terms of its type, location, time of day and duration, the presence of others, and their feelings. The intensity of feelings was reported on a 0-6 scale, and participants also rated their overall emotional experiences of the previous day using the same scales. Lastly, they were asked to report and rate a moment of intense emotion, either positive or negative, as well as evaluate how the day in terms of a typical day. Measurements included the net effect of the episode, a duration-weighted net effect, the valence of peak and low experiences, retrospective evaluation, and experience of episodes. The net effect of an episode was defined as the average positive emotional rating minus the average negative emotion rating. The duration-

weight net effect was calculated by multiplying the net effect of each episode with the proportion of time. The results showed that the duration-weight net effect was able to predict the retrospective evaluation of the previous day. However, the end of an episode could not be evaluated in the study because it was difficult to identify when this was. Also, the typical comparative evaluation could be predicted by the peak and the low evaluation.

Miron-Shatz's study is important because it indicates the limitations of the peak-end rule. First, the peak-end rule is suitable for clearly bounded events, but the start and end of emotional experiences cannot always easily be determined. Indeed, daily emotional experiences are more likely to overlap between episodes rather than reach an obvious endpoint. The gap between an experience and a memory for evaluating the emotion of that experience in daily life is also too short. Thus, overall emotional experience might be better understood from the summary evaluation rather than the peak and the end of an event itself. Hence, the peak–end rule should be explored in discrete episodes.

Overall, the foregoing review indicates the utility of the peak-end rule to research into emotion and memory. These studies explored how retrospective evaluation can be predicted by the intensity and the end of emotional experiences. The thesis deploys the peak-end rule as the main theoretical framework for understanding how the utilities of emotion and memory work in terms of browsing Facebook. In most of the previous peak-end studies, participants' retrospective evaluation was compared with a continuous real – time, moment-by-moment judgement but in this thesis, we collect the judgements by individuals of their news feed on Facebook, which contains a sequence of discrete threads.

In addition to explore the utility of emotions, the next section, we will discuss emotion theories whether emotional dimensions or the basic emotions that had been widely explored in terms of psychological theories.

2.7 Emotions and their Measurement

To study the peak – end rule with respect to emotional response while reading the news feed on Facebook, it is necessary to understand what an emotion is and how it can be measured. This section discusses emotion theories in different terms and then moves to explore the emotional response, and its measurement.

Mehrabian and Russell (1974) stated that emotions can be described with three dimensions: Pleasure - Arousal - Dominance (PAD) or Valence - Arousal - Dominance (VAD), while some researchers claimed that dominance element could not describe people's emotional state (Russell, Ward and Pratt, 1981; Kuppens, 2008). Pleasure or valence defines the level of pleasure in a person between extreme unhappiness or pain to extreme happiness with scales such as happy – unhappy, pleased – annoyed and satisfied – unsatisfied. These dimensions indicate people's feeling in terms of the value of positive - negative emotional state whereas a neutral emotion is indicated as a zero. Arousal refers to a mental activity which is identified as a state of feeling along to a single dimension. Dominance refers to a feeling of control or submission.

To evaluate the emotional response along with PAD dimensions, Self – Assessment Manikin (SAM) is a commonly use measuring tool for people's response (Lang, 1980). The SAM tool is an image – based measurement. It uses a face or a human picture to represent a characteristic of each dimension with a continuous nine-point scales (Figure 2.2). Pleasure/valence is represented with a smiling face (positive emotional response), a normal face (to neutral), and a frowning face (negative emotional response). The intensity of arousal is represented from a wide-eyed figure (excited) to a sleepy figure (calm). Lastly, the dominance element is a feeling of control, and the size of the figure will be changed from the largest face represents the maximum control in the situation. Due to the image – based measurement of the SAM tool, it is widely used in either verbal or nonverbal stimuli judgement (Bradley and Lang, 1994).

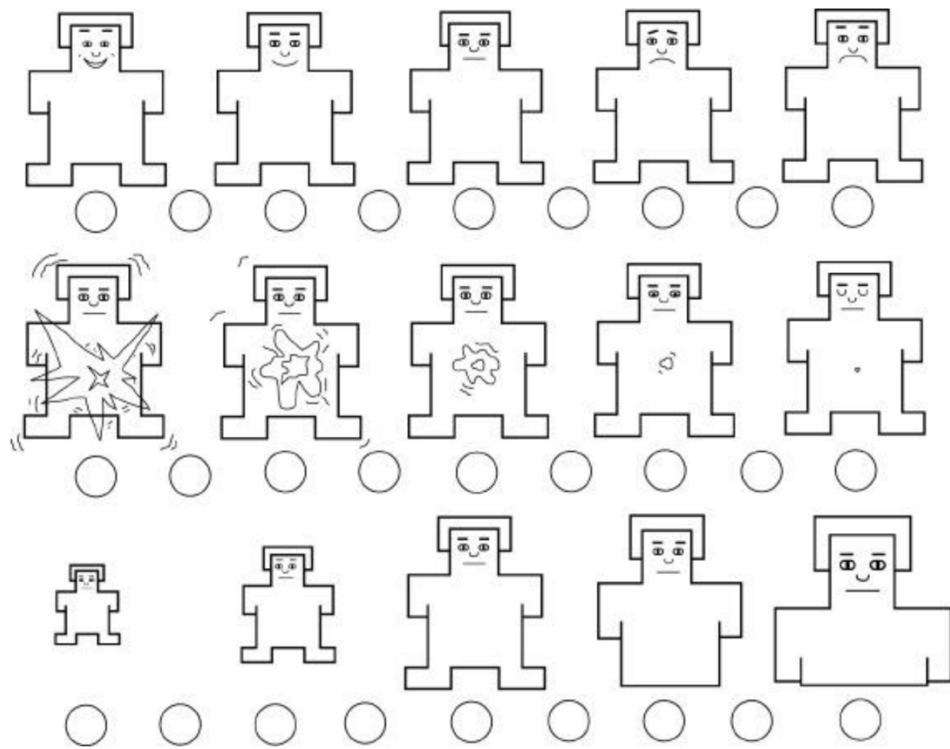


Figure 2.2 The Self – Assessment Manikin (SAM) from Lang (1985). This picture shows a nine-point scale for each PAD dimension: Valence or Pleasure (top panel), arousal (middle panel) and dominance (bottom panel).

This and similar studies have shown that this tool has high validity and reliability for the valence and arousal dimensions, and, more broadly, that people are able to report a scale value for the strength of their emotional response.

Despite its usefulness, SAM can evaluate only valence and arousal scales, but it does not distinguish between discreet emotional experiences (e.g. happy, sad, anger, relaxed, and etc.). Rather than consider multi-dimensional scales, we take a reductionist approach of decision-making perspective and assume that people are motivated to maximise subjective utility and that our measurement of emotion might focus on its utilitarian aspects, as in the literature on the peak – end rule from Kahneman (Varey and Kahneman, 1992). Therefore, we assume that the emotional

valence (positive and negative) might be a good proxy of utility. However, to understand the emotional valence, theories of basic emotions and their measurement are discussed here.

Generally, emotions are understood as based on animal instincts and facilitating human needs and culture. The definition of an emotion has been addressed by many scholars, but theories can be grouped into three categories: physiological theories, neurological theories and cognitive theories. For example, Charles Darwin (1998) suggested that the evolution of animals' emotions and humans' emotions has been adaptive throughout their existence, helping animals and humans to survive and reproduce. James-Lange's theory, on the other hand, claims that emotions occur when animals and humans see an external stimulus that leads to a physiological reaction (Cannon, 1987). However, the emotions will present in different reactions, depending on how those animals and humans interpret the external stimulus. The interpretation will be based on their existing experience and knowledge. Under observation, different people will present different emotions in the same situation. This is because of differences in their knowledge, background and experiences.

Table 2.2 Basic emotions identified in the literature (table adapted from Ortony and Turner, 1990).

Reference	A set of basic emotion
Ekman, Friesen and Ellsworth (1982)	Anger, disgust, fear, joy, sadness, and surprise
Weiner & Graham (1984)	Happiness and sadness
Tomkins (1984)	Anger, interest, contempt, disgust, distress, fear, joy, and shame
Frijda (1986)	Desire, happiness, interest, surprise, wonder, and sorrow
Oatley and Johnson-laird (1987)	anger, disgust, anxiety (fear), happiness (joy) and sadness
Izard (1977)	Anger, contempt, disgust, distress, fear, guilt, interest, joy, shame, and surprise
Mowrer (2009)	Pain and pleasure

In addition, a set of basic emotions has been widely discussed and was summarised by Ortony and Turner (1990). Ortony and Turner's study summarised theories that identify a few basic emotions and reduce them to binary pairs in some cases (Table 2.2) For example, Mowrer (2009) states that the set of basic emotions consists of pain and pleasure, and Weiner & Graham (1984) claim that emotions are all related to happiness and sadness. These researchers thus divided basic emotions into two groups of positive and negative emotional valence. Others, however, such as Frijda (1986), Izard (1977) and Tomkins (1984), claimed that interest and surprise are basic emotions. Ekman, Friesen and Ellsworth (1982) identified anger, disgust, fear, joy, sadness and surprise as fundamental emotions; Oatley and Johnson-laird (1987) presented the five basic emotions of anger, disgust, anxiety (fear), happiness (joy) and sadness. Therefore, it is unclear which theory is most appropriate to describe the notion of basic emotion. This may be due to the fact that these fundamental theories were developed via different methodologies. For example, Ekman, Friesen and Ellsworth (1982) studied the facial expressions of humans; Izard (1977) explored age-related human behaviour.

On the other hand, researchers who study emotional response often use a continuous scale to explore the subjective experience of emotions. They also use self – reporting methods for gathering participants' data. For example, to explore increased emotional response with virtual reality (VR). Estupiñán *et al.* (2014) used the continuous rating scales from zero to 100 (a zero representing a highly negative feeling, 100 representing a highly positive feeling, and 50 representing a neutral feeling). To study emotional response to films, scholars used an 11-point Likert scale for collecting participant's data (Fredrickson and Kahneman, 1993; Kahneman *et al.*, 1993). The Likert's scale was between -5 (representing the most negative emotional experience) and 5 (representing the most positive emotional experience) with zero (representing a neutral emotional experience). To study the duration of neglect in the peak – end rule, Dienerm Witz, and Oishi (2001) also used a Likert scales. This time it was a 9-point scale.

The research in this thesis borrows this approach to emotion measurement, using a 21-point scales from -10 to +10 with a zero-neutral point. We have found no studies using a category scale (i.e. positive, negative and neutral) for gathering emotional response data, so we prefer to continue the tradition of using a numeric scales.

2.8 Chapter Summary

This chapter has considered the literature on many aspects which are related to Facebook use. First, the features and algorithms used by the platform to display news feeds were identified as key reasons for Facebook's attractiveness to users. Then, we considered U&G theory (Joinson, 2008; Papacharissi and Mendelson, 2010; Smock *et al.*, 2011; Spiliotopoulos and Oakley, 2013; Lapidés *et al.*, 2015). This theory explains how and why people use social media rather than the other way around. U&G thus views features on Facebook as motivational tools for users rather than means to manipulate them. Finally, Facebook has been seen as particularly important for maintaining relationships, rather than creating relationships anew.

The chapter then explored insights into the design features of Facebook that make it particularly persuasive, i.e., how it changes users' attitudes and behaviour by triggering their perception to prolong browsing episodes and form habitual patterns of use. Users receive rewards which are pleasurable, unpredictable and temporal while browsing Facebook. The rewards include likes, the pull-to-refresh feature and reading pleasurable posts on news feeds. The effect of these rewards can be to encourage repeated or habitual Facebook browsing behaviour. The rewards of browsing Facebook might explain why Facebook is particularly attractive.

While U&G theory is able to explain the attractiveness of Facebook in terms of its design features, it can only provide limited insight into the psychological mechanisms that might underlie why users find it so compelling. Therefore, the rewards for habit formation and partial reinforcement were explored as a possible factor in Facebook use. People may (inconsistently) receive rewards or punishment by interacting on the platform and thereby build positive perceptions of Facebook, a process which may explain the platform's attractiveness.

The chapter then considered information-foraging theory to explain the phenomenon of skipping between threads while browsing Facebook. This theory claims that attention to information sources is allocated in ways maximising the uptake of valued information. Once the perceived value of information decreases, people will turn their attention elsewhere, either to another thread on the platform, or simply quitting the Facebook news feed altogether. This approach is promising, but undeveloped, and seems to require a broader conception of utility – for this purpose we turned to emotional response.

Previous studies found that browsing the news feed is an emotionally mixed experience, with high valence of emotional experiences remembered better than neutral ones. It seems that both emotion and memory may be relevant to explain why people browse Facebook. Both of these utilities are integrated into the retrospective evaluation of browsing experiences, seen in terms of the peak-end rule. Reviewed in this chapter, the peak-end rule states that overall retrospective evaluation can be predicted by the peak emotional experience and the end emotional experience from a past event; the results of these studies have been discussed in this chapter, and it was concluded that the peak-end rule may explain retrospective evaluations of browsing Facebook.

The next chapter presents the first experiment which aimed to understand emotional evaluations of Facebook browsing sessions by using the peak-end rule. The boundaries of emotional experiences are also explored through the analytical lens of foraging theory.

CHAPTER 3

MEMORY FOR EMOTIONAL RESPONSE TO THE FACEBOOK NEWS FEED

3.1 Chapter Overview

In Chapter 2 we explored the different motivations for Facebook usage such as by design features and emotions. In this chapter, we will investigate the potential of memory bias as a partial explanation for the attractiveness of Facebook. We test whether Facebook users may have positive emotional experiences such as happiness, enjoyment and pleasure from the content of social media, and whether their memory of social media interactions is biased toward this positive experience.

The peak – end rule is employed in this study. This theory explains that people often remember the most intense emotional response as well as the final emotion rather than the averaged emotional response of an episode. In this study, we mainly investigate the extent to which the most intense emotional response and the final emotional response affect the retrospective experience of a Facebook browsing episode. The experiment methodology of this study is novel, though derived in part from the prior studies. Additionally, we gather quantitative data that describes participants including demographic data, emotional responses and memories whilst browsing Facebook. The results support the hypotheses of this study, which is: a) the peak – end rule can predict the overall retrospective emotional response of browsing Facebook and b) people can

better recall highly valenced emotional responses and c) people receive more positive emotional responses than negative and neutral emotional responses.

3.2 Thesis Experiment 1

3.2.1 Study Background and Motivation

In this study we test whether the peak-end rule explains people's summary memories for the emotional tone of a Facebook browsing episode. The retrospective evaluation of an episode may be an important motivational factor in the future use. The peak-end rule indicates that the peak intensity of emotional experience, and the final moments, greatly affects the retrospective evaluation. In this study, we narratively review some of the earlier studies which examined the most extreme emotions and the final emotional utility of a moment and whether it predicted the overall emotional experience of the event.

The empirical origins of the peak - end rule was reviewed in Chapter 2. Here we summarise some of the issue, particularly to note why they are promising in the Facebook context, and what is new and different in our approach. Earlier studies investigated the peak – end rule and its use in unpleasant situations such as the pain of immersing a hand in the tub of cold water (Kahneman et al., 1993), and the pain of colonoscopy and lithotripsy (Redelmeier and Kahneman, 1996). Both example studies reported that a future decision was created based on the hedonic predictions. Participants made their decisions to choose the next trial of pain based on their memory of the past experiences. The retrospective judgement was rated from the peak and the end of an experience, not from the average of experience.

There were some previous studies which have investigated how the middle of an experience might affect people's retrospective judgement of their experience. For example, the duration of an experience, especially an aversive experience had only a small effect on the retrospective judgement (Fredrickson and Kahneman, 1993). Similar to Diener, Wirtz and Oishi (2001) who pointed out that reading the character life story: the quality of life in the middle was ignored while the end of life was

overweighted, and it disproportionately affects the global retrospective evaluation of the global quality of life. Therefore, it is clear that the duration of an experience will be ignored. Intuitively this seems to match the context of Facebook browsing, which we speculate will take place, for most users, in many episodes of varying duration.

As the retrospective evaluation can be predicted from the peak and the end of experiences, a different time scale of response may be another effect on predicting the retrospective evaluation. People may forget the detail of experiences that occurred in a particular part, but they may remember some parts of an experience that just happened. Geng, Chen, Lam, and Zheng (2013) studied whether the peak – end rule works on a long or a short – retention interval. Their experiments were conducted during a holiday. A 7-point scale (1 represented unhappy; 7 represented very happy) was used in this experiment. Participants were asked to rate how happy they were at the end of each day during the holiday. After the holiday, participants were asked to rate the overall retrospective evaluation of their holiday. This task was called a recalled task. The same participants were asked to recall how happy they were with the three durations of the time scale: the day after the end of the holiday, three weeks after and seven weeks after. The results showed that the peak and the end of the experience could predict the overall retrospective evaluation for the next day and three weeks after the experience. However, they could not predict for the seven weeks after the experience. Therefore, the peak – end rule can be useful to predict the overall retrospective response over a short time delay but not over a long-time delay. This supports its relevance to Facebook, where the duration between separate browsing episodes is typically short.

Therefore, we used the peak-end rule to investigate how people evaluate the overall experience of a browsing Facebook. We also investigated how episodic memory may affect information overuse. We contend that the overall emotional experience of browsing Facebook in short intervals has many features which suggest that the peak-end rule is likely to apply.

We investigated people who browse Facebook frequently throughout the day. They may receive positive emotional experiences at specific single points. The study design will allow us to test whether positive emotional experiences (while browsing Facebook) are better remembered than negative or neutral experiences. People may also better recall either positive threads or negative threads, relying on a peak emotional experience. Furthermore, people may recall a peak emotional moment of browsing Facebook at a single point of time.

If the peak experience - and the final experience - of a Facebook browsing episode can predict the retrospective evaluation, then perhaps the final experience might predict when Facebook users will quit browsing Facebook in a particular session.

3.2.2 Study Design

In the section above, we explored previous studies and their procedures. The main research question from the previous studies was how retrospective summary judgments of emotional utility are affected by the real-time moment- by-moment emotions. In this study, we ask a similar question but with some important differences. Rather than using moment- by-moment, or time-window by time-window judgments, we collected judgments of individual news feed threads. Reading the news feed can be considered as reading a sequence of discrete threads. By asking for emotional responses to each thread (rather than after fixed periods of time), we respected this structuring of user experience and enabled analysis of the relation between emotional response and memorability of threads. This approach maintains an important aspect of the moment-by-moment approach in that it allows characterisation of the whole episode as a time-ordered sequence of emotional states. The earlier investigations that looked at, e.g. medical operations or films (Fredrickson and Kahneman, 1993), had no obvious discrete structure to align emotional utility judgments with, so used time-windows of necessity.

Furthermore, we collected these judgments retrospectively, after the browsing episode, rather than in real time, so as to minimise the interruption to participants' reading experience.

Consequently, as mentioned in this chapter, we tested the below research questions:

RQ1: What emotions do people remember shortly after reading Facebook and how is this affected by their emotional response to individual threads?

RQ2: Do people remember threads as following the classic serial order effects?

This leads to the hypotheses of this experiment:

H1: The peak – end rule will predict the overall emotional experience of browsing Facebook

In particular, we test the hypothesis that the peak-end rule will predict overall judgments of emotional experience

H2: The recall of news feed threads will show a classic serial position effect.

If threads encountered at the beginning and end of a Facebook session are the best recalled (primacy and recency), then these threads will exert the most influence on the attractiveness of future use. However, the threads, although encountered in series, are more varied as memory-materials than typical memory-experiment stimuli.

H3: People are able to recall positive emotional experience more than negative emotional experience.

We consider the suggestion that a memory bias might underpin the judged attractiveness of the news feed, by testing the hypothesis that remembered threads will be more emotionally positive than forgotten threads.

We additionally test the hypothesis that highly emotional threads (whether positive or negative) are better remembered than more neutral threads.

H4: The effect of the end emotional experience on the quitting Facebook session will be apparent in end ratings that are lower than average ratings.

We consider whether the fluctuation of emotional responses to threads might explain the local decision to quit Facebook. Do people quit when there is a decline in emotional valence?

3.2.4 Pilot Study

Two pilot participants were recruited, one male and one female. They were both postgraduate students at the University of Bath. The participants were studying in different departments. Both pilot participants were required to have a Facebook account. After completing the experiment and analysing the results, we adjusted some descriptions to improve clarity before launching the real experiment.

3.3 Method

3.3.1 Participants

Participants were students and staff of the University of Bath, recruited by posters on the campus. Each participant was paid £5.00 for their participation. Participants were required to have a Facebook account, but were asked, when scheduled, not to access Facebook in the hour before the experiment. In total 53 volunteers participated, 39 women and 14 men. 37 volunteers were 21 -30 years, 9 volunteers were 31-35 years, and 7 volunteers were over 36 years. (For comparison, in 2018 the population of global active Facebook users is 53% female and 47% male and the most frequent age group is 18 – 29 years old (We Are Social Hootsuite, 2018).

On the Facebook usage questionnaire, participants self-reported that they, on average, spent 83 minutes in a day browsing Facebook and visited the site between 3 - 11 times

per day. Most of participants reported that they had, on average, between 251 and 500 Facebook friends and 10 percent of participants had over 1000 friends. Participants used Facebook for keeping in touch with friends and families, sharing personal information (pictures, music and videos) and finding information. In addition, the main activity of using Facebook was reading information on the news feeds rather than posting information and sharing interested information.

3.3.2 Materials

In this section we list the materials used (in the order they were encountered during the experimental procedure), and in particular how instructions were worded for the emotion rating tasks.

The experiment utilised:

- The Chrome Browser on a University-secure Apple MacBook Pro on which each participant's Facebook account was accessed.
- The QuickTime Player screen recorder.
- The Macintosh Digital Desktop clock.
- A Facebook Usage and demographics questionnaire reduced from the online questionnaire of University of California (University of California, 2016) (see Appendix F).
- A single retrospective emotional rating question using a 21 point scale.
- A spreadsheet on which participants attempted to recall encountered threads, then listed all threads, then rated their emotional response to each thread.

The retrospective rating was introduced as follows:

'Think back to when you were browsing Facebook. Please rate the session according to how negative or positive overall an emotional experience it was.

A positive response would include liking enjoying, being interested by, finding funny, touching etc.

A negative response would include disliking, being irritated, upset, bored etc'

The response was made by ticking one box on a 21 point scale labelled from -10 to +10 with the zero point labelled "Indifferent" and the words Negative and Positive over the respective part of the scale.

The recall instructions were as follows:

'Please recall the threads you encountered (a thread is the set of messages under any status update). Describe or name each thread you can recall with a distinguishing phrase.'

The instructions for rating each emotional thread were as follows:

'Please rate your emotional response to every thread. We recognise that this might be quite nuanced, but we would like you to distinguish whether your response was positive or negative.'

A positive response would include liking enjoying, being interested by, finding funny, touching etc.

A negative response would include disliking, being irritated, upset, bored etc.

'For each thread please also rate how strong your response was, with a middle point of indifference, or no emotional response'

The response for each thread was made by ticking a box on a scale identical to that used for the retrospective rating of the entire episode.

3.3.3 Procedure

Each participant was invited individually into the laboratory. The procedure comprised five main phases in a fixed order: interacting with Facebook by reading the news feed; responding to a questionnaire; judging the overall emotional utility of the Facebook-browsing episode; recalling Facebook threads; judging the emotional utility to each encountered Facebook thread (see in Figure 3.1). Participants were not warned in advance about later phases. These phases are detailed below.

After completing informed consent, participants were invited to access their Facebook account via the Chrome browser running on an Apple MacBook Pro. Participants were asked to browse Facebook for between 10 and 15 minutes; they were told to use the Macintosh digital desktop clock to note the time they started browsing and to ensure that they browsed for at least 10 minutes and to quit some time within the next 5 minutes.

While browsing Facebook, participants were instructed that they could read, “like” and “share” only. While reading they were allowed to open links, but always to return directly to Facebook from this linked destination. They were asked not to enter status updates or comments so that their memories were not disrupted by other stimuli and to ensure they encountered a number of separate threads during the experiment session. The screen was recorded throughout (and of course participants were informed that this was happening.) The screen recording was deleted at the end of each session.

After the browsing period, participants were asked to complete the demographic and Facebook usage questionnaire, slightly reduced from the online questionnaire of University of California (University of California, 2016) (see Appendix F) . As well as providing the demographic and usage statistics summarized above, this phase separated reading from recall and prevented rehearsal. Participants took roughly 5–7 minutes to complete the questionnaire. Participants were then asked to rate their overall emotional experience of the Facebook-browsing session. Participants made this judgment on a Likert-type scale with -10 as the most negative and +10 as the most

positive emotional experience. Participants were informed that a positive response might include liking, enjoying, being interested in, finding funny, touching, etc., while a negative response would include disliking, being irritated, upset, bored, etc. (One might question whether “boring” is a label for negative as opposed to neutral emotion, but our choice to include it is perhaps justified by Lapidés et al. (2015) who report that many of their participants expressed annoyance at uninteresting status updates.)

Next, participants attempted to recall every thread that they had seen during the Facebook–browsing session. It was explained that a “thread” meant a status update and any responses. They were instructed to write a distinctive phrase in an Excel file for each thread they could recall. After they reported being unable to recall further threads, the recording of the session was opened for participants to view. The participants were required to complete their recalled list with the forgotten threads, using a distinctive phrase as before, and to note the order in which all the threads had been encountered (by numbering the threads in their completed list).

Finally, participants were asked to rate how positive or negative was their emotional experience of each thread in the complete list, recalled as well as forgotten. They did this using the same response scale as for the overall evaluation and entered their responses in the Excel spreadsheet. This is a notable departure from the methodology of the typical peak-end study, as the experienced “moment by moment” utility of each thread is itself remembered (or perhaps repeated), rather than done at the time of the initial exposure. On completion of the thread-judgment task, participants were thanked and debriefed, and the recording of their browsing session was deleted.

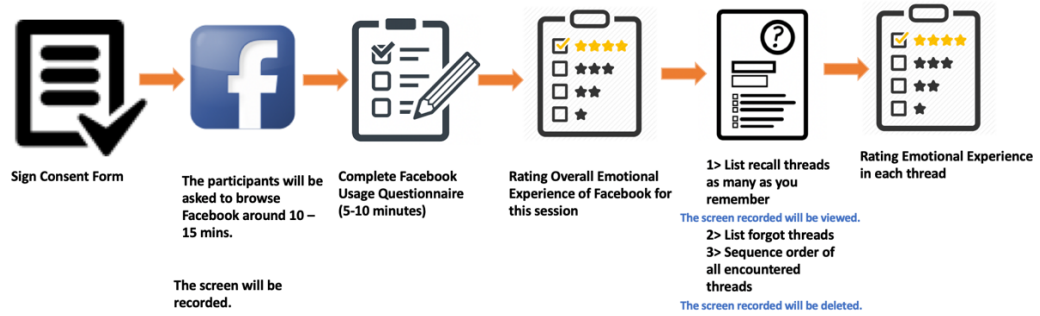


Figure 3.1 Procedure of Experiment 1.

3.4 Results

Descriptive Data

On average, participants spent 11 minutes 40 seconds browsing Facebook, which indicates that they typically quit relatively early during the 5-minute discretionary period. (Five participants signalled that they were stopping shortly before 10 minutes has elapsed, in which case they were told to continue, and told when 10 minutes had elapsed so that they should stop within the next 5 minutes.) On average, participants read 28 threads during this time (a thread comprises a status update and any responses). Table 3.1 displays these data, along with participants' recall performance, and their responses to the emotion judgment tasks. Forty nine of the fifty-three participants reported an overall positive retrospective emotional evaluation of their browsing episode; four participants reported a negative overall emotional experience.

On average participants recalled around one third of the threads they encountered. Around two thirds of threads were rated positive, emotionally, and the average emotional judgment of all threads was moderately positive, marginally less positive than the single rating of the entire episode.

Table 3.1 Participants' Performance of the Experiment 1.

	M	SD	r
Overall emotional rating of episode	3.62	3.21	
Number of encountered threads	27.54	17.76	
Number of recalled threads	8.84	4.83	
Number of forgotten threads	18.70	14.56	
Number of positively rated encountered threads	18.40	12.21	
Number of negatively rated encountered threads	5.90	7.55	
Number of neutral(zero) rated encountered threads	3.30	3.88	
Average emotional rating of encountered threads	2.79	1.83	0.31*
Average emotional rating of recalled threads	3.86	2.06	0.23*
Average emotional rating of forgotten threads	2.30	1.90	0.23*
Emotional rating of peak encountered thread	7.66	4.20	0.45*
Emotional rating of end encountered thread	3.23	4.88	0.30*
Emotional rating of last three encountered threads	3.03	2.34	0.23*

Note: *r* means the correlation with the overall emotional rating, (*r*) = not significant correlation, **p* < 0.05, ***p* < 0.01

H1: The peak – end rule will predict the overall emotional experience of browsing Facebook

The overall emotional utility reported retrospectively by participants was, on average, 3.62 (Table 3.1) which was higher than the average of all threads' emotional utility as subsequently rated when viewing the screen recording ($t(52) = 1.92, p < 0.05, d = 0.32$). Table 3.1 shows that the correlation between both variables was positive and significant ($r = .31, p < 0.05$). The correlation between the end rating and the overall rating was similar ($r = .30, p < 0.05$). The correlation between the peak emotional experience and the overall rating was higher ($r = .46, p < 0.05$).

To further test the peak-end rule we performed a multiple regression with peak and end as the predictor variables and overall rating as the dependent variable. This regression was significant ($F(2,50) = 6.36, R^2 = 0.20, p < 0.01$). The results indicated that the model explained 20% of the variance. While the peak judgement contributed significantly to the model ($B = 0.30, p < 0.05$), the end judgement did not ($B = 0.05, p = 0.58$).

The final predictive model was:

$$\text{The overall rating} = 1.11 + 0.30 * (\text{PEAK}) + 0.05 * (\text{END})$$

Plausible alternative models were less successful predictors of overall emotional rating, as follows: averaged thread valence ($r^2 = .10$); recalled thread valence ($r^2 = .05$).

H2: The recall of news feed threads will show a classic serial position effect.

Figure 3.2 shows the mean proportion of threads recalled by serial position of encounter, with separate averages across participants for the first three and last three encountered threads. The central value is an average of each participant's proportion of intermediate threads recalled (which is the average over a varying number of threads). The shape of the curve shows classic primacy and recency effects. We conducted a single-factor, repeated measures ANOVA on proportion recalled of first three, intermediate and last three threads. This revealed a significant effect ($F(2, 104) = 5.3, p < 0.01$).

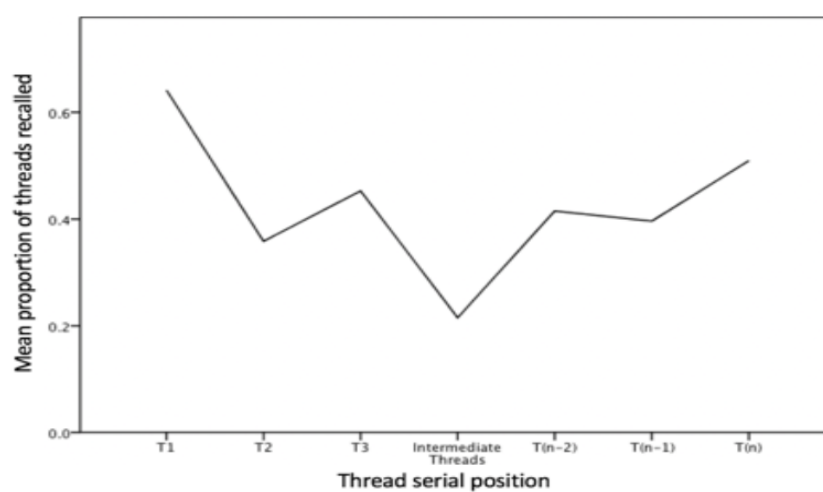


Figure 3.2 Mean proportion of recalled threads by serial position of encounter.

H3: People are able to recall positive emotional experience more than negative emotional experience.

We predicted that people would better recall emotionally more positive threads. The data in Table 3.1 show that, on average, the recalled threads were rated more positively than the forgotten threads.

To test this hypothesis, we conducted a paired t - test comparing each participant's average emotional response to recalled threads with their emotional response to forgotten threads. The effect was significant ($t(52) = 5.858, p < 0.01, d = 0.805$).

Similarly, we compared the absolute emotional valences of recalled threads and forgotten threads for each participant, and this effect was significant ($t(52) = 9.384, p < 0.01, d = 1.23$). (But we should note that this test is not independent of the positivity effect, given the relatively small number of negatively rated threads overall.) Consequently, we tested recalled v. forgotten negative threads in those 15 participants that had at least one of each. The recalled threads were more negative, and this effect was marginally significant, despite very low power ($t(14) = 2.44, p < 0.05, d = 0.66$).

H4: The effect of the end emotional experience on the quitting Facebook session will be apparent in end ratings that are lower than average ratings.

Table 3.1 shows the rated emotional utility of the end encountered single thread was higher than the average of all threads' emotional experience. The final thread was not rated lower than previous threads, suggesting that people did not quit their sessions because their enjoyment had diminished.

Paired t-test were computed to compare the average response to all threads with the last thread, and with the average of the last four threads. Neither of these t-tests revealed a significant effect.

3.5 Discussion

Our participants seemed readily able to rate the overall emotional utility of a brief period of Facebook browsing, and additionally, the emotional utility of each encountered thread on a single dimension. These ratings showed an overall positive emotional experience, and one that, in keeping with some earlier research on retrospective evaluation of episodes, can be predicted from the rated emotional utility of the thread with the highest emotional utility together with the utility of the end encountered thread (the peak-end rule).

Recall of encountered threads revealed classic serial order effects, with the first three and last three encountered threads being better recalled, on average, than intermediate threads. Furthermore, emotional utility predicted recall, with recalled threads being more positive, and more emotionally valenced than forgotten threads (Walker, Skowronski and Thompson, 2003; Lampe, Ellison and Steinfield, 2007)

Together, these results support our overall claim that the emotional utility of the News Feed, and the way this interacts with memory, might contribute to the attractiveness of Facebook, and consequently to its extensive use. People respond positively to most of the news feed threads they encounter, and in their memory the overall experience is even more positive.

We found no evidence in this study that people quit after low-utility threads, which in turn (because of the peak-end rule) might contribute to positive evaluations of the overall episode. It seems quite possible, however, that quit decisions in a laboratory context are different from those that operate in the real world.

This point raises a key limitation of our study, which is that the participants' interaction with Facebook was in several ways a little unnatural. Firstly, it was in a laboratory, and approximately time limited. Secondly, participants were instructed to read (and like or share), but not to post, and only to follow links over a single step.

These constraints on user behaviour are striking in the context of a research literature (the uses and gratifications literature reviewed above), which has found a wide variety

of user motivations linked to a wide variety of particular Facebook behaviours. Our approach cuts through the platform's functions or features to consider an episode of Facebook use (actually, reading) as simply a period of varying emotional utility. We propose that future work might expand our experimental paradigm to consider some aspects of the "Facebook as a toolkit" idea (Smock *et al.*, 2011). For example, we might consider how the type of news feed thread (e.g. text v photo v video) or the nature of the social relationship (e.g. online-only v offline friend) affect thread memorability alongside emotional utility. Such work might require more intrusive procedures, however, with some privacy implications to navigate.

Our most general defence of controlled experimental designs, despite the applied context of our research, is that they allow better tests of *theories* which have real-world consequences in less constrained situations (Reader and Payne (2007) have called this the "Broadbent approach" to applied research, after the British psychologist). We would argue that the peak-end rule is such a theory.

More specifically, this particular experiment has quite high ecological validity, especially in its use of participants' own Facebook news feeds. We should also note again that our method for obtaining emotional responses to individual threads was unusual, compared with a typical peak-end rule study. We did not collect responses to threads as they were first encountered, because we worried that making such responses might itself affect memory for threads and so disrupt some of the main hypotheses we wished to test. This design decision also increased the naturalness of the participants' reading experience. The cost of the decision is that the emotional utility of threads was rated retrospectively, when threads were re-encountered on a screen recording, so that these individual thread ratings might themselves be affected by some unknown memory bias. Further studies might instead use real-time ratings, accepting different empirical risks.

3.6 Conclusion

Our main, overarching aim in this study is to introduce the idea of emotional utility, and how this interacts with memory as part of the explanation for the attractiveness of the Facebook news feed. Our experiment has demonstrated the potential of using simple emotional utility ratings to throw light on aspects of Facebook use, and, in particular, on how memory for the experience of using Facebook might contribute to its attractiveness in prospect

CHAPTER 4

EFFECT OF QUIT DECISION ON EMOTIONAL VALIENCE AND RECALL

4.1 Chapter Overview

In Experiment 1, we found that the peak - end rule was able to predict the overall retrospective emotional experience of browsing Facebook. In keeping with other research on the peak - end rule, this finding suggests that people evaluate their emotional experience, in retrospect, by consulting snapshots from an episode, rather than the entire episode. In keeping with other investigations on the Facebook news feed (Pempek, Yermolayeva and Calvert, 2009; Lapidés *et al.*, 2015), Experiment 1 also confirmed that reading the news feed is an emotionally mixed experience, but that most people view more threads as a positive rather than negative or neutral emotional experience. Likewise, their retrospective judgment of the entire episode was positive, indeed, more positive, on average than the average of all their thread judgments, presumably because of the influence of the Peak. In this respect, we might regard the retrospective emotional judgment as distorted, or poorly calibrated, and more positive than the experience really was. Such a distortion might contribute to the compelling nature of Facebook interaction.

Following this argument and remembering the role of the end-judgment in the peak - end rule, it seems possible that Facebook users could generate better calibrated

emotional memories if they chose to end browsing episodes when they experienced negative emotions. Indeed, one might expect such a pattern to be extant, by analogy to Information Foraging theory, and its suggestion that information gatherers will be inclined to quit tasks or patches when their gain from those patches suffers some kind of decline (usually considered as “useful information” but perhaps plausibly viewed or correlated with emotional response; (Pirolli, Peter and Card, 1999; Payne and Reader, 2007)).

In Experiment 2 we test the logic of this argument – the suggestion that, because of the peak-end rule, a strategy of quitting browsing when negatively valenced threads are encountered should result in better calibrated post-hoc emotional judgments.

4.2 Thesis Experiment 2

4.2.1 Study Background and Motivation

This experiment aims to understand if using the peak – end rule to construct a quit heuristic that might overcome its distorting effect. As we found from the Experiment 1, the overall emotional experience of browsing Facebook can be predicted by two snapshots of its experience: the intense moment and the final moment, rather than the sum of the emotional experience of the entire episode. Also, Facebook users rated their emotional experience as positive whether the emotional experience of the entire episode or the emotional experience of the threads encountered. The effect of the overall retrospective evaluation might be influenced by the peak that was rated as positive. It seems that the peak - end rule distorts the emotional memory of Facebook browsing toward the peak and the end emotional experiences.

In Chapter 2, we reviewed the literature on information foraging theory. This theory explained that people will tend to leave a patch or information source when the rate of encountered with valuable information reduces (Pirolli, Peter and Card, 1999; Payne and Reader, 2007). To follow this theory, Facebook users could moderate the attractiveness of Facebook – make it more valid – strategically by preferring to quit Facebook when they experienced a negative. According to Experiment 1, such

emotional responses are relatively rare, but not prohibitively so, and relatively moderate, so that as a strategy it seems plausible that it will be a) workable and b) produce better calibrated overall emotional memories, moderately reducing the typical judgement.

It is also a simple strategy to implement – and in this respect the suggestion is an example of the idea of an Implementation Intention – which approach has been used successfully in behaviour change in a number of contexts, and which literature we will now briefly review.

Generally, people may set a strategy in the “IF – THEN” form during daily life. For example, I will browse Facebook for 10 minutes then quit and another example is, I intend to play a game after I have finished doing my homework. These situations can be described by the “Implementation Intentions” theory. The concept of this theory is to define the when, where and how of goal achievement wherever there’s a performance or an outcome (Gollwitzer and Brandstätter, 1997; Gollwitzer, 1999). The implementation intentions theory helps people to improve their behaviour and might lead to habit formation(Gollwitzer and Sheeran, 2006). They claimed that the IF – THEN form can create a strong correlation between the specific situation and the intended behaviour. Indeed, people try to remember their intention and strive for their goal (i.e. being mindful of the time that they are browsing Facebook). They do not want to miss their plan. Furthermore, the implement intentions theory can be used to treat unhealthy addiction behaviours such as smoking, alcoholism and gambling.

Higgins and Conner (2010) explored implementation intention in adolescent smoking. Their study focuses on three points: (1) to test the effect of implementation intention between current behaviour and past behaviour and if this can predict the smoking behaviour, (2) testing the theory to prevent smoking in adolescents and (3) the impact relationship between this theory and smoking behaviour. The adolescents selected for this study were 11-12 years old and had begun smoking. The subjects of this study were followed over eight weeks. There were two groups of subjects: A control group who only received information about smoking and an experimental group who

received the same information as well as a behavioural plan following the implementation and intention strategy. Both groups were asked to complete a questionnaire before the study and read about the negative outcomes of smoking. However, the experimental group were also asked to complete a questionnaire that contains questions about the implementation intention behaviour plan for helping them quit smoking whereas the controlled group were asked to complete a questionnaire about the implementation intention plan of how to complete their homework at school. After eight weeks, all subjects were asked to complete a further questionnaire about their attitudes towards smoking. The questions were formed as an IF – Then statement. For example, “If I started to smoke this term it would be”. The answers to the question were provided on a five-step emotional rating (bad – good, harmful – beneficial) The scales ranged from -2 to represent a negative attitude towards smoking and +2 to represent a positive attitude. Additionally, questions about how to stop smoking (how, where and when) were presented for subjects in the experimental group. The results of this study found that the correlation between the current behaviour and prior behaviour can predict smoking behaviour in the future. However, there is no evidence of the implementation intention reducing the number of people starting smoking in adolescence. It is implied that this study should be observed over a long period of time to assess the effectiveness of the implementation intention in preventing smoking.

However, many studies explored the implementation intention of preventing smoking in different age ranges. Armitage (2016) found that implementation intention can help smokers change their behaviour. The usage of IF – THEN behavioural plans can decrease the number of cigarettes smoked in a day and change the participants’ habits. This study was performed by Higgins and Conner’ and is different than the other studies as all participants were asked to choose the “THEN” solution statement by themselves. This study appears to be a more realistic situation. One of the main limitations of this study is still the length of time which subjects were followed. Changes in behaviour need a long duration of time to be effective.

Inspired by the implementation intention, this chapter introduces a novel approach to studying when people quit Facebook. Our approach is based on the idea of the implementation intention. As we mentioned earlier, the emotional judgement of browsing Facebook might be calibrated if people prefer to quit Facebook when the end judgement is a negative emotion. Therefore, it is the experimental condition. On the other hand, Facebook, Apple, Google create the screen and time usage management feature that allows users to control how many hours you spent on Facebook or other social media (Ranadive and Ginsberg, 2018; Apple, 2020; Google, 2020). It seems the time limitations might be another reason why people quit browsing Facebook. Therefore, time limitation is the control condition in this experiment.

As we mentioned earlier, there are two conditions that we focus on in this experiment. The participant will be instructed how to quit Facebook. For example, I intend to quit Facebook when I receive a negative emotional response, or I intend to quit Facebook when I have spent x minutes browsing. This study will test the peak – end rule similarly as to in Experiment 1. We would like to review if the peak – end rule can predict the overall emotional experience of browsing Facebook, based on these 2 situations.

Consequently, the research question of this study is “*RQ3: Can overall retrospective judgements be reduced if the emotional response to the end thread is depressed?*”. Additionally, the experiment will attempt to replicate the most interesting findings of Experiment 1. We will investigate if when people are being instructed on their browsing conditions then peak – end rule can predict the overall retrospective utility of Facebook browsing.

This research question was tested as below:

H1: The mean retrospective rating of the experiment group will be lower than those in the control group, because they will have depressed end emotional ratings.

H2: The peak – end rule will predict the overall emotional experience for participants in both conditions of the experiment.

H3: The recall of news feed threads will show a classic serial position effect.

H4: People are able to recall positive emotional experience more than negative emotional experience.

4.2.2 Study Design

There were two conditions for this experiment: quit at negative group (INS#1) and quit after N minutes (INS#2). This experiment was run as a yoked control design. The yoked control design is an instrumental learning situation in which an experimental subject receives a response event (Kjmmel and Terrant, 1968). This design claims that the event may affect a desired behaviour. Theoretically, the yoked control design requires a number of paired subjects in the same situation but different response events. One of the two members of each pair is asked to be an experimental subject while the other member of the pair is asked to be a yoked control subject.

In this experiment, the learning instruction is a guideline for quitting Facebook during a single browsing session. The experimental subject was asked to quit Facebook when they receive a negative emotional experience. As an example, this happened after five minutes of browsing Facebook. The control subject was then asked to limit their Facebook browsing time to just 5 minutes as this was the length of time the experimental subject browsed for.

Therefore, this experiment was run in the yoked control design with two conditions of Facebook browsing: quitting after a negative emotion and quitting after N minutes, where N is matched to a participant in the experiment group.

4.3 Method

4.3.1 Participants

Recruitment was done via notice boards around the University of Bath, online notices boards, and word-of-mouth recruitment. Data was collected from 26 pairs of subjects ($n=52$, 35 females). All participants were students and staffs from different departments in the University of Bath. They were between 18 and 52 years old ($M = 28.73$, $SD = 7.22$). Participants in the experimental condition spent an average 10 minutes and 46 seconds for browsing Facebook ($M = 10.46$, $SD = 4.20$). As designed, the yoked control participants spent the same amount of time browsing Facebook.

During the experiment, each participant was asking to complete Facebook usage questionnaire. The participants reported, on average, that they thought it would be 134 minutes until they opened Facebook again ($M = 133.78$, $SD = 205.81$). Participants moderately agreed with the statement “I am looking forward to the next time I open Facebook” ($M = 0.33$, $SD = 4.13$) but they significantly disagreed with “I was frustrated by having to quit Facebook just now” ($M = -4.54$, $SD = 5.44$). Participants reported their average number of Facebook friends was 489 ($SD = 452.28$). They visited Facebook around 8 time in a day ($SD = 8.24$) and spent 89 minutes browsing Facebook in a day ($SD = 100.67$).

Due to the yoked control experiment design, participants were sequentially assigned to one of the two group. The first group was the experimental group where each participant was instructed to quit Facebook when they experimented a negative thread after the first five minutes of browsing Facebook. The second group was the control group. Participants in the control group were instructed to quit Facebook after N minutes.

4.3.2 Materials

In this section we list the materials used (in the order they were encountered during the experimental procedure), and in particular how instructions were worded for the emotion rating tasks.

The experiment utilised:

- The Chrome Browser on a University-secure Apple MacBook Pro on which each participant's Facebook account was accessed.
- The QuickTime Player screen recorder.
- The Macintosh Digital Desktop clock.
- A Facebook Usage and demographics questionnaire reduced from the online questionnaire of University of California (University of California, 2016) (see Appendix F).
- A single retrospective emotional rating question using a 21 point scale.
- A spreadsheet on which participants entered the threads that they encountered while browsing Facebook, then rated their emotional response to each thread, then listed recalled threads.

The instructions for rating the emotional utility of each encountered thread while browsing Facebook were as follows:

'Please fill with the threads that you encountered (a thread is to set of messages under any status update). Describe or name each thread with a distinguishing phrase.

Please rate your emotional response to every thread. We recognise that this might be quite nuanced, but we would like you to distinguish whether your response was positive or negative.

A positive response would include, liking, enjoying, being interested by, finding funny, touching etc.

A negative response would include disliking, being irritated, upset, bored, etc

For each thread, please also rate how strong your response was, with a middle point of indifference, or no emotional response.'

The response for each encountered thread was made by ticking one box on a 21 point scale labelled from -10 to +10 with the zero point labelled "Indifferent" and the words Negative and Positive over the respective part of the scale.

The retrospective rating was introduced as follows:

'Please rate the entire Facebook interaction session according to how negative or positive it was as an overall emotional experience.'

The response for the retrospective rating was made by ticking a box on a scale identical to that used for the emotional experience of each encountered thread.

The recall instructions were as follows:

'Please recall the threads you encountered (a thread is the set of messages under any status update). Describe or name each thread you can recall with a distinguishing phrase.'

4.3.3 Procedure

Individual participant was invited into the laboratory. The procedure of this experiment consisted of three main phases in a fixed order: 1) interacting with Facebook by reading the news feed and judging the emotional utility of each encountered thread while browsing Facebook (the moment-by-moment rating), responding to a questionnaire; 2) judging the overall emotional utility of Facebook-browsing episode; 3) recalling Facebook threads. The phases are detailed below.

Once the consent form was signed, each participant was handed an information sheet to read and could ask if they have any question before starting the experiment (see Appendix C). In the information sheet, participants were instructed about when they were allowed to quit Facebook. While reading the news feed, participants were instructed that they could only “read”, “like”, and “share” as well as they were allowed to open links, but always to return directly to Facebook from this linked destination. Participants were not allowed to enter status updates or comments so that their memories were not disrupted by other stimuli and to ensure they encountered a number of separate threads during the experiment session. They also were informed their screens were recorded while browsing Facebook.

Participants were invited to access their Facebook account via the Chrome browser running on an Apple MacBook Pro. If participants were instructed to quit after N minutes, they were told to use the Macintosh digital desktop clock to note the time they started browsing and to ensure that they quit at N minutes. However, if participants were not quit at N minutes, the participants will be told to stop by the experimenter.

Additionally, while browsing Facebook, participants were asked to write a distinctive phrase and rate how strong positive or negative was their emotional experience for each thread they encountered. Participants made their judgement on a Likert – type scale with -10 as the most negative and +10 as the most positive emotional experience. Participants were informed that a positive response might include liking, enjoying, being interested in, finding funny, touching, etc. while a negative response would

include disliking, being irritated, upset, bored, etc. (a bored label is a negative as opposed to neutral emotion as we explained in Experiment 1). These judgement -- writing a distinctive phase and rating their emotional experience were recorded by participants in an Excel file.

After the browsing period, participants were asked to complete the demographic and Facebook usage questionnaire. This questionnaire was similar to the questionnaire of Experiment 1 (see Appendix F). Participants took around 5 – 7 minutes to complete the questionnaire. Then participants were asked to rate how positive or negative was their overall emotional experience of the Facebook browsing. Participants used the same response scale as for the moment-by-moment rating.

Next, participants attempted to recall encountered threads that they had seen during Facebook browsing session. They were instructed to write a distinctive phase as before in the Excel file but different sheet from the moment-by-moment rating. We called this sheet as post-recalled sheet. After they reported being unable to recall further threads, the recording of the session was opened for participants to view. The participants were required to complete their recalled list with the forgotten threads, using a distinctive phased as before. Also, they were required to note the order in which all the encountered threads.

Once completed the rating, participants were thanked and debriefed, and the recording of their browsing session was deleted.

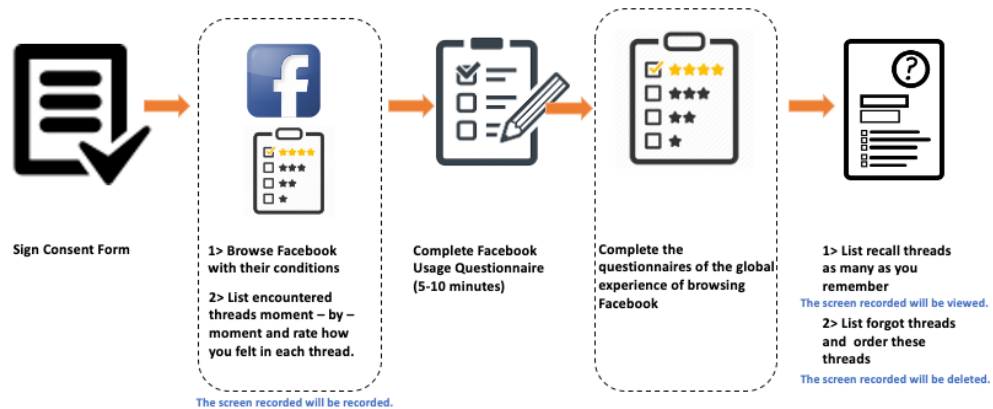


Figure 4.1 Procedure of Experiment 2.

4.4 Results

In this section, analysed data is presented with five parts which are descriptive data and four following the hypothesis of this study.

Descriptive data of the experimental group:

On average, participants spent 10 minutes and 46 seconds browsing Facebook. Table 4.1 shows these data, along with their response to the emotion judgement for the quit after negative group. Twenty – six subjects participated in this group. Twenty - two participants reported overall positive retrospective emotional rating of their browsing episode; only one participant rated negative overall emotional experience.

Participants on average read 13 threads during browsing Facebook ($M = 12.77$, $SD = 7.53$) and they were able to remember two of third of all encountered threads ($M = 8.08$, $SD = 5.51$).

Descriptive data of the control group:

On average, participants spent 10 minutes and 46 seconds browsing Facebook as for the experimental group. Twenty – six subjects participated in the control group. Eighteen participants reported overall positive retrospective emotional rating of their browsing episode; eight participants reported the neutral of the overall retrospective

emotional rating; and no participant rated overall negative retrospective emotional experience of browsing episode.

Participants on average read 13 threads during browsing Facebook (M = 13.27, SD = 4.90) and they could remember almost 70 percent of all encountered threads (M = 8.58, SD = 2.74).

Table 4.1 Descriptive data for the experimental group.

Group I: Quit after negative group	M	SD	r
Overall emotional rating of episode	2.88	2.25	
<i>Moment-by-moment rating</i>			
Number of encountered threads	12.77	7.53	
Number of recalled threads	8.08	5.51	
Number of forgotten threads	4.69	6.54	
Number of positively rated encountered threads	7.96	4.63	
Number of negatively rated encountered threads	1.85	1.05	
Number of neutral rated encountered threads	2.96	3.82	
Average emotional rating of encountered threads	2.31	2.08	0.76**
Average emotional rating of recalled threads	2.27	2.19	0.67**
Average emotional rating of forgotten threads	2.73	2.73	0.70**
Emotional rating of peak encountered thread	5.56	5.80	(0.38)
Emotional rating of end encountered thread	-2.53	3.29	(0.22)
Group II: Quit after N minutes			
Overall emotional rating of episode	2.73	2.34	
<i>Moment-by-moment rating</i>			
Number of encountered threads	13.27	4.90	
Number of recalled threads	8.58	2.74	
Number of forgotten threads	4.69	3.58	
Number of positively encountered threads	7.69	3.10	
Number of negatively encountered threads	2.65	2.84	
Number of neutral encountered threads	2.92	2.61	
Average emotional rating of encountered threads	2.23	1.69	0.45*
Average emotional rating of recalled threads	2.68	1.65	(0.23)
Average emotional rating of forgotten threads	2.72	2.83	0.56**
Emotional rating of peak encountered thread	4.69	7.34	0.45*
Emotional rating of end encountered thread	1.53	5.26	(-0.04)

Note: *r* means the correlation with the overall emotional rating, (*r*) = not significant correlation, **p* < 0.05, ***p* < 0.01

H1: The mean retrospective rating of the experiment group will be lower than those in the control group, because they will have depressed end emotional ratings.

The overall retrospective rating reported by participants in the experiment group was, on average, 2.88 (SD = 2.25) which was, in fact higher than the overall retrospective rating of the control group (M = 2.73, SD = 2.34).

To further test this hypothesis, we conducted a paired t-test comparing between the mean retrospective rating of the experiment group and the mean retrospective rating of the control group. This effect was not significant ($t(25) = 0.24, p = 0.81, d = 0.07$).

Clearly, there is no support at all for Hypothesis 1.

H2: The peak – end rule will predict the overall emotional experience for participants in both conditions of the experiment.

In this section each group was analysed separately. We started with the exploration of the experiment group. Participants in the experiment group were asked to quit Facebook after they experienced the negative thread. Next, we moved to analyse the control group. Participants in this group were asked to quit Facebook when the time limit expired (after N minutes). Each participant was instructed with a different browsing Facebook time.

The experimental group:

Table 4.1, Unfortunately, there were no significant correlation between the overall emotional experience and the peak rating ($r(24) = 0.38, p = 0.06$) or between the overall emotional experience and the end rating ($r(24) = 0.22, p = 0.27$).

A multiple linear regression was calculated to predict the overall emotional response based on the peak emotional experience and the end emotional experience. Unsurprisingly given the partial correlations, the result shows that, the peak rating and

the end rating were not a significant predictor of retrospective judgement ($F(2,23) = 1.97, R^2 = 0.15, p = 0.16$).

However, Table 4.1 shows that the overall emotional experience and the average emotional rating of all threads were highly correlated with ($r(24) = 0.76, p = 0.00$). So, a multiple – regression was performed to test that the average emotional experience of all threads could predict the overall emotional experience. The result showed that it was a significant effect ($F(1,24) = 32.9, R^2 = 0.58, p < 0.001$).

The control group:

The finding shows that the peak rating was moderately significant correlated with the overall emotional experience ($r(24) = 0.45, p < 0.05$). Unfortunately, the end rating was not significant correlated with the overall emotional experience ($r(24) = -0.04, p = 0.86$).

To test the peak – end rule we performed a multiple regression with the peak and the end as the predictor variables and the retrospective emotional experience as the dependent variable. This regression was not significant ($F(2,23) = 2.98, R^2 = 0.21, p = 0.07$).

Regarding to the correlation between the overall emotional experience and the peak rating. A multiple regression was conducted to test that the overall emotional experience was predicted by the peak rating. This revealed a significant effect ($F(1,24) = 5.96, R^2 = 0.20, p < 0.05$).

In addition, there was moderately significant correlation between the overall emotional experience and the average emotional experience of encountered, $r(24) = 0.45, p < 0.05$. So, a multiple – regression was performed to test that the average emotional experience of all threads could predict the overall emotional experience. The result showed that it was a significant effect ($F(1,24) = 5.97, R^2 = 0.20, p < 0.05$).

Having reported these analyses for each group separately, we might note that their statistical power is somewhat low. Furthermore, the failure of H1 means that it is

legitimate to ignore the distinction between groups, and to test hypotheses 2 – 4 using the entire participant sample.

Importantly, this confirms the peak – end rule as valid. The peak rating was moderately significant correlated with the overall emotional experience ($r(50) = 0.42, p < 0.001$). Unfortunately, the end rating was not significant correlated with the overall emotional experience ($r(50) = 0.04, p = 0.78$).

To test the peak – end rule we performed a multiple regression with the peak and the end as the predictor variables and the overall emotional experience as the dependent variable. This regression was significant ($F(2,49) = 5.26, R^2 = 0.18, p < 0.001$). The results indicated that the model explained 18% of the variance. While the peak judgement contributed significantly to the model ($B = 0.14, p < 0.01$), the end judgement did not ($B = 0.03, p = 0.62$).

The final predictive model was:

$$\text{The overall rating} = 2.07 + 0.14 * (\text{PEAK}) + 0.03 * (\text{END})$$

H3: The recall of news feed threads will show a classic serial position effect

We predicted that the position of threads in a sequence might affect recall of threads. Recall of the first three threads should be boosted by the primacy effect while the last three threads will be boosted by the recency effect. The intermediate position in a sequence is represented by the average of each participant proportion of intermediate recalled threads. Figure 4.2 shows the mean proportion of recalled threads by a sequence of encountered threads with separate averages across participants. This curve is a “U” shaped curve that is following the serial position effect. Participants could better recall a beginning and the end of a sequence of encountered threads than the middle of a sequence of encountered threads.

We conducted a single – factor, repeat measure ANOVA on proportion recalled of the first three, the intermediate and the last three threads. The result shows it was significant effect ($F(2,153) = 7.13, p < 0.001$).

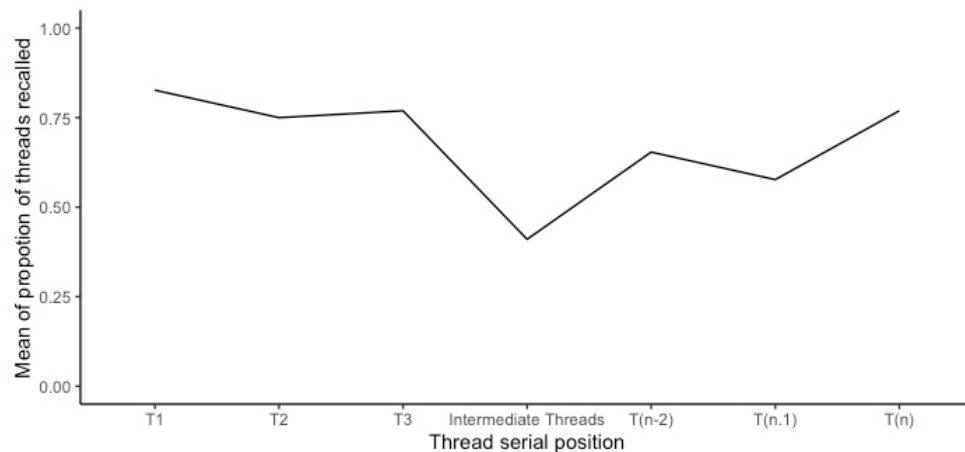


Figure 4.2 Mean proportion of recalled threads by serial position of encounter.

H4: People are able to recall positive emotional experience more than negative emotional experience.

We predicted that people would better recall emotionally more positive threads than negative and neutral threads. Table 4.1 shows that, on average, the recalled threads were more positively than the forgotten threads. In the results, we found there were four participants could remember all encountered threads. So, these participants were no forgotten records.

To test this hypothesis, we conducted a paired t-test comparing each participant's average emotional response to recalled threads with their emotional response to forgotten threads. The effect was not significant ($t(47) = -0.99, p = 0.33, d = 0.19$).

We also computed a paired t – test between the absolute emotional valence of recalled threads and forgotten threads for each participant and this effect was significant ($t(47) = 2.44, p < 0.05, d = 0.34$).

4.5 Discussion

In Experiment 1, the peak – end rule predicted the overall emotional experience of browsing Facebook. Furthermore, the overall emotional experience was found to be more positive than negative or neutral. This might be because of the peak judgement. Therefore, in this study we further explored the distortion of the retrospective emotional experience. The end judgement was manipulated between groups, to test a prediction that follows from the peak-end rule, that lower end judgements will be associated with lower retrospective summary judgements. It was calibrated in this study by how participants chose to quit browsing Facebook when they experienced negative emotions. These findings will be discussed below.

Participants were asked to rate the emotional utility after reading each thread and the retrospectively overall emotional experience. These ratings showed the overall emotional experience was rated positively and higher than the average emotional experience. Likewise, the peak rating was still more positive than for Experiment 1.

However, depressing the end judgement did not systematically effect on the retrospective judgement. There was no difference between the retrospective rating of the two groups. When the groups were combined to allow a more powerful test, the peak – end rule was found to be a reliable predictor of retrospective rating, but this effect was weaker than it was in Experiment 1, and even more dependent on the peak judgement.

Furthermore, in this experiment, unlike Experiment 1, the peak – end rule was a (very slightly) weaker predictor of retrospective summary rating than the average judgement of all encountered threads.

Further, we have confirmed that the serial position curve of recalled threads of browsing Facebook is characterized by a U shape which incorporates primacy and recency effect. First and last threads are better recalled than the intermediate threads, replicating one of the finding of Experiment 1.

The results with respect to emotional utility and recall only partially replicated the main finding of Experiment 1. Even if the recalled threads are positive, those threads are not significantly more positive than the forgotten threads when both rated. However, in terms of absolute strength of emotional response, recalled threads were significantly higher than forgotten threads.

The failure-to-replicate aspects of Experiment 2 are, we speculate, due to the change in method. In Experiment 2, some participants were instructed to stop browsing Facebook when they experienced a negative emotional experience. Because of this, a thread-by-thread, moment-by-moment rating made during the initial browsing was requested. In this procedure, participants were asked to report the sequence of emotional experiences while browsing Facebook. This was necessary so that they could stop when they rated the first negative threads. This interaction appears to be unnatural behaviour, or at least, we speculate that it has reduced some of the effects noted in Experiment 1. It seems plausible that it will have raised the salience of the emotional response to each individual thread and encouraged an approach to retrospective judgement in which these responses are remembered and averaged.

4.6 Conclusion

The aim of the current study was to examine whether depressing the end judgement might affect the retrospective emotional experience judgement. Indeed, in this study participants were instructed to quit Facebook after encountering a negative thread. We hypothesized that the negative emotional experience of the end thread might depress their overall emotional experience of browsing episode.

Unfortunately, this manipulation did not have the predicted effect. Nevertheless, the study did replicate the peak-end rule, although more weakly than in Experiment 1, which we attribute to the change in method, requiring participants to judge each thread as it was encountered.

The peak component of the peak-end rule appears to be more important than the end, which doesn't affect its promise as an explanation of the attractiveness of the news

feed but does affect its promise as a way of recalibrating summary judgments by employing a simple quit rule.

Further study is needed to better understand insight the peak – end rule especially emotional response as well as the emotional valence. For example, to extend which positive emotional labels are influence the retrospective judgement and the remember utility.

CHAPTER 5

TYPES OF EMOTIONAL RESPONSES TO THE FACEBOOK NEWS FEED

5.1 Chapter Overview

In the first two studies, we considered emotional responses to the Facebook news feed, only in terms of valence – the strength of feeling associated with a browsing episode, and whether the emotion was positive or negative. In the first study it was discovered that the memory for the emotional valence of a browsing episode was quite well predicted by the emotional valences of the peak thread and those of the end or the last-encountered thread. This confirmation of the peak-end rule is interesting because it suggests a partial explanation for why Facebook is so compelling: users’ memory for their emotional experience is likely to be “higher” or “better” than their moment-by-moment experience while browsing. The second experiment attempted to utilise the peak-end rule to construct a quit heuristic that might overcome its distorting effects: it was argued that if users quit after a negative thread then the peak-end rule should mean that the emotional valence of their remembered experience should be reduced, and perhaps better calibrated. Unfortunately, this hypothesised effect was not observed, and furthermore, the peak-end rule was more weakly supported in the data. We reasoned that this might be because of the necessary shift in method, which insisted that participants rated the emotional experience of each encountered thread

during their initial browsing. Such a focus might encourage a retrospective judgment which knowingly remembers (or attempts to remember ALL the prior judgments).

In this study we therefore return to a more naturalistic design in which the initial browsing of the news feed is not interrupted by any ratings. The study aims to look “inside” the peak-end rule effect and the emotional responses to the news feed by investigating the precise emotional responses as well as their valence. What do people most commonly feel when browsing the news feed? Do some of their emotional responses play a bigger role in their memory and retrospective judgments than do others?

In addition to this focus on emotion-TYPES, this experiment investigates whether the medium of Facebook posts (i.e. text, photographs, or video) affects the likelihood of threads being recalled or the emotional responses.

5.2 Thesis Experiment 3

5.2.1 Study Background and Motivation

In Experiments 1, and 2 we found that Facebook users in general rated their emotional experience as positive whether this was the emotional experience of the entire episode or the emotional experience of the encountered threads. Also, the users were better at remembering positively valence emotions than the emotions of negative valenced. Therefore, this section reviews narrative studies of emotional tones of a particular aspect of Facebook – the news feed. Then literature examining emotion as emotional-type labels is reviewed and lastly, we review prior studies exploring the effects of the medium on memory utility and emotion utility.

Krasnova, Wenninger, Widjaja and Buxmann (2013) studied particular emotional responses to Facebook use. Although their paper has a particular focus on envy, it begins with a wider-ranging investigation of the emotions people experience while using Facebook. In this study, participants were asked to complete a short online questionnaire that included open and closed questions. There were three questions in

the study. First, participants were asked “Please think about the last time you used Facebook. What did you feel afterwards? Which emotions did you experience?”. The results showed Facebook usage consisted of 28.8% neutral experience, 43.8% of positive emotional experience (joy/fun, satisfaction, feeling informed, excited and relaxed) and 27.4%, negative emotional experience (boredom, anger, frustration, guilt, sadness, loneliness, or envy). While the study focussed on envy, only four participants in this study experienced envy while using Facebook. The scholars argued that participants might deny labelling their emotions as envy, instead assigning other negative emotional experiences to their emotional outcomes. The second question was “Many users report feeling frustrated and exhausted after using Facebook. What do you think causes these feelings?” 29.6% of participants reported that these feelings were likely to arise from negative comparisons with other users; 19.5% from the lack of attention reflected in the absence of comments, likes and feedback; 13.7% from the sense of wasted time, 10.4% from loneliness, 10.1% from the negative content of news and 16.7% believed negative feelings stemmed from other reasons. The answers to this question seem to confirm that the envy emotional-type label is a major cause of frustration of Facebook use. The last question was “Please think about the last time you envied someone. Where did you experience this feeling?”. Participants felt envy of the travel and leisure activities of others (56.3%), their social interaction (14.1%), their happiness (7.0%) and for other reasons (22.6%). Consequently, this study found that people might experience the entire Facebook episode as a mixed (positive and negative) emotional experience. It also found that Facebook users can arouse negative emotional experiences, particularly the envy experienced when they compare their lives to other people.

Lapides, Chokshi, Carpendale and Greenberg (2015) concur that browsing Facebook is an emotionally mixed experience. Their mixed-methods study focused on the impacts of perceptions and satisfaction while browsing Facebook. There were four phases of this experiment. First, participants were asked to complete a questionnaire, including demographic questions, and Facebook usage questions. Then, they were asked to browse Facebook for about twelve minutes. While reading the news feed, the

participants were allowed to use it as usual (e.g. posting, liking, commenting, and sharing). Next, participants were moved to the third phase, referred to as think-aloud news feed browsing. In this phase, participants were asked to explain each thread as they encountered it. They needed to explain “how they knew this friend, who was posting, why they were interested or not in this post, and any specific context if the situation called for it” (Lapides *et al.*, 2015, p. 165). The last phase was a semi-structured interview. Participants were asked about their perceptions of browsing news feeds, their emotional experience of their other users and their general opinions of Facebook. Five categories emerged from this research: friendship strength and closeness, interestingness, annoyances, judgment, and liking and commenting on actions.

In terms of *friendship strength and closeness*, participants reported that friendship was the most important factor determining their interest in a post. A friend on Facebook meant family, or close friends (offline friends). Participants were more interested in posts from their family and close friends than acquaintances whom they no longer met. In contrast, participants were quick to ignore some posts that made them feel annoyed. *Interestingness* was linked to curiosity. Participants were particularly curious to read stories or posts from their close friends or topics of personal interest. The third category, *annoyances*, denoted negative emotional experiences which might be triggered by reasons such as an overload of uninteresting topics created by more distant acquaintances or community pages, and such threads were quickly skimmed through. Annoyance could also result from users who were perceived as posting too often about their travels or leisure activities. The theme of *liking and commenting* referred to the reciprocal liking of friends’ stories or friends’ posts, and the reluctance to comment on posts which were not fully understood. Perhaps surprisingly, all participants read comment threads due to curiosity about how others felt about the threads. In the final *Judgement* category, participants reported that they judged their friends by the content they posted and that their actions on Facebook were also intended to avoid the negative evaluations of others.

Lapides et al's study therefore explored the experience of reading the news feed and confirmed that the strength and closeness of friendship might be an important factor in whether or not a news feed thread was read. Personal interest and curiosity could motivate people to read threads, with interest also linked to the type and strength of friendship. Clearly, participants want to share interests and content with their friends, and if they read content created by strong, positive ties of various sorts, they might receive positive emotional experiences such as joy and happiness (Krasnova *et al.*, 2013). Nonetheless, reading news feeds can be trigger negative emotional experiences such as jealousy and envy (Krasnova *et al.*, 2013; Tandoc, Ferrucci and Duffy, 2015). Clearly, Facebook users experienced mixed emotions from their interactions on Facebook, whether this derived from reading threads or the strength of a tie.

Similarly, Lin and Utz (2015) investigated whether the emotional outcomes of reading threads on Facebook are influenced by the strength of tie. In this study, individual participants were asked to browse Facebook and read their news feeds. They were asked to report only four threads they had encountered. Participants were then asked to rate their feeling on a 7-point Likert scale after reading a thread: whether it was positive or negative, boring or entertaining, superficial or intimate, and finally, factual or subjective. Participants then reported the relationship between the participant and the poster by rating how strongly they agreed with these statements: 1. "We have a close relationship/friendship" and 2. "I would categorize him/her as one of my strong ties". Later, participants rated how strongly they agreed with the statements "I feel pleasant" and "I feel envious". The findings indicated that most participants received a positive emotional experience and were entertained after reading threads. The tie strength between a reader and a poster could predict the emotional outcome of browsing Facebook. Stronger ties could predict positive emotional experiences. In contrast, a weak tie strength could not predict a negative emotional experience. Negative experiences occurred because of self-esteem and because of reading sad content from close friends. Positive and negative emotional labels from all these studies are summarised in Table 5.1.

Table 5.1 Studies of emotions associated with browsing Facebook.

Reference	Emotional-type labels
Krasnova (2013)	Fun, Satisfied, Excited, Relaxed, Happy
	Bored, Angry, Frustrated, Guilty, Sad, Lonely, Envious, Irritated
Lin and Utz (Lin and Utz, 2015)	Happy, Entertain
	Envious, Frustrated, Jealousy
Lapides (2015)	Interested

Developing these earlier studies, but with a broader ranging and more general approach, the precise emotional experiences of browsing Facebook will be focused on this study. The objective of this study is to extend our knowledge of the particular emotions that reading the Facebook news feed tend to engender and how these determine retrospective judgments of a browsing episode.

To create the discrete categories used in this study, we considered both the emotional experience of browsing the Facebook news feed and the basic emotions from the general psychological perspective (Chapter 2.7). Rather than choosing one particular theory for this thesis (such as the widely used classification of anger, disgust, sadness, fear, anxiety, surprise, joy and happiness), it is possible to identify emotional-type labels that are shared by multiple theories. Table 5.2 presents the labels used for emotions in this experiment. These labels were adjusted from the literature from a noun form to an adjective form; for instance, the *entertainment* label from Lin and Utz (2015) was altered to *amused*. We also added some labels that might describe the emotional experience of browsing Facebook, such as *disgusted* and *anxious* from Friesen and Ellsworth (1982) and Oatley and Johnson-laird (1987). *Surprised*, from Friesen and Ellsworth (1982) and Frijia (Frijda, 1986) was added because this emotion has been linked to interest or curiosity. Lastly, we hypothesized that the label of *calm* might differ from “relaxed” in terms the situations in which it applies. Additionally, *proud* (adjusted from pride) might help to explain an emotional experience justifying why people post or share their lives on Facebook.

Thus, ten positive and ten negative labels for emotions, besides the labels of a neutral emotional experience, were used to describe participants' feelings when reading their news feeds.

We also investigated the effect on the utilities of memory and emotion exerted by the different media used in threads. The media of text, images and video used on Facebook have been widely explored from a business-marketing perspective, demonstrating that the effects of media on user engagement differ due to variation in their vividness and interactivity (Liu and Shrum, 2002). Luarn (2015) studied the effects of Facebook brand marketing pages on online user engagement, using secondary data from third parties. The data derived from several brand pages and measured consumer interest via features such as the number of likes, comments and shares. The researchers assumed that the number of likes and shares pointed to the level of interest and views from other users, while the number of comments indicated the impact of a product. The results showed that a high level of vividness (e.g., a post containing a video) could not increase user engagement, while the medium level of vividness produced, for instance, by a post containing text and images, had a strong influence on engagement. This may have been due to the reduced time, effort, and data allowance required to access text and images. On the other hand, posts that allowed users to interact positively affected the level of engagement. For this study, it is clear that the time spent reading or watching might be more significant than the media type, and that the time spent consuming the message might affect the time needed for retrieving the experience from memory.

Sundar (2000) explored the effect of multimedia on the processing and perception of online news, focussing on the relationship between the type of media, the user's memory, and the user's perception of news content on the website. For this experimental study, each participant was randomly presented with one of five media conditions (text, image, audio, image + audio, and video). These media were presented on the news website with the same design layout and the same content. After browsing the website, the participants were asked to complete a questionnaire which included

items on the perception of media content, evaluations of website usability, and memory after reading or watching the media. The results found that media containing images and audio was better remembered, while there was no evidence of an effect of video on memory. Additionally, only images produced a significant positive effect on perception, with the effect of video on perception much lower. In terms of online news, presenting audio or video appeared to hinder memory, due to limitations of the human capacity to remember larger amounts of information. In summary, the findings were similar to those of Luarn (2015), who found that media containing images (and text) might aid user perceptions whereas video might hinder memory.

Table 5.2 The set of labels for emotions used in Experiment 3.

Positive labels	Negative labels
Fun	Bored
Satisfied	Angry
Excited	Frustrated
Relaxed	Guilty
Interested	Sad
Calm	Lonely
Happy	Envious
Surprised	Irritated
Proud	Disgusted
Amused	Anxious

Therefore, it may be reasonable to explore whether the particular media used on news feeds might affect participants' memories of browsing experiences. In this respect, it was determined that Facebook users can create media in seven configurations: text, image, video, text + image, text + video, image + video, and text + image + video.

To sum up, this study continued to explore the peak-end rule by investigating the labels used for types of emotion in order to determine the label that best describes the overall retrospective rating of browsing Facebook as follow the research question is '*RQ4: What do people most commonly feel when browsing the news feed? and do some of their emotional-type labels play a bigger role in their memory and the*

retrospective judgement than do others?’ It also investigates the effect of the media used in Facebook posts on the utility of memory and emotion ‘RQ5: Does the medium of Facebook posts affect the likelihood of threads being recall or the emotional response of browsing the news feed?’

We hypothesized that:

H1: The peak – end rule will predict the overall emotional experience of browsing Facebook.

H2: The prediction of recall of news feed threads will show a classic serial position effect.

H3: People are able to recall positive emotional experience more than negative emotional experience.

H4: The effect of the end emotional experience on the quitting Facebook session will be apparent in end ratings that are lower than average ratings.

H5: Some emotions play a larger role in memory and retrospective judgements than others.

H6: The media used in news feeds affects the likelihood of threads being recalled and emotional responses of browsing news feeds.

5.3 Method

5.3.1 Participants

Seventy, in total, participants (59 Females and 11 males) were recruited from email advertisement and poster advertisements. They were between 18 and 52 years old ($M = 22.70$, $SD = 6.16$). The results of the Facebook usage questionnaire showed that participants had between 3 and 13,888 friends on Facebook ($Mdn = 477$). They spent, on average, 58 minutes in daily the platform ($Mdn = 45$). and visited roughly 6 times per day ($Mdn = 4$). Eighty percent of participants said they did not accept friend requests from strangers on Facebook while only one percent sometime accepted such

requests. Eighty – two percent of participants often posted a status on their news feeds. Participants also reported using Facebook to keep in touch with their family and friends, find information and share pictures, music and videos. In addition, fifty – four percent of all participants agreed with the statement was “social networking is important with to me” while five participants disagreed with it.

5.3.2 Materials

In this section we list the materials used (in the order they were encountered during the experimental procedure), and in particular how instructions were worded for the emotion rating tasks.

The experiment utilised:

- The Chrome Browser on a University-secure Apple MacBook Pro on which each participant’s Facebook account was accessed.
- The QuickTime Player screen recorder.
- The Macintosh Digital Desktop clock.
- A Facebook Usage and demographics questionnaire reduced from the online questionnaire of University of California (University of California, 2016) (see Appendix F).
- A single retrospective emotional rating question using a 21 point scale.
- A spreadsheet on which participants attempted to recall encountered threads, then listed all threads, then selected the best emotional labels (at least one, up to three labels) and rated their emotional response to each thread.

The retrospective rating was introduced as follows:

‘Please rate the entire Facebook interaction session according to how negative or positive it was as an overall emotional experience, rate how strong your response was for the overall emotional experience, and what the best labels (up to three) are for your overall emotional experience’.

The response was made by ticking one box on a 21 point scale labelled from -10 to +10 with the zero point labelled “Indifferent” and the words Negative and Positive over the respective part of the scale. (As in Experiments 1 and 2).

The emotional labels were entered by selecting a menu list that contained with a set of positive labels (fun, satisfied, excited, relaxed, interested, calm, happy, surprised, proud, and amused) and a set of negative labels (bored, angry, frustrated, guilty, sad, lonely, envious, irritated, disgusted, and anxious).

The recall instructions were as follows:

‘Please recall the threads you encountered (a thread is the set of messages under any status update). Describe or name each thread you can recall with a distinguishing phrase.’

The instructions for rating each emotional thread were as follows:

‘Please rate your emotional response to every thread. We recognise that this might be quite nuanced, but we would like you to distinguish whether your response was positive or negative.

For each thread please also rate how strong your response was, with a middle point of indifference, or no emotional response and what the best labels (up to three) are for your overall emotional experience’.

The response for each thread was made by ticking a box on a scale identical to that used for the retrospective rating of the entire episode.

The emotional labels selections were made by selecting from a menu that contained a set of positive labels and a set of negative labels – exactly the same as were used for the retrospective rating of the entire episode.

5.3.3 Procedure

The general structure of this study closely followed Experiment 1, but the procedure was elaborated with additional emotional-labelling tasks. There were again five main experimental phases in a fixed order: interacting with Facebook by reading the news feed; responding to a Facebook usage questionnaire; judging the overall emotional experience of the Facebook-browsing episode; recalling Facebook threads; and judging the emotional experience of each encountered Facebook thread. Participants were given general information concerning the experiment to obtain informed consent, but the detail of later tasks was not given until the tasks were encountered.

The important difference from Experiment 1 came in judging the emotional experience both of overall retrospective utility and of each the encountered Facebook thread. Each participant was asked to select the best emotional labels (at least one, up to three labels) which described the emotion(s) they experienced. To perform this task, they were presented with a menu of ten positive emotional labels (fun, satisfied, excited, relaxed, interested, calm, happy, surprised, proud, and amused) and ten negative emotional labels (bored, angry, frustrated, guilty, sad, lonely, envious, irritated, disgusted, and anxious). Participants were also allowed to add their own labels to describe which emotional they experienced.

Each participant was invited into the laboratory. After completing informed consent and reading the participant information sheet, each person was invited to access their Facebook account via the Chrome browser running on an Apple MacBook Pro. They were asked to browse Facebook for between 10 and 15 minutes; they were also told to use the Macintosh digital desktop clock to note the time they started browsing and to ensure that they browsed for at least 10 minutes and to quit sometime within next 5 minutes.

While browsing Facebook, participants were instructed that they could only read, like and share posts. They were allowed to open links that showed on their news feed but were told always to return directly to Facebook from this linked destination. Participants were asked not to post a new status, comment or chat via a Facebook

messenger, so what their memories were not disrupted by other stimuli and to ensure they encountered a number of separate threads during the experiment session. They were informed that the screen would be recorded throughout.

After the browsing episode, participants were asked to complete the demographic and Facebook usage online questionnaire (see Appendix F), taking roughly 7 – 10 minutes to do so. Then, participants were asked to rate how positive or negative their overall emotional experience of the Facebook–browsing episode had been. The Likert – type scale for this was the same as for Experiment 1. After judging the overall emotional experience, the participants were asked to select up to three emotional labels and rate how strong the response was for each label. To perform this task, the participants were presented with one of two menus of ten emotional labels which represented their overall judgement of the emotional experience of Facebook. If the participant rated the overall emotional experience as positive, they were presented with the menu of ten positive emotional labels. In contrast, if the participant rated the overall emotional experience negatively, they were presented with the ‘negative’ menu. If they rated the experience as emotionally neutral, they were allowed to skip this task.

Next, the participants attempted to recall every thread that they had seen during the Facebook – browsing session. They were again asked to do this by offering a brief descriptive label for each recalled thread. After they reported being unable to recalled further threads, the recording of the browsing session was opened for participants to view. The participants were required to complete their recalled list with the forgotten threads, using brief descriptive labels, and to select each type of thread (text, picture, and video) and to note the order in which all the threads had been encountered.

Finally, the participants were asked to rate how positive or negative their emotional experience of each thread in the complete list had been, including both recalled and forgotten threads, and, again, to choose up to three items to labels the emotions they associated with each thread (or to supply their own). On completion of the thread-judgment task, participants were thanked and debriefed, and the recording of their browsing session was deleted.

5.4 Results

On average, the participants spent around 12 minutes browsing Facebook ($M = 11.91$, $SD = 1.58$). They reported they had encountered an average of 24 threads during this time. Thirty-seven participants rated the overall experience positively, but five rated it negatively. In addition, twenty – eight participants rated the overall emotional experience as neutral.

The study participants reported that they recalled around one-third of the threads they encountered. Around half of all encountered threads were rated emotionally positively, and the average emotional judgment of all threads was moderately positive, but less positive than the overall emotional experience of the entire episode.

Table 5.3 Encountered threads, judgement of emotional utility and recall performance of Experiment 3.

	M	SD	r
Overall emotional rating of episode	2.87	4.11	
Number of encountered threads	24.19	11.33	
Number of recalled threads	8.87	3.52	
Number of forgotten threads	15.31	9.67	
Number of positively rated encountered threads	12.00	5.79	
Number of negatively rated encountered threads	2.74	2.40	
Number of neutral (zero) rated encountered threads	9.44	6.97	
Average emotional response of encountered threads	2.61	1.88	0.53**
Average emotional response of recalled threads	2.78	2.45	0.40**
Average emotional response of forgotten threads	2.40	2.07	0.45**
Emotional response of a peak encountered thread	7.10	4.60	0.39**
Emotional response of an end encountered thread	2.20	4.70	(0.18)
Emotional response of last three encountered threads	2.46	3.11	0.45**

Note: *r* refers to the correlation with the overall emotional rating, (*r*) = not significant correlation, * $p < 0.05$, ** $p < 0.01$

H1: The peak – end rule will predict the overall emotional experience of browsing Facebook.

The overall emotional utility and the average of all threads were positively correlated with $r(68) = 0.53, p = 0.00$. The correlation between the overall rating and the peak rating was lower ($r(68) = 0.39, p < 0.001$). In contrast, the end rating and the overall rating were not correlated with each other.

To test the peak – end rule we performed a multiple regression with peak and end as the predictor variables and the overall rating as the dependent variable. The regression was significant ($F(2,67) = 6.46, R^2 = .16, p < 0.001$). The results indicated that the model explained 16% of the variance. While the peak judgement contributed significantly to the model ($B = 0.33, p < 0.01$), the end judgement did not ($B = 0.10, p = 0.30$).

The final predictive model was:

$$\text{The overall rating} = 0.33 + 0.33 * (\text{PEAK}) + 0.10 * (\text{END})$$

H2: The recall of news feed threads will show a classic serial position effect.

Figure 5.1 shows the mean proportion of threads recalled, according to the position of encounters in the series, with a separate average across participants for the first three, and last three threads encountered. The central value was an average of each participant's proportion of intermediate threads recalled (which was the average over a varying number of threads)

The primacy effect was higher than the recency effect while the intermediate position in sequences was higher than the recency effect but lower than the primacy effect. Unfortunately, then, this finding did not follow the serial position effects rule. Figure 5.2 presents the average emotional rating of recalled thread for each position following the serial position effect.

We conducted a single-factor, repeated measures ANOVA on the proportion recalled of the first three, intermediate and final three threads recalled by participants. These revealed a significant effect ($F(2,207) = 100.3, p < 0.001$).

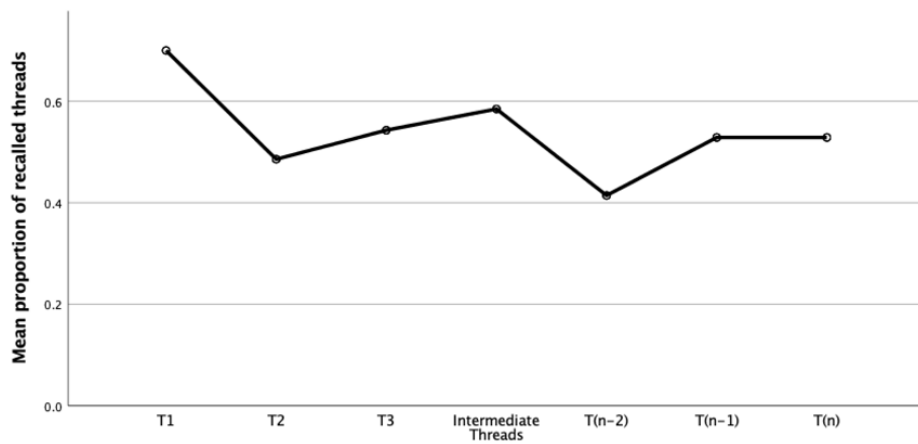


Figure 5.1 The mean proportion of recalled threads for the first three threads, intermediate threads, and last three threads.

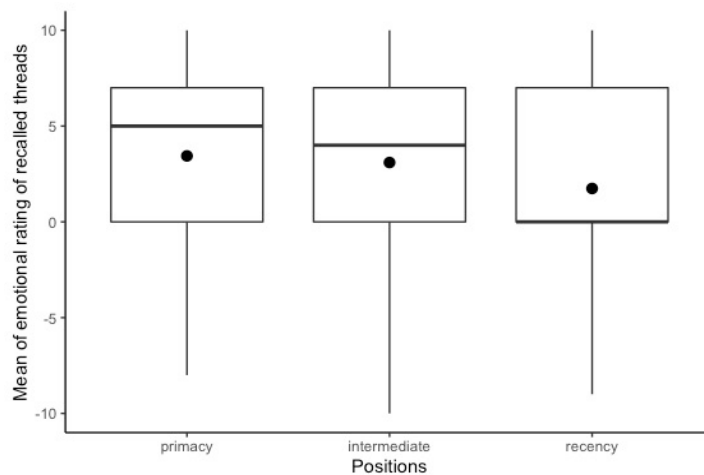


Figure 5.2 The mean emotional rating of recalled threads for each position of primacy, intermediate, and recency threads.

H3: People are able to recall positive emotional experience more than negative emotional experience.

As predicted, people's recall of positive emotional experiences was better than for negative emotional experiences. The data in Table 5.3 shows that on average the recalled threads were rated more positively than the forgotten threads.

To test this hypothesis, we conducted a paired of t-test comparing each participant's average emotional rating of recalled threads with their emotional response to forgotten threads. Unfortunately, the effect was not significant ($t(69) = 1.20, p = 0.23, d = 0.17$).

However, when the absolute emotional valence of recalled threads ($M = 4.57, SD = 1.79$) and forgotten threads ($M = 3.33, SD = 1.85$) was compared, the effect was a significant ($t(62) = 6.25, p = 0.00, d = 0.68$).

H4: The effect of the end emotional experience on the quitting Facebook session will be apparent in end ratings that are lower than average ratings.

Table 5.3 shows that the emotional experience of the last encountered thread ($M = 2.20, SD = 4.70$) and the emotional experience of the last three encountered threads ($M = 2.46, SD = 3.11$) were lower than the average of the emotional experience of all encountered threads ($M = 2.61, SD = 1.88$). The end rating was lower than the rating of the last three threads. We thus hypothesized that people might quit their session because their enjoyment had diminished.

A paired t – test was computed to compare the average response to all threads with the last thread. This effect was not significant ($t(69) = 0.80, p = 0.61, d = 0.11$). A paired t – test was additionally computed to compare the average response to all threads with the last three threads. The effect was not significant ($t(69) = 0.51, p = 0.43, d = 0.05$).

Table 5.4 Descriptive data of each emotional-type label.

Emotional label	All encountered threads			Recalled threads			Forgotten threads			Overall retrospective utility		
	M	N	NP	M	N	NP	M	N	NP	M	N	NP
Fun	5.72	148	52	5.88	62	36	5.59	86	40	6.07	13	13
Satisfied	6.06	54	34	6.15	26	19	5.96	28	19	6.45	11	11
Excited	6.29	89	46	6.36	44	29	6.22	45	32	6.00	4	4
Relaxed	5.97	38	22	5.94	17	13	6.00	21	15	7.18	11	11
Interested	5.84	280	64	6.32	122	58	5.46	158	53	6.22	18	18
Calm	5.08	37	27	4.69	16	14	5.38	21	17	6.88	8	8
Happy	6.16	171	59	6.52	92	49	5.74	79	36	6.56	9	9
Surprised	5.95	40	26	6.17	23	18	6.00	16	15	7.33	3	3
Proud	6.19	48	27	6.83	24	18	5.54	24	20	6.00	2	2
Amused	5.62	177	42	6.13	53	28	5.46	123	32	6.70	10	10
Bored	- 4.42	26	16	- 4.83	12	10	- 4.07	14	8	-7.00	2	2
Angry	- 4.79	39	26	- 4.89	18	15	- 4.71	21	16	-2.00	1	1
Frustrated	- 5.05	37	23	- 5.39	18	16	- 4.74	19	13	-5.50	2	2
Guilty	- 5.71	7	6	- 6.33	3	3	- 5.25	4	3	-10.00	1	1
Sad	- 4.94	52	32	- 4.70	30	24	- 5.27	22	14	-5.00	1	1
Lonely	- 4.33	3	2	- 4.00	1	1	- 4.50	2	2		0	0
Envious	- 4.00	17	9	- 3.29	7	4	- 4.50	10	7		0	0

Note Number of the label was assigned to the threads (N), Number of participants who selected the labels (NP).

Table 5.5 Descriptive data of each emotional-type label (cont.)

Emotional label	All encountered threads			Recalled threads			Forgotten threads			Overall retrospective utility		
	M	N	NP	M	N	NP	M	N	NP	M	N	NP
Irritated	- 4.66	41	21	- 4.91	23	18	- 4.33	18	11	-6.00	1	1
Disgusted	- 4.28	18	14	- 5.14	7	6	- 3.73	11	10			
Anxious	- 5.27	15	11	- 5.70	10	9	- 4.40	5	15	-1.00	1	1
Extra emotional labels from participants												
Admired	6.00	1	1	6.00	1	1						
Warm good feeling	7.00	1	1	7.00	1	1						
Stressed	- 5.00	1	1	- 5.00	1	1						
Uncomfortable	- 3.00	1	1	- 3.00	1	1						
Sympathetic	- 7.00	1	1	- 7.00	1	1						
Confused	- 3.00	2	1				- 3.00	2	1			
Concerned	-10.00	1	1				- 10.00	1	1			

Note Number of the label was assigned to the threads (N), Number of participants who selected the labels (NP).

H5: Some emotions play a larger role in memory and retrospective judgement than others.

Participants were asked to select the best labels (at least one, up to three labels) to describe the emotion they experienced for the overall retrospectively and for the emotional experience of each Facebook thread encountered. They were presented with a menu of ten positive emotional labels (fun, satisfied, excited, relaxed, interested, calm, happy, surprised, proud, and amused) and ten negative emotional labels (bored, angry, frustrated, guilty, sad, lonely, envious, irritated, disgusted, and anxious). Participants were also permitted to use their own labels.

Table 5.4 and Table 5.5 present the descriptions of emotion labels with positive and negative labels. Additionally, seven new labels were added by participants. These new consisted of two positive emotional labels (admired and warm good feeling) and five negative emotional labels (stressed, uncomfortable, sympathetic, confused, and concerned).

The next step was to consider whether retrospective emotional evaluation could be predicted by considering only those threads that shared the label that participants assigned to their retrospective rating. Because interested was the most commonly used label, and thus provides the most data as well as being arguably the most important case, this analysis focussed on that label. When a participant labelled their overall retrospective evaluation as *interested* than we considered only those threads that were labelled *interested* and considered the emotional valence across these threads (Table 5.6).

Fifteen participants assigned the *interested* label to their retrospective evaluation. The average of this label for the overall emotional rating of the entire episode was higher than for the overall emotional rating of the equivalent threads in the episode. The correlation between the average of the *interested* label rating of the entire episode and the overall emotional rating of episode demonstrated a highly positive effect. ($r(13) = 0.94, p < 0.001$). Similarly, the average of the *interested* label for all encountered threads and the overall emotional rating of the episode was positively correlated (r

(15) = 0.55, $p < 0.05$). The correlation between the end rating and the overall emotional experience was also similar ($r(15) = 0.63, p < 0.05$).

To test the validity of these results, we conducted a multiple regression with the overall retrospective response as the dependent variable with the peak and the end of the *interested* label as a predictor variable. The result showed that a significant effect $F(2,12) = 4.32, p = 0.03$, with $R^2 = 0.32$, indicating that the peak and the end of this label can predicted the retrospective emotional evaluation.

Table 5.6 The judgements of emotional utility and recalled performance for the *interested* label.

	M	SD	r
Overall emotional rating of episode	6.27	2.79	
Average of this label for the overall emotional rating of episode	6.40	2.79	0.94**
Average emotional rating of encountered threads	6.05	1.88	0.55*
Average emotional rating of recalled threads	6.26	1.98	(0.35)
Average emotional rating of forgotten threads	5.73	2,13	0.50*
Emotional rating of peak encountered thread	7.89	2.07	(0.38)
Emotional rating of end encountered thread	6.13	2.34	0.63*

Note: r refers to the correlation with the overall emotional rating of the episode, (r) = not signification correlation, * $p < 0.05$, ** $p < 0.0$.

This table presents descriptive data from 15 participants who assigned the *interested* emotional-type label on the overall retrospective utility and the emotional experience of the encountered threads

It must be noted that participants were asked to select at least one, and up to three emotional labels. The *interested* label could be assigned for the recalled threads with other emotional labels. Table 5.7 presents the comparison between recalled and forgotten threads which were assigned the emotional labels that came with the *interested* label.

To test the association between the emotional labels and the recalled threads. A Chi-Square was performed. This result shows that there was not enough evidence to

suggest the correlation between the emotional labels and the recalled threads ($\chi^2 = 47.5$, $df = 42$, $p = 0.26$).

Table 5.7 Descriptive data of the emotional labels which selected alongside the *interested* label.

Emotional Label	Recalled threads			Forgotten threads		
	N	Mean	SD	N	Mean	SD
Interested	122	6.32	2.39	158	5.46	2.38
Fun	9	6.67	1.58	9	6.11	1.62
Satisfied	6	6.17	2.23	5	6.20	2.86
Excited	9	6.00	2.24	8	7.00	1.77
Relaxed	1	6.00	-	2	6.00	1.41
Calm	3	4.00	1.00	3	5.33	3.06
Happy	8	5.88	1.55	11	5.73	2.80
Surprised	6	6.17	2.40	2	8.00	2.83
Proud	5	5.20	2.28	8	5.38	2.77
Amused	4	3.50	1.73	9	6.56	2.83
admired	1	6.00	-	-	-	-

H6: The media used in news feeds affects the likelihood of threads being recalled and emotional response of browsing news feeds.

All participants were asked to identify the types of media encountered in each thread. Each thread could be classified as containing more than one type. As mentioned above, seven type of patterns were identified text, picture, video, text + picture, text + video, picture + video, and text + picture + video. Table 5.8 presents the quantity of each media pattern among the threads that participants either encountered, recall or forgot. Media posted in the form of text + picture was the most frequently encountered and followed by the form of picture.

Table 5.8 Descriptive data of the types of media on Facebook posts.

Text	Picture	Video	All encountered Threads			Recalled Threads			Forgotten Threads		
			N	M	SD	N	M	SD	N	M	SD
		Y	261	3.18	4.47	111	3.83	4.77	150	2.70	4.19
	Y	Y	6	7.50	1.87	3	8.33	2.08	3	6.67	1.52
Y		Y	78	2.47	4.87	34	2.82	5.81	44	2.20	4.05
Y	Y	Y	11	3.18	3.03	3	4.00	2.65	8	2.88	3.27
	Y		615	3.05	3.96	245	3.42	4.22	370	2.79	3.77
Y	Y		662	3.36	4.25	245	3.01	4.67	417	1.98	3.27
Y			373	1.58	4.74	152	1.36	5.24	221	1.74	4.35
Total			2006	2.56	4.34	793	2.96	4.78	1213	2.30	4.05

Note: Mean of the emotional experience for each pattern (M), Standard deviation of the emotional experience for each pattern (SD).

Table 5.9 Descriptive data of each medium, for 34 participants who experienced all types of threads.

Type of medium	All encountered Threads			Recalled Threads			Proportion of recalled thread	
	N	M	SD	N	M	SD	M	SD
Video	243	3.08	4.80	114	3.76	5.11	0.53	0.26
Picture	637	2.45	3.92	236	2.97	4.43	0.39	0.20
Text	219	1.21	4.79	101	1.09	5.19	0.59	0.30

Note: Mean of the emotional experience for each medium (M), Standard deviation of the emotional experience for each medium (SD).

To test effect of memory, larger groupings were needed so that enough participants encountered threads of all types. We regrouped in the different groups according to the ‘richest’ medium in each thread: video, picture, or text (Table 5.10). There were thirty – four participants who encountered threads of all of these three types. Table 5.10 showed that the average emotional judgement of posts including the form of video (M = 3.08, SD = 4.80) was higher positive rating than posted including the form of picture (M = 2.45, SD = 3.92) and the form of text (M = 1.21, SD = 4.79).

Regarding the proportion of recalled threads, posts contained text was remembered most frequently, followed by that of video and of picture. Then we conducted a single-factor, repeated measures ANOVA on the proportion recalled of the form of included text ($M = 0.59$, $SD = 0.30$), the form of included video ($M = 0.53$, $SD = 0.26$) and the form of included picture ($M = 0.39$, $SD = 0.20$) by participants. These revealed a significant effect ($F(2,99) = 5.17$, $p < 0.01$).

Additionally, to test the effect of medium on the emotional judgement of browsing Facebook, we conducted a single-factor, repeated measure ANOVA on the average emotional rating of different medium by participant. This revealed a significant effect ($F(2,99) = 5.95$, $p < 0.01$). As can be seen in Table 5.10, the video medium had the highest, most positive average emotional response, and the text-only medium had the lowest.

5.5 Discussion

This experiment replicates most of the main effects of Experiment 1, which bolsters the speculative attempt to explain away the non-replication of or weakening of some of these effects in Experiment 2.

In particular, this experiment provides strong evidence and support *Hypothesis 1* that the overall emotional experience of browsing Facebook was positive and can be predicted both from the thread with the highest emotional utility and that of the end-encountered thread.

Although, participants' recall of threads did not replicate the classic serial order effect it did confirm a primacy effect, to the extent that the primacy threads were better recalled than the last three encountered threads. Additionally, we found the emotional impact of the first three recalled threads was highly positive before reducing until the end of the episode. Because of the high intensity of emotional responses, participants were better able to recall the first three threads than the other threads.

Also, the results of this study did not support *Hypothesis 3*. Recalled threads were not more positively valenced than forgotten threads, However, as in Experiment 1

emotion strength led to better recall: the absolute valence of recalled threads was higher than forgotten threads.

On the other hand, we found that the effect of the end thread on users' experiences did not support the *Hypothesis 4* that the emotional experience of browsing Facebook would be diminished at the end of the thread. It can be therefore be assumed that due to the peak-end rule, the overall emotional experience of browsing Facebook may be more positively rated.

The *interested* label was the most widely selected to describe both the overall retrospective response and the emotional experience of specific threads (the *Hypothesis 5: RQ4*). This label also appeared to be a powerful factor in the utility of the platform for memory and emotion. The overall retrospective response as *interested* can be predicted from the peak and the end of encounter threads that were assigned with this label

Finally, the richest medium posted on Facebook in the form of video and the form of text were remembered better than it posted in the form of picture. There was significant effect on different medium on people' memory (the *Hypothesis 6: RQ5*). Surprisingly, posts containing video and text were better remembered than containing picture. This is even more surprising given the additional finding that picture posts had higher emotional response than did text-only posts. We reasoned that people might spend more time-consuming posts that contained video or text (i.e. watching or reading content and that text might be shorter in the presence of a picture). The additional time spent consuming these media could positively affect the ability of participants to commit these posts to memory.

5.6 Conclusion

The chapter presented in this study explored the peak-end rule. The valence of emotional utility, especially the peak moment and the end moment of an experience, might be a main factor explaining why Facebook is so attractive to browse. This

importance of the peak – end rule first identified in Experiment 1 was replicated. Additionally, this study investigated the best labels to describe the emotional utility of browsing Facebook, finding that *interested* was the highest placed of these. While some scholars have argued that interestingness is not a basic emotion, it is an emotion which is deeply implicated in learning (Tomkins, 1984; Frijda, 1986; Izard, 1992). It thus appears that when people browse Facebook, they might learn something from news feeds. The next chapter will explore why the *interested* label is suitable to describe the emotional experience of browsing Facebook.

CHAPTER 6

PREDICTORS OF

INTERESTINGNESS OF THREADS

ON FACEBOOK NEWS FEEDS

6.1 Chapter Overview

In this chapter, having discovered that ‘interested’ is the most commonly used emotional label for Facebook responses and behaves according to the peak-end rule so as to be a strong predictor of emotional memory, we further examine the interestingness of Facebook browsing experiences, drawing on previous studies of interestingness as an emotion and attempting to discover something about its causal structure.

While many scholars do not include ‘interested’ as a basic emotion, others argue that it is properly termed an emotion. For example, Izard (1977) emphasised that emotions are a basic motivation for learning. Supporting this, Silvia (2008) explained that interest is an intrinsic motivation for learning new and complex information. Izard and Silvia claim that human emotions are present from birth. For example, babies attempt to explore new things around themselves and learn how to express their responses to their mothers using their faces, their actions and their voices. Interest initially motivates people to seek knowledge, beginning at birth and is adaptive over time. In another example, the label of interest has been described in terms of education. Krapp (1999) stated that students would achieve higher grades in

interesting subjects rather than in boring subjects. These factors combined may explain why these scholars include interest as a basic emotion.

Even if regarding interest as an emotion is unusual, and even if the above argument is not fully convincing, it is surely true that people can judge and report how strongly interested they have been in a Facebook thread, and this judgement is similar in important ways to how they would judge how strongly amused or pleased (for example) they are by a thread.

We have already seen that Facebook users are inclined to use ‘interested’ as a label for their (emotional) responses to contents on their news feeds. Therefore, this chapter explores the causal structure of such a judgement. What aspects of a news feed thread are associated with its being labelled ‘interesting’?

6.2 Thesis Experiment 4

6.2.1 Study Background and Motivation

In the previous study, we found that the label ‘interested’ was a popular choice in both stages of browsing Facebook. This was for both the overall emotional response to the Facebook browsing session and the emotional response to the encountered threads. Additionally, the interestingness emotion has been explained as motivational and learning emotion (Izard, 1977). In this section, we review some literatures on the interestingness emotion, and relate this to the motivation and learning aspects of Facebook browsing, especially group awareness. We try to categorise factors that make Facebook users interested in contents on Facebook news feeds.

The ‘interested’ emotion might be considered one of the basic emotions that is for motivation and learning. Indeed, Izard (1977) emphasised that emotions in general are a basic motivation for learning. Supporting this, Silvia (2008) and Sanders (2010) explained that an interest is an intrinsic motivation for learning that is new and complex. They claim that emotions occur since human birth. For example, the baby tries to explore a new thing around themselves and learn how to express their response

to their mum by expressing their faces, their physical movements. Thus, Interest initially motivates people to seek knowledge since birth and it has been adaptive over time. In another example, the label of interest has been described in terms of education. Krapp (1999) states that students will get higher grades in subjects they find interesting rather than boring subjects. These factors combined may explain why these scholars include interest as a basic emotion.

Interest has two important empirical aspects: (1) different people are interested in different topics and (2) each person's interest will be change over time (Silvia, 2008). These raise the question: 'what makes something interesting'. According to appraisal theory, emotion is activated when a subject is evaluated. People evaluate an event and then respond with an emotion to that event. Different people will express different emotions for the same situation because each person interprets a situation differently. This is linked to how people evaluate a situation as well as to their background knowledge. It may be that when people are interested in something, it is because they have some background knowledge about it and experience with that topic. For example, some visitors in the British museum are interested in art and culture whereas others are not interested in this. The individual interests of a person will motivate them to search and learn more about this thing. When the person gains enough knowledge, they will likely move their attention to another thing. This leads to individual interest changing over time.

In terms of 'interest' regarding the motivations for using Facebook, the users and gratifications theory has been widely discussed (and revied in this thesis). For example, Facebook users may be curious to read stories or posts from their family, close friends or topics of personal interest (Lapides *et al.*, 2015). These researchers also stated that their participants were interested in some posts, even those posts that were not created by their close relationships, but which related to pre existing knowledge of the poster – for example, knowing that the poster had a track record of posting interesting content. It seems that being interested in contents on Facebook

news feeds might be influenced by the relationship and closeness of the reader to the poster as well as the prior knowledge of the poster.

On the other hand, learning information from Facebook pages or Facebook groups is related to awareness and group awareness. In Computer-Supported Cooperative Work (CSCW), there has been much exploration of awareness, especially group awareness. Awareness is defined as '*an understanding of the activities of others, which provides a context for your own activity.*' (Dourish and Bellotti, 1992, p. 107), while group awareness is defined as '*an understanding who you are working with, what is being worked on and how your actions affect others is essential to effective collaboration*' (Dourish and Bellotti, 1992, p. 107). Group awareness of reading contents on news feed, particularly the contents from independent Facebook communities such as pages or groups would appear to have an impact on emotional response and may well be related to the judgement of interestingness.

Facebook is an online large community that contains small communities being called a page or a group. Facebook users can join in on the page or the group by liking the page or being a member in the group. If they are a member in that community, they can see information on there. The small communities on Facebook invite members who are interested in the same topics to exchange further interesting information. A member is allowed to share their knowledge or new information with other members in the communities. Due to collaboration in the group, member should be aware of interacting with members in the group.

Tsovaltzi et al. (2015) studied about how participants collaborate to develop ideas and how they learn through Facebook groups. They examined the influence of scripts, individual preparation and group awareness and how this might support learning curves on Facebook group. There were three experiments in this study, but we focus on the first two studies which were related to group awareness. In both, participants were controlled for their demographics such as age, gender, interests in and attitudes to a group learning. For the first experiment as a pilot study, forty participants who studied behaviourism took part. They were asked to prepare a script to discuss 'should

behaviouristic principles be applied in the classroom?’. Each participant was allowed about 25 minutes to prepare their script. Next, they were invited into the private Facebook group for discussion based on the question. The participants then were asked to complete post-test questionnaires. The result of this experiment revealed that there was a positively significant effect of learning gains while the individual preparation was not correlated to the leaning gains. The second experiment was conducted to investigate how the group awareness and the argumentation scripts are supported during individual preparation. The procedure of this experiment was as for the first experiment, but the group awareness task was added. Before discussion, participants were informed that their idea will be posted on the unit forum and other students can interact with those posts. The interaction was identified as evaluation and amendment. The result shows that the group awareness support had a significant effect on learning gains. This study confirms that the Facebook groups can act as a channel to exchange knowledge without individual preparation and it can influence how people acquire new knowledge. These functions might underpin the importance of ‘interestingness’ as a judgement about Facebook threads.

Additionally, Facebook is an easy way for seeking new information sources. Fletcher and Nielsen (2018) state that the motivation of using social media such as Facebook, Twitter and YouTube were viewing other people’s discussion. Particularly for the Facebook environment, Facebook users could see other Facebook users’ discussion when they commented under each thread. In a similar vein, the Facebook features can improve information flow and allow for better communication of information, for example, commenting, status updates and fewer filters on information (Jelin, 2013; Stroud *et al.*, 2015; Kim and Lee, 2016; Oz *et al.*, 2018).

Therefore, it might be important to distinguish two distinct motivations for Facebook browsing. One for gathering information related to prior interests from Facebook communities and one for satisfying the curiosity into friends and families lives. Thus, there are four factors which seem plausibly associated to the interesting of reading the

news feeds on Facebook: the amount of prior knowledge, the amount of information acquired, and the relationship and the closeness of the reader to the poster.

Thus, the main research question in this experiment is '*RQ6: What aspects of a news feed thread determine its interestingness?*' We explored four factors that might influence people to feel interested in posts on their news feed: amount of prior knowledge, amount of knowledge acquired, type of relationship between reader and poster, and closeness of reader to poster. The main hypotheses of this experiment are:

H1: The following variables of a thread will predict a thread's interestingness: amount of prior knowledge; amount of knowledge acquired; relationship between reader and poster, and closeness of reader to poster.

H2: More interesting threads will take longer to be judged as interesting.

Reading time, on the other hand, is a factor that indicates the interest level. Reading content on Facebook may be different from reading books. Content in books is more consistent and cohesive while that on Facebook is divided into smaller pieces of content, each of which may not be relevant to the others. The topic of each piece of content ends up being independent and a new topic will start with the next piece of content. People seem to encounter many topics of interest in a single Facebook browsing session. Due to the short nature of the content, we were interested in the reading time of each piece of content. The reading time of each piece of content might be a measurement of the level of interest. Nakamura's (2009) study about the reaction time for judgement was used as a measurement in the study. A long reaction time was described as indicative of a high level of interest, similar to Claypool (2001), who stated that time spent reading had a relationship with a user's interest. Therefore, we hypothesise: **H3: The amount of information acquired will predict time spent reading.**

As well as testing these hypotheses, we additionally asked participants to choose and rate another emotional label alongside their judgement of the interestingness of each thread. This allowed exploration of whether interest is associated particularly with other emotion types.

6.2.2 Study Design

This study aims to understand what aspects of a news feed thread are associated with its being labelled “interested”. Figure 6.1 presents four variables that might predict a thread’s interestingness.

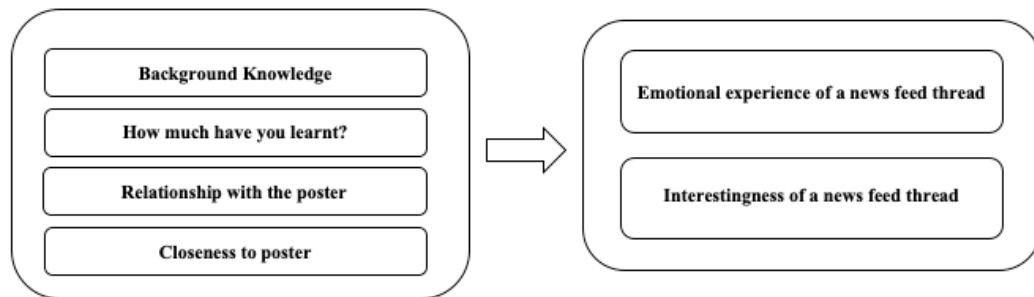


Figure 6.1 Four factors of interesting threads.

A multilevel modelling or Hierarchical Linear Modelling (HLM) was performed in this study. Multilevel modelling is useful for investigating the relationship between an individual and a group (Hox, Moerbeek and Van de Schoot, 2010). The individual and the group are conceptualized as a hierarchical structure such that the individuals are nested within the group, students are nested within a class and a class nested within a school. The lower level has variables which are influenced by the higher level.

In this study, we analysed the relationship between the threads of each participant encountered as ‘within participant’ and threads that were encountered across participants as ‘between participants’. In terms of hierarchical analysis, the low level (level 1) is an encountered thread while the high level (level 2) is the participant.

6.3 Method

6.3.1 Participants

One hundred participants were recruited from Prolific, a crowdsourcing website but only 99 participants were recorded in Prolific. One participant reported that they were unable to register on the experiment correctly and had to drop out. This left us with 99 participants with valid data.

The conditions of recruitment were (1) participants were currently in the UK, and (2) English was their first language. There were 71 females and one individual who preferred to self-describe. On average, respondents were between 18 and 64 years old ($M = 31.40$, $SD = 10.19$). Their average number of friends on Facebook was 424 ($SD = 598.82$). Males reported that they had more Facebook friends than females did ($M = 470.63$, $SD = 930.30$). The high value of the standard deviation (SD) in males was due to the wide range of the data (between 2 and 5,000).

The participants reported that they spent on average 73 minutes on Facebook per day ($M = 72.88$, $SD = 79.50$). The results showed that females spent more time on the site than males ($M = 77.51$, $SD = 81.32$). Those who used Facebook daily visited Facebook around seven times each day ($M = 7.50$, $SD = 6.67$), with females visiting Facebook more often than males in a given day ($M = 8.32$, $SD = 5.44$).

The participants were asked why they browse Facebook. Many of them reported that keeping in touch was the most popular reason for browsing Facebook. Additionally, the participants moderately agreed with the sentence 'Using Facebook is important to me' ($M = 5.55$, $SD = 2.35$).

6.3.2 Procedure

This study was run as an online experiment. It was programmed on the Gorilla platform (Anwyl-Irvine *et al.*, 2020) that is specifically designed for running psychological experiments. The experiment had three parts: responding to the general demographic questions; judging the emotional experience of the sequence of

encountered threads and responding about the Facebook experience while browsing Facebook; and judging the overall emotional experience of the Facebook browsing session (Figure 6.2). Screenshots of this experiment are attached in Appendix E.

Participants in this study were recruited from the crowdsourcing behaviour research platform Prolific Academic (ProA; <https://www.prolific.co>). Participants on Prolific reflect diverse backgrounds and cultures (Palan and Schitter, 2018). To ensure that participants used Facebook and performed the experiment at the same time, this study was able to run only on a personal computer, as opposed to a mobile or tablet device. This requirement was set on both Gorilla and Prolific. Each participant took part in this study via the Prolific website and through the Gorilla platform. The logic workflow of this study was set in Gorilla (Figure 6.2).

After completing the informed consent form and reading participant information on the website, participants were asked to complete a general demographic questionnaire. Participants were then asked to access their Facebook page from another tab on their browser. Participants were informed that they could switch back and forth to the Facebook tab if needed to answer the question.

While browsing Facebook, participants were asked to complete a set of questions in 11 loops (the first loop was a practice trial). Each loop began by reading a thread in the Facebook tab. Participants were then sent back to the experiment tab to complete a set of questions. After completing the 11 loops, participants were asked to judge how they felt about the Facebook session overall – the same retrospective rating as was used in all the experiments. Upon completion of this experiment, participants read a debrief information page.

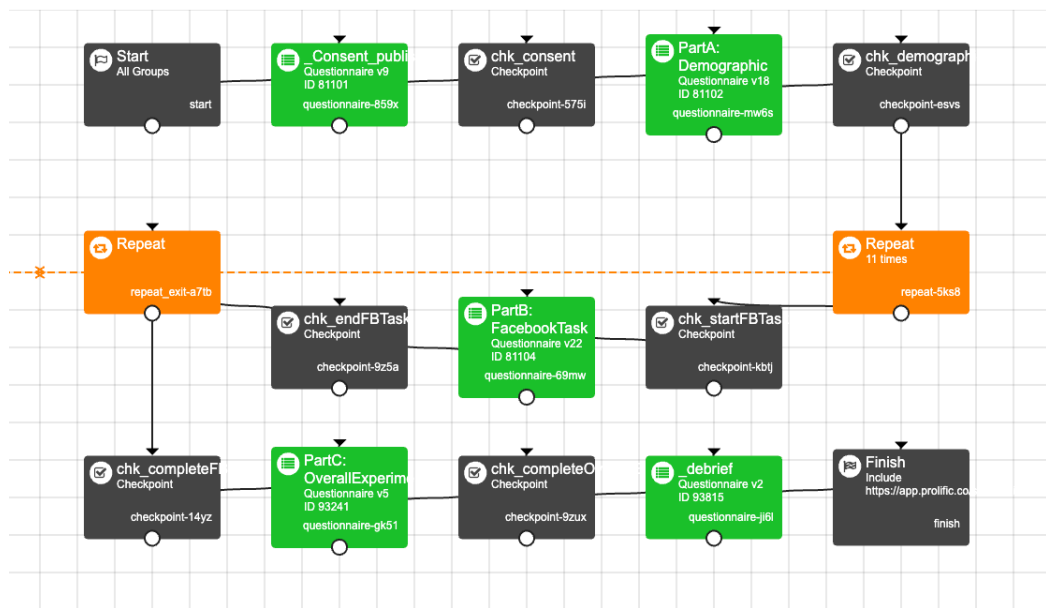


Figure 6.2 A workflow in Gorilla. Green nodes represent tasks: either the consent form, the questionnaire, or the debrief form. Grey nodes represent control experiment workflows and checkpoint stages that are used to verify participants' action in each required interaction. Orange nodes represent repeat loops.

6.4 Results

Descriptive Data

Participants were asked to rate how interested they were in each of the 11 encountered threads. The first was treated as a practice thread, and responses from the next 10 threads were analysed. The results showed that, on average, participants rated threads as moderately positively interesting ($M = 4.93$, $SD = 2.94$), which was quite similar to the overall retrospective evaluation of interestingness across participants ($M = 4.81$, $SD = 2.40$).

While browsing Facebook, participants reported that, on average, the encountered threads that they read were moderately associated with their background knowledge. They also reported that they had learnt some new knowledge from reading each thread. The most encountered threads were created by communities, such as groups,

pages and marketplaces (41%), friends (25.6%), acquaintances such as co-workers and old classmates (18.64%), Facebook friends only (9.1%) and family (5.66%). Participants' ratings of their closeness to the thread poster averaged 3.39. On average, participants spent around two minutes reading each thread. The encountered threads had 1,585 likes and 316.10 comments on average. Table 6.1 showed the descriptive statistics for both level 1 and level 2. In level 1, these averages were over threads ignoring participants whereas in level 2, other averages were for each participant and then averaged across participants. Online experiments are necessarily risky with respect to participants taking each task seriously. Our confidence that the experiment is robust in this respect is helped by the substantial average time to judge each thread, and by the fact that the average thread ratings are generally similar to those noted in earlier experiments.

Table 6.1 Descriptive statistics for encountered threads.

	Mean	SD
Average interested emotional response of encountered threads	4.93	2.94
Average emotional response of encountered threads	2.04	4.34
Level 1: within - participant		
Amount of prior knowledge	4.08	2.92
Amount of knowledge acquired	3.80	2.75
Relationship of reader to poster	3.56	1.38
Closeness between reader and poster	3.39	2.66
Time spent reading each thread (seconds)	97.44	76.99
Level 2: Between - participants		
Overall Emotional Experience of all threads	1.99	4.01
Overall Emotional Experience of interestingness label of all threads	4.98	2.40

Participants were asked to select the best emotional label to describe their emotional experience of the threads. Table 6.2 shows the *indifferent* label was the most selected alongside the interested label and the average strength of indifferent label was lower and near the neutral emotion. Fun and Happy emotion label were the most selected retrospectively, and the average strength of both labels were higher than other labels.

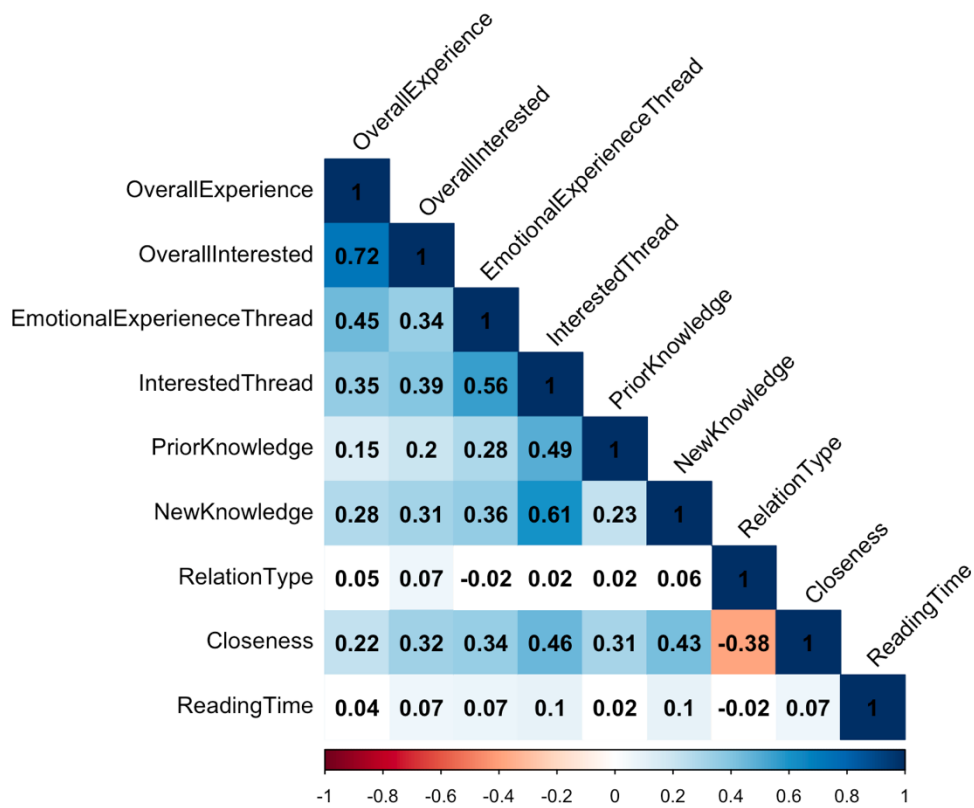


Figure 6.3 The correlation matrix between each variable and others. (The white square indicates to no significant effect.) These correlations were computed across all 990 threads, ignoring the participants who labelled each thread.

Table 6.2 Descriptive statistics of eight emotional labels which were chosen alongside of the interestedness label.

Emotional label	n	Average strength of interestedness		Average strength of emotion	
		Mean	SD	Mean	SD
Indifferent	301	2.69	2.11	1.00	2.20
Fun	138	6.29	2.55	5.00	2.99
Happy	128	6.81	2.06	5.60	2.85
Amused	62	5.77	2.31	4.06	2.57
Bored	55	1.91	1.35	2.76	2.67
Satisfied	45	6.87	2.08	4.78	2.61
Sad	38	5.95	2.77	4.68	2.70
Calm	37	6.08	2.44	4.14	3.02

Using multilevel model to generate the best fit model

Multiple models were used to test H1 and H2. For each of the 99 participants, ten encountered threads were analysed.

Two-level hierarchical linear modelling (Raudenbush and Bryk, 2002) was performed in this study. Comparing the mean of each variable of a different group in a linear regression might lead to neglecting a correlation within a group while a multilevel model is appropriate for analysing both within- and between-group variances, controlling for variables. Therefore, HLM is a suitable method for analysing the data in this study.

There are four steps involved in generating the HLM model used in this study. First, an intercept-only model was created without any explanatory variable. This model is useful for estimating the intercept variance and residual variance. Generally, equation 6.1 is the lower level while equation 6.2 is the higher level. The null model is then created by substituting equations 6.1 and 6.2 with equation 6.3 (Equations from Raudenbush and Bryk, 2002).

$$Y_{ij} = \beta_{0j} + e_{ij} \quad 6.1$$

$$\beta_{0j} = \gamma_{00} + u_{0j} \quad 6.2$$

$$Y_{ij} = \gamma_{00} + u_{0j} + e_{ij} \quad 6.3$$

The intercept-only model of this study was run as shown in Table 6.3. This model was conducted with 990 observations in 99 groups participants. The intercept-only model (M0) estimated the intercept as 4.93 (SD = 0.18), which was the average level of interest across the encountered threads level and the participant level. The variance of the encountered thread level (within participant) was estimated 6.08 (SD = 2.47), while the variance of the participant level (between participants) was estimated 2.54 (SD = 1.60). This model shows that all parameters were significant at $p < 0.001$. This implies that the mean value for participant j could be estimated by $4.93 + u_{0j}$ where u_{0j} is the participant residual (each group in level 2). The intraclass correlation (ICC) was also calculated. The ICC of the intercept-only model was 0.29, meaning that the correlation of the level of interest among encountered threads within the same participant was 0.29. Additionally, the deviance value was reported as 4759.1, which was a measure of model misfit.

The second step, a new model, includes all explanatory variables of level 1: amount of prior knowledge, amount of knowledge acquired, each of relationship types and closeness. This model was conducted without any slope-variables. The results show that prior knowledge ($t = 13.95, p < 0.001$), amount of knowledge acquired ($t = 18.24, p < 0.010$), the relationship of reader to poster as community such as groups/pages and marketplaces ($t = 1.97, p < 0.05$) and closeness ($t = 6.68, p < 0.001$) were significant predictors of the level of interest for encountered threads. Additionally, the results of this model showed the impact of these predictors: the estimate of variation in intercepts across participants was 0.67 while the within-participant variation was estimated as 3.24. To test which model was the better model, we performed ANOVA to compare the two models M0 and M1. Our ANOVA found that M1 was significant ($\chi^2 = 674.28, df = 7, p < 0.001$). Therefore, in order to expand a complex model, M1 was kept.

In the third step, we added the explanatory variables of level 2 – the overall emotional experience and the overall interest evaluation – to M1 (Table 6.3). The results showed that the overall interest evaluation did not have a statistically significant relationship with the level of interest for encountered threads. The overall emotion experience of the ‘*interested*’ label was also not a significant predictor ($t = 103.46$, $p = 0.25$). However, to test a better model, ANOVA was performed to compare models M1 and M2. The result showed that M2 was better than M1 ($\chi^2 = 16.76$, $df = 2$, $p < 0.001$).

For the first three steps, we created the fixed and random intercept models among the explanatory variables for level 1 (within participant) and level 2 (between participants). M1 and M2 show that each participant has a line that is a regression line, but they have the same level of the effect size because the model does not yet have any slope. In the next step, we assumed that among the explanatory variables, each participant might have their own slopes.

In the last step, we tested explanatory variables as a slope variable. We found that three explanatory variables: amount of prior knowledge, amount of knowledge acquired, and closeness had a significant effect on the outcome. Also, the type of relationship of reader to poster had no significant effect.

The random variance of coefficients for the amount of knowledge acquired across participants (0.02) was smaller than that of the amount of prior knowledge (0.04) and of closeness (0.05). leading us to conclude that the relationship of closeness on to the level of interest for encountered threads varied more across participants (between participants) than does the impact of prior knowledge and new knowledge.

ANOVA was performed to compare the models. The results showed that M3 was a better-fitting model than M2 ($\chi^2 = 57.30$, $df = 9$, $p < 0.001$). Therefore, M3 was chosen as the final model of this study.

The amount of information acquired might predict time spent reading.

Additionally, we predicted that the amount of information acquired could predict time spent reading. To test this hypothesis, we conducted a multiple regression using the amount of information acquired as a predictor variable and reading time as the dependent variable. This regression was significant although it was a rather small effect ($F(1, 988) = 11.70, R^2 = 0.01, p < 0.001$).

6.5 Discussion

This study aimed to examine the interestingness of the Facebook browsing experience and the aspects of a news feed thread that are associated with its being labelled as ‘interesting’. A two-level (within-participant and between-participants) hierarchical linear model was created. We found that at the participant level, the closeness of the reader to the poster, amount of prior knowledge and amount of knowledge acquired had significant effects on judged interestingness. This finding is consistent with previous studies (Izard, 1977; Silvia, 2008; Silvia and Sanders, 2010). However, the relationship types of reader to poster in this study had not significant effect the level of interested emotion. This is not related to Lapidés (2015) who claimed that people were interested in a post if it was created by their friends.

Additionally, the amount of information acquired was able to predict reading time. This finding is consistent with those of Nakamura (2009) and Claypool (2001). This implies that time spent reading is a measure of interest in terms of the Facebook browsing experience.

For the results of the between-participants level, the overall emotional experience could be predicted by the interested emotional experience of encountered threads. This finding also confirms our results in Experiment 3 that the ‘interestingness’ emotional label can be a predictor of emotional memory.

Table 6.3 Parameter estimates and standard error for Intercept-only model and models with explanatory variables of level 1 and level 2.

Model	M0: intercept only		M1: with all explanatory variables of level 1		M2: with explanatory variables of level 2	
Fixed part	Estimates	SE	Estimates	SE	Estimates	SE
Amount of prior knowledge			0.33	0.02***	0.32	0.02***
Amount of knowledge acquired			0.49	0.03***	0.47	0.03***
Relationship between readers to poster						
Family			0.01	0.32	0.12	0.32
Friend			0.10	0.20	0.12	0.20
Facebook friend only			0.04	0.25	0.05	0.25
Community such as			0.36	0.18*	0.34	0.18
groups/pages and marketplaces.						
Closeness			0.22	0.03***	0.19	0.03***
Level 2						
Overall Emotional Experience					0.07	0.03*
Overall Interest Evaluation					0.07	0.06
Random Part						
Intercept	2.54	1.60	0.67	0.82	0.50	0.71
Residual	6.08	2.47	3.24	1.80	3.25	1.81
Deviance	4759.1		4084.8		4068.1	
AIC	4765.1		4104.8		4092.1	
BIC	4779.8		4153.8		4150.9	

Note: p-value: 0.0001 ‘***’ 0.001 ‘**’ 0.01 ‘*’, The acquaintance in the relationship between reader to poster is a baseline of the models.

Figure 6.4 Parameter estimates and standard error for the model with random effect.

Model	M3: with three slopes	
Fixed part	Estimates	SE
Level 1		
Amount of prior knowledge	0.31	0.03***
Amount of knowledge acquired	0.48	0.03***
Relationship		
Family	0.17	0.24
Friend	0.06	0.19
Facebook friend only	-0.05	0.24
Community such as groups/pages and marketplaces.	0.27	0.17
Closeness	0.20	0.04***
Level 2		
Overall Emotional Experience	0.06	0.03*
Overall Interest Evaluation	0.07	0.05
Random Part		
Intercept	0.51	0.71
Residual	2.75	1.66
Prior Knowledge	0.04	0.20
New Knowledge	0.02	0.12
Closeness	0.05	0.23
Deviance	4010.08	
AIC	4052.80	
BIC	4155.60	

Note: p-value: 0.0001 ‘****’ 0.001 ‘***’ 0.01 ‘**’

6.6 Conclusion

This study examined the effect of background knowledge, learning new knowledge and relationship closeness between reader and poster on the level of interest in encountered threads. In the experiment, participants were asked to evaluate how interested they were in a piece of content that they read as well as how much background knowledge they had about the content, how much they learnt from the content, how close they were with the person who posted the content and how long they spent reading the content. Overall, participants read 11 threads and were then

asked to rate their overall emotional experience and overall interest during the Facebook session.

We emphasise two findings: first: the results show that the closeness of a reader to a poster, amount of prior knowledge, and amount of knowledge affect the level of interested emotional experience in the encountered threads, varying across participants. Second, the time spent reading was predicted by the amount of information acquired.

CHAPTER 7

DISCUSSION AND CONCLUSION

7.1 Chapter Overview

This thesis aims to summarise what has been learned from the studies in this thesis about why social media platforms are so compelling by exploring the emotional experience and memorability of individual threads during Facebook browsing. This chapter is the final chapter, and we start by reviewing the background to the thesis: the argument from the literature which motivated the empirical approach. We then discuss some of the limitations in the experimental method that was used, before summarising the finding from the empirical studies and the contribution of this thesis regarding the main research questions.

7.2 General Discussion

To date, statistics show that Facebook is the most popular social media platform and on average people check Facebook multiple times per day (Clement, 2020). Most users spend more time reading news feeds on Facebook rather than posting their own posts (Pempek, Yermolayeva and Calvert, 2009). In this thesis, we investigated the following 2 general research questions: **‘Why are social media platforms so compelling, in particular Facebook’** and **‘How is the emotional experience of browsing Facebook remembered’**. There have been previous investigations into these questions by other researchers. It is clear that there is not one single answer for either of these questions.

At the beginning of this thesis in the literature review, the uses and gratification theory (U&G) was explored as an attempt to understand the motivation of social media use. Many studies have examined this theory by investigating how people either use Facebooks general functions or specific functions (Lampe, Ellison and Steinfield, 2006; Papacharissi and Mendelson, 2010; Smock *et al.*, 2011; Karnik *et al.*, 2013; Spiliotopoulos and Oakley, 2013; Spiliotopoulos *et al.*, 2013; Lapidés *et al.*, 2015) . These studies explored in terms of broad functions which were framed in a design perspective. Facebook design seems to follow the persuasive design approach. Facebook plays on the strong advantages of the persuasive design approach to engage people to continue browsing Facebook. In addition, Facebook provides some interesting features such as likes, pull – to – refresh, and push notifications. People might be persuaded by interacting with these features as they require little effort and are easy to complete (Fogg, 2009). In addition, the effect of the persuasive design is that people form a habit loop. The habit is exhibited when people receive rewards from either a pleasant or unpleasant outcome. In the Facebook browsing case, people may receive a reward during browsing Facebook however this does not occur every single time. Because of receiving rewards, people might continue browsing Facebook. Receiving a reward can be explained with partial reinforcement (Skinner, 1990).

Partial reward is more powerful in forming user behaviour because of the unpredictability. The uncertainty of a reward affects the human brain pleasure centre to increase the level of pleasure experienced (Berns *et al.*, 2001). This could help explain the habitual pattern of Facebook browsing. The effect of the appeal of uncertain rewards leads to memory bias. The memory bias makes people better at remembering more emotionally valenced information than neutral information (Dolcos, LaBar and Cabeza, 2006). Also, Lapidés et al (2015) examined how people can receive mixed emotional experiences when browsing Facebook. This could lead to an impact on human memories and emotional experiences of the news feed and increase the attractiveness of Facebook use.

Consequently, in this thesis, we aim to understand whether the issue of memory bias is relevant to the emotional utility of browsing Facebook and how people judge their emotional experience and how this effects their memory while using Facebook. The peak – end rule was addressed as the main theory in this thesis. This theory focuses on how an experience is evaluated and remembered, based on the highest valence- and the final episode of emotional experience in an event (Varey and Kahneman, 1992), rather than focusing on the average of the emotional experience in an event. The average of the emotional experience is not accounted for because the duration of an experience is neglected (Fredrickson and Kahneman, 1993).

In this thesis, there were three experiments to test the peak – end rule of Facebook browsing. We also ran a final experiment to gain greater insight to the judgement of interestingness while browsing Facebook, having discovered that this emotion was, overall, the most active. In the next section, we discuss some limitations in the experimental method that was used and some suggestions for future works.

7.3 Limitation of Thesis and Future Work

While doing the experiments throughout this thesis, we found some limitations for each study. In this section we discuss the overall limitations throughout this thesis and also leads to proposals for avoiding these limitations in future works.

7.3.1 Participants and Generalisability

One of the primary limitations of this thesis is the somewhat small sample size for each study. The procedure of the first three experiments required close involvement by the experimenter and was very labour intensive. Also, the sampling technique of this thesis was non-probability sampling. All participants for our studies used self – selection sampling. The participants volunteered to take part in our studies, rather than being directly approached by us. Self – selection sampling is better at reducing research time but increases the risks to a high level for self – selection bias(Sharma, 2017). This bias might affect the behavioural research, in particular the representation of the broader population (Rosnow *et al.*, 1969). In our studies, even though there

were many participants with diverse backgrounds, age and cultures, they might not be representative of the population of Facebook users. Also, the self-selecting bias is associated with a lack of generalisability. Therefore, the findings in this these may not be applicable to other populations.

In order to get a high population variance (e.g. many participants and a larger experiment), we moved the final study (Experiment 4: Chapter 6) to Prolific which is a crowdsourcing platform (<https://www.prolific.co/>). Prolific collects participants demographic data so the researchers can choose to select a broad representation of the population for the study to be given to. Although the issues of the self – selection bias and generalisability has been raised in this thesis, we have emphasized that the finding throughout this thesis are illustrative rather than representative.

To avoid both of these issues, a larger number of participants and the recruitment of participants via crowdsourcing platform should be considered. The larger number of participants would increase the validity of the procedure and the reliability of the findings. While crowdsourcing platforms such as Prolific and Amazon’s Mechanical Turk can help researchers to find participants who have different characteristics and demographics. These suggestions could provide an opportunity for improvements in future work.

7.3.2 Research method

Another limitation of this thesis, according to some standards in Human-Computer Interaction research, is the laboratory based experimental studies in the first three studies. For those studies, we tested the emotional utility and remembered utility of reading the Facebook news feed but tested using different procedures. In the first study, participants were asked to recall encountered threads and rate the emotional experience whilst in the second study, participants were asked to rate the encountered thread in the moment while reading each encountered thread. The procedure of the third study was the same as first study however the content differed. In this study participants were asked to identify what their emotional experience was to each of the

encountered threads. Those studies were conducted in the laboratory which is an unnatural environment for this human behaviour. The users were also controlled in other factors. For example, participants were only allowed to use a Mac Book Pro, that was an experimental computer, to access the Facebook, rather than using their own devices such as mobiles or tablets. Another limiting environmental factor was time. Each study participants were asked to browse Facebook for a set quantity of minutes. Lastly, participants were instructed to read, like and share news feed, but not allowed to post and comment. These limited environmental and behavioural factors might affect the findings of this thesis.

In HCI theory, some researchers argued that the laboratory experimental studies may not be sufficiently broadly generalisable data sets for the user experience phenomenon, rather than the “in-the-wild” experiments such as a field experiment (Chamberlain *et al.*, 2012; Rogers and Marshall, 2017). It has been stated that the in-the-wild study is better at understanding human behaviour, learning and integration between the technologies and human lives than the lab-based study, especially in terms of psychological study. However, in our studies, we were careful about this issue. To reduce the lab-based issue, a pilot study was run in each lab-based experimental study. Also, the lab-based study was set as close to a realistic environment as we could manage. We can believe that our studies, which were run in the laboratory setting, are valid and reliable data sets. The procedure of the first study was replicated by the third study. The significant findings of both studies were the same results as a repeatable under the same conditions. Therefore, the hypothesis in our studies might be acceptable. Nonetheless, our approach should be extended in broader social behaviour study in future works.

To sum up this section, even though the limitations of this thesis are expressed, the findings across this thesis offer valuable insight into emotional design for social media. In the next section, we will move on to discuss the summaries of the key findings and the contributions across the experiments.

7.4 The Key Findings and Contributions

In this section, we aim to summarise findings from across the thesis. The main focus of this thesis was how memory is associated with the emotional experience of browsing Facebook and how they affect decision making in the future. We can draw our findings to two empirical contributions and one theoretical contribution. These contributions can be considered contributions to Human Computer Interaction of social media, in particular, from emotional design perspective.

7.4.1 The Emotional Experience of the Facebook browsing episode

For the first findings of the experiments, we found that the emotional responses to the Facebook news feed in terms of valence, whether positive or negative emotional response, are associated with a browsing episode. The memory for the emotional valence of a Facebook browsing episode was predicted by the emotional valence of the peak thread and the end thread. It might be clear that the peak – end rule can suggest a partial reinforcement explanation of why Facebook is so compelling (RQ1: Experiment 1, Experiment 2 (more weakly) and Experiment 3). We also found that the overall retrospective judgement of browsing Facebook was positive, and it might be influenced by the peak judgement that was rated as more positive. While the contribution of the end judgement did not affect the quit decision.

The effect of the quitting decision was explored in Experiment 2 (Chapter 4). We assumed that if the end judgement was calibrated to be depressed, it would affect the overall retrospective judgement. To test this, participants were instructed to quit Facebook after experiencing a negative thread. Unfortunately, this hypothesis was not supported and the peak – end rule was weaker in these data (RQ3: Experiment 2). This could be because of the testing methodology. In Experiment 2 (Chapter 4) in the method of this experiment, participants were asked to rate their emotions while browsing Facebook on a moment-by-moment basis which is different from Experiment 1(Chapter 3) and Experiment 3 (Chapter 5) where participants were only required to rate their emotions retrospectively.

Additionally, we found that the recalled threads were more emotionally valenced than forgotten threads. Also, the primacy and the recency threads were more easily remembered than the intermediate threads (RQ2: Experiment 1, and Experiment 3). In terms of the recalled threads, people were better at remembering threads if that thread contained the video medium or the text medium rather than the picture medium (RQ5: Experiment 3). We reasoned that this might be because of how time-consuming reading or watching this content is on Facebook. It takes longer to read text and watch video, than it takes to view picture. Therefore, the longer event might be more readily recalled in the episodic memory.

To the above evidence, our findings can contribute the understanding of why Facebook is so compelling. The robust findings show that the empirical findings confirm that the emotionally retrospective experiences and memory biases play a major role on Facebook browsing behaviour. People would remember their emotionally positive experience while browsing Facebook, or after browsing Facebook. It looks like most of users' interaction with Facebook, users often receive more emotional valence experience as pleased rewards. These rewards are a kind of partial reinforcement that are uncertainly unexpected rewards. The habitual pattern of Facebook browsing is formed by these rewards. Therefore, the empirical findings of this thesis might describe the attractiveness of using Facebook.

The impact of emotional design on HCI leads people to face problematic behaviours. Designers or product owners would like to make people love and need their products by focusing on emotional design. Likewise, Facebook design attempts to play on user's emotions during Facebook browsing. Facebook begins by prefilling the status posting box by asking users, "What is on your mind, [Facebook username]". Also, there is a reaction button on the bottom of a thread where emojis are presented with tooltips across a range of emotions such as like, love, caring, laughter, amazement/shock, sadness, and anger. Facebook users can express how they feel on each encountered thread. It is clear that those reaction buttons have more positive emoji than negative emoji. Facebook has stated that the goals of user's news feed

experience are ‘to keep the platform positive and to optimize the news feed experience’ (Gonzalez, 2015). The above findings of this thesis can confirm that Facebook achieves this goal. The overall emotional experience of browsing Facebook was rated as positive. Gonzalez (2015) stated that if people have a positive experience, they will be motivated to share their experience on the news feed and thus spend more time on Facebook. This in turn leads to problematic behaviour such as information overuse.

7.4.2 Interestingness of reading news feed on Facebook

In Experiment 3 (Chapter 5), we investigated the peak – end rule effect and the emotional evaluation of the news feeds on Facebook browsing. As is well known, browsing Facebook is a mixed emotional experience (Lapides *et al.*, 2015) but generally has heavier emphasis on the positive emotional experience (Experiment 1: Chapter 3, and Experiment 3: Chapter 5). Therefore, Experiment 3 aims to understand the precise emotional response of browsing Facebook. The precise emotional response refers to the emotional label. One key finding in Experiment 3 is that the *interested* label was the most used emotional label for emotional response and this label can be a strong predictor on the peak – end rule effect (RQ4).

In Experiment 4 (Chapter 6), we found strong evidence that some factors reliably affected the interestedness of Facebook browsing experience; closeness of reader to poster, amount of prior knowledge, and amount of knowledge acquired (RQ6: Experiment 4). Participants reported that they were interested in the threads that were posted by people whom they were close to. This empirical finding supports previous studies that if the relationship between reader and poster is strong then this leads people to expose more and engage more on Facebook posts (Lapides *et al.*, 2015). Also, Lin and Utz (2015) claimed that the emotional experience outcome might not only be the content on the posts, but it is because of closeness and relationship between reader and poster. Additionally, the amount of knowledge acquired was a strong predictor of readers’ interestedness on Facebook posts. Participants reported they learnt some amount of new knowledge after reading the news feed. This implies that

if the emotional outcome of browsing Facebook is high, people would learn more new knowledge. Additionally, the amount of prior knowledge was another factor of the interestedness on Facebook posts that we found in this thesis. Participants reported that they were more interested in the threads when they were associated with their prior knowledge.

Browsing the news feed on Facebook appears to be a learning experience. We reasoned that Facebook users can build their communities such as a group, and a page. People who are interested in the same topic will be invited in the group or the page. The members become a part of a community centred around that interest (Riva, Wiederhold and Social, 2015). So, it is hardly surprising that people can acquire new information from browsing news feeds and as people can gravitate towards things, they have prior knowledge of this creates a positive feedback loop where they keep gaining more information on things, they have interest in.

Algorithm design also leads more people to the posts who also have more interest in the posts. This algorithm tries to rank user's interested posts (topic) and present them on user's news feed. Therefore, it might be another reason why Facebook is so compelling.

7.4.3 Using the peak – end rule on discrete elements during an experience

The peak – end rule was studied across this thesis. This theory is a heuristics and bias theory to explain how the past experiences are remembered. The overall retrospective judgement will be an evaluation from how you felt at the most intense moment of an event and the final moment of an event. There has been much previous research conducted with the peak – end rule with different experiences of either pleasurable or unpleasurable experiences. In this section, we will discuss the method to perform this theory.

There is a distinction between a peak – end rule based on discrete elements during an experience and one based on a sample of moment. Some earlier studies applied the peak – end rule on a homogenous experience, for example, the experience of a cold

pressor (Kahneman *et al.*, 1993), of viewing aversive film clips (Fredrickson and Kahneman, 1993), of a medical process (Redelmeier and Kahneman, 1996) and of listening to unpleasurable sound (Schreiber and Kahneman, 2000). In these studies, participants were asked to judge their emotional experience in a real time rating or a moment-by-moment rating. The finding of these studies contributed to the knowledge that the peak – end rule can be applied to the moment-based approach based on the emotionally homogenous experience.

However, in this present thesis, the peak – end rule analyses were performed based on discrete elements during the experience of Facebook browsing. The discrete elements can be explained as a sequence of discrete threads on Facebook user 's news feed which expresses emotionally mixed experience. Rather than using the moment-by-moment rating, we used the memory-based approach in Experiment 1 (Chapter 3) and Experiment 3 (Chapter 5). For the memory-based approach, participants were asked to rate the emotional experience of individual news feed threads after Facebook browsing episode. This approach contributes to our knowledge that the peak – end rule can be applied in terms of the discrete elements during an experience in terms of Facebook browsing.

7.5 Concluding Remarks

This thesis has explored why Facebook is so compelling by underpinning the relationship between the emotional utility and the memory experience of Facebook browsing. The peak – end rule was the main theory used for the experiments across the thesis. The findings reported that the potential of using emotional experiences and how the emotional experiences interact with users' memory of using Facebook can explain why Facebook is so compelling. It seems that user' emotional experience is focused by developers or designers in terms of HCI persuasive design. Such as Facebook user's news feeds as a tool for users to express their emotions and share to other users. This leads to Facebook being more attractive and compelling

This thesis elaborates on several previous literatures and our findings have resulted in empirical and theoretical contributions. We hope these contributions will be another step towards complete understanding of how and why social media is so compelling and how this can be used to further explore problematic behaviours such as information overuse.

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Appendix A

Data Management Plan

Data Management Plan

1. Overview

Project title
Cognitive Explanation of “Information Addiction”
Student name and department
Pawarat Nontasil Department of Computer Sciences
Supervisor(s)
Note: the main University of Bath supervisor is the Data Steward for the project. Prof Stephen Payne S.J.PAYNE@BATH.AC.UK
Project description
We will test Facebook users’ memory for their own news feed, and how memory is related to the emotional experience of Facebook browsing. The peak–end rule will be tested in this project: i.e. the idea that the retrospective emotional rating of a browsing episode will be determined primarily by the peak and end emotional experiences. We will apply this theory to the overall retrospective emotional judgement of browsing Facebook, and further investigate the relationship between memory and emotion with respect to the memorability of individual Facebook threads. We believe that such constructs have an important role to play in explaining the appeal of Facebook to its users.

2. Compliance

University policy requirements
The data will be stored as described in this form for at least ten years.
University policy or guidance

University of Bath Research Data Policy	
Legal requirements	
We are not aware of any legislative requirements relating to this research.	
Contractual requirements	
My research is not subject to any non-disclosure agreement.	
Name of funder	Data policy URL
Thai Government via PhD studentship.	Not applicable.

3. Gathering data

Description of the data
3.1.1 Types of data
I will be generating quantitative data from laboratory experiments and using questionnaires.
3.1.2 Format and scale of the data
<i>All participants will be complete a response sheet in Excel(.xlsx), this will be the primary raw data of each study. The storage for these data will be no longer than 50GB.</i>
Data collection methods
I will generate quantitative data from the excel file and transfer to SPSS program or similar software for statistical analysis.
Development of original software
I will not develop any original software. An Excel template for collecting data will be produced and provided to participants.

4. Working with data

Short- and medium-term data storage arrangements
My primary copy is on the University's managed storage, in my supervisor's area of the X: Drive, to which both my supervisor and I have access.
A university laptop with an encrypted hard disk will be used to collect data during the experiment. We already mention that the screen recording will be deleted when

the experiment finishes, the participant will see the deletion and the emptying of the trash.
Control of access to data and sharing with collaborators
The anonymised study data will be stored in my supervisor's area of the X: Drive, to which both my supervisor and I have access. The University managed servers are enterprise grade storage that are mirrored across two physical locations and are backed up regularly making them resilient to damage failure and security breaches.
File organisation and version control
Only myself and my supervisor will have access to my data during the project. We will have the only copies of the key to the locked filing cabinet containing the paper consent sheets.
Documentation that will accompany the data
I use the structure <myname><experiment><YYYYMMDD><participant No> to name my files.

5. Archiving data

Selection of data to be retained and deleted at the end of the project
I will keep all of my data, both raw and processed, since both may be useful in future studies.
Data preservation strategy and retention period
As above, data underpinning publications and any other data that would be of value to future research will be archived for at least 10 years.
Maintenance of original software
Not applicable

6. Sharing data

Justification for any restrictions on data sharing
All of my data may be shared on request from other investigators at the end of the project when my research findings are published. All data will be anonymous.
Arrangements for data sharing
I will provide underpinning data for each publication as supplementary information to that publication, if requested by the publication or by its readers.

7. Implementation

Review of the Data Management Plan
The Data Management Plan of this project will be reviewed every three months.
Special resources required for the project
-
Further training needs
-

Appendix B

Experiment 1 Documents

STUDY CONSENT FORM

Participant No.

BEHAVIOUR AND EMOTION EXPERIENCE ON FACEBOOK

INVITATION

You are being asked to join in this experiment. You need to have a Facebook account. The aim of this experiment is to study people's response to Facebook reading. Additionally, please do not browse the Facebook in at least one hour before the experiment starts.

WHAT WILL HAPPEN

Before the experiment starts, you are not requested to browse the Facebook for an hour. This experiment will take place in the laboratory. On the computer, the internet browser and screen capture software will be opened. You will need to log in your Facebook account before starting the experiment. The screen capture will be automatically deleted when you completely finish the experiment. Also, you are instructed to quit browsing Facebook before starting the experiment.

In this experiment, there are two phases: browsing the Facebook, and completions a Facebook usage questionnaire. Firstly, you are asked to browse Facebook. You are able to interact with Facebook such as reading, commenting, and clicking a liked button. You will quit browsing Facebook, relying on what the instruction you are received at the beginning of the experiment. You then will be presented with the Facebook usage questionnaire.

TIME COMMITMENT

The experiment takes approximately 40 minutes in total.

PARTICIPANTS' RIGHTS

Your participation in this study is voluntary. You may decide to stop being a part of the research study at any time without explanation. You have the right to omit or refuse to answer or respond to any question that is asked of you. You have the right to have your questions about the procedures answered (unless answering these questions would interfere with the study's outcome). If you have any questions as a

result of reading this information sheet, you should ask the researcher before the study begins.

COMPENSATION

As a thank you for your participation in this experiment, you will receive £5 when you completely finish the experiment.

RISKS

There are no known risks for you in this experiment.

CONFIDENTIALITY/ ANONOYMITY

The data collected in this study remains anonymized. The responses you type during the session are recorded for further analysis but will not be linked to any identifying information you have supplied.

DATA RETENTION AND PUBLICATION

The data will be securely archived and retained after this experiment finishes for further research. Other researchers may be granted access to this preserved data for further analysis, providing they agree to preserve confidentiality. Subject to your consent, data extracted from the experiment may be used during presentation at conferences or published within academic papers.

FOR FURTHER INFORMATION

Should you have any questions about this experiment, you can contact me as Pawarat Nontasil at P.Nontasil@bath.ac.uk, Department of Computer Science, and University of Bath. As well as you can contact my supervisor as Professor Stephen J. Payne at s.j.payne@bath.ac.uk

Your signature below indicates that you have understood the information about the experiment and consented to participate. The participation is voluntary and you may refuse to answer certain questions on the questionnaire and withdraw from the study at any time with no penalty. You will receive a copy of the consent form for your own record. If you have further questions related to this research, please contact the researcher.

Signed:.....

Date:.....

Appendix C

Experiment 2 Documents

STUDY CONSENT FORM

Participant No.

BEHAVIOUR AND EMOTION EXPERIENCE ON FACEBOOK

INVITATION

You are being asked to join in this experiment. You need to have a Facebook account. The aim of this experiment is to study people's response to Facebook reading. Additionally, please do not browse the Facebook in at least one hour before the experiment starts.

WHAT WILL HAPPEN

Before the experiment starts, you are not requested to browse the Facebook for an hour. This experiment will take place in the laboratory. On the computer, the internet browser and screen capture software will be opened. You will need to log in your Facebook account before starting the experiment. The screen capture will be automatically deleted when you completely finish the experiment. Also, you are instructed to quit browsing Facebook before starting the experiment.

In this experiment, there are two phases: browsing the Facebook, and completions a Facebook usage questionnaire. Firstly, you are asked to browse Facebook. You are able to interact with Facebook such as reading, commenting, and clicking a liked button. You will quit browsing Facebook, relying on what the instruction you are received at the beginning of the experiment. You then will be presented with the Facebook usage questionnaire.

TIME COMMITMENT

The experiment takes approximately 40 minutes in total.

PARTICIPANTS' RIGHTS

Your participation in this study is voluntary. You may decide to stop being a part of the research study at any time without explanation. You have the right to omit or refuse to answer or respond to any question that is asked of you. You have the right to have your questions about the procedures answered (unless answering these questions would interfere with the study's outcome). If you have any questions as a result of reading this information sheet, you should ask the researcher before the study begins.

COMPENSATION

As a thank you for your participation in this experiment, you will receive £5 when you completely finish the experiment.

RISKS

There are no known risks for you in this experiment.

CONFIDENTIALITY/ ANONOYMITY

The data collected in this study remains anonymized. The responses you type during the session are recorded for further analysis but will not be linked to any identifying information you have supplied.

DATA RETENTION AND PUBLICATION

The data will be securely archived and retained after this experiment finishes for further research. Other researchers may be granted access to this preserved data for further analysis, providing they agree to preserve confidentiality. Subject to your consent, data extracted from the experiment may be used during presentation at conferences or published within academic papers.

FOR FURTHER INFORMATION

Should you have any questions about this experiment, you can contact me as Pawarat Nontasil at P.Nontasil@bath.ac.uk, Department of Computer Science, and University of Bath. As well as you can contact my supervisor as Professor Stephen J. Payne at S.J.Payne@bath.ac.uk

Your signature below indicates that you have understood the information about the experiment and consented to participate. The participation is voluntary, and you may refuse to answer certain questions on the questionnaire and withdraw from the study at any time with no penalty. You will receive a copy of the consent form for your own record. If you have further questions related to this research, please contact the researcher.

Signed:.....

Date:.....

Appendix D

Experiment 3 Documents

CONSENT FORM

Please answer the following questions to the best of your knowledge

	YES	NO
DO YOU CONFIRM THAT YOU:		
- have an active Facebook account	<input type="checkbox"/>	<input type="checkbox"/>
HAVE YOU:		
- been given information explaining about the study?	<input type="checkbox"/>	<input type="checkbox"/>
- had an opportunity to ask questions and discuss this study?	<input type="checkbox"/>	<input type="checkbox"/>
- received satisfactory answers to all questions you asked?	<input type="checkbox"/>	<input type="checkbox"/>
- received enough information about the study for you to make a decision about your participation?	<input type="checkbox"/>	<input type="checkbox"/>
DO YOU UNDERSTAND:		
that you are free to withdraw from the study at any time until you have completed it. You can also request that your data is withdrawn up until the time it is anonymized.		
I understand I can withdraw without giving a reason for withdrawing.	<input type="checkbox"/>	<input type="checkbox"/>
I understand I can withdraw my data until it has been anonymized (you will receive your £5 even if you withdraw)	<input type="checkbox"/>	<input type="checkbox"/>

I hereby fully and freely consent to my participation in this study

- I understand the nature and purpose of the procedures involved in this study. These have been communicated to me on the information sheet accompanying this form.
- I understand and acknowledge that the investigation is designed to promote scientific knowledge and that the University of Bath will use the data I provide for no purpose other than research.
- I understand that the data I provide will be kept **confidential**, and that on completion of the study my data will be **anonymised** by removing all links

between my name or other identifying information and my study data. This will be done at the close of my participation and before any presentation or publication of my data.

- I understand that after the study will be made available on request to scientists from other universities. I understand that this means the anonymised data will essentially be publicly available and may be used for purposes not related to this study, and it will not be possible to identify me from these data.

Participant's signature: _____ Date: _____

Name in BLOCK Letters: _____

**Final consent
Having participated in this study**

I agree to the University of Bath keeping and processing the data I have provided during the course of this study in accordance with the information I received at the outset and the Data Protection Regulation.

Participant's signature: _____ Date: _____

Name in BLOCK Letters:

If you have any concerns related to your participation in this study please direct them to the Department of Psychology Research Ethics Committee, via email: psychology-ethics@bath.ac.uk.

Study Name: Emotional Responses to Facebook

Participant Information Sheet

Description: This experiment will take place in the laboratory. On the computer, the internet browser and screen capture software will be opened by the experimenter. You will need to log in your Facebook account before starting the experiment. The screen capture will begin after you have logged on to Facebook and will be deleted when you finish the experiment or if you decide to withdraw from the study before completing the experiment. The experimenter will not be deliberately viewing your Facebook page, and will not be able to access the screen capture, except to help you use it.

In this experiment, there are two phases: browsing Facebook, and completing a Facebook usage questionnaire. Firstly, you are asked to browse Facebook. You are able to interact with Facebook by reading, commenting, clicking the like button and sharing. You will be asked to browse Facebook for at least 10 minutes and to quit some times within the next 5 minutes. You then will be presented with the Facebook usage questionnaire.

Eligibility Requirements: To be eligible to take part in this study you must have an active Facebook account and be a regular user of the Facebook news feed.

Duration: Approximately 40 minutes

Confidentiality/Anonymity:

The data collected in this study will be anonymized. The responses you type during the session are recorded for further analysis but will not be linked to any identifying information you have supplied.

Data Retention and Publication:

The data will be securely archived and retained after this experiment finishes for further research. Other researchers may be granted access to this preserved data for further analysis. Subject to your consent, as given on this form, data extracted from

the experiment may be used during presentation at conferences or published within academic papers.

Compensation: You will receive £5.00 as an honorarium for participation (even if you withdraw, or withdraw your data)

Researcher: Pawarat Nontasil, PhD student Department of Computer Science, p.nontasil@bath.ac.uk

Principal Investigator Prof Stephen Payne, Department of Computer Science, s.j.payne@bath.ac.uk

Ethics Approval Code: 19-268

Debrief Information Sheets

Emotional Response to Facebook

Thank you for taking part in this study. My PhD project, of which this study is one part, asks the question: “Why is social media compelling to many users?”, and tests the idea that part of the answer can be found in the way people remember episodes of Facebook interaction. In particular, the project tests the “peak – end rule”, the idea that the retrospective evaluation of an episode is determined by its peak and end emotional experience. We believe that such constructs have an important role to play in explaining the appeal of Facebook to its users. As well as the intensity of emotion, we are interested in the particular emotional labels that users choose to use to label content of Facebook news feed, and how these are related to the overall experience, and to memory for the experience.

In the experiment, all data that you have provided is automatically anonymised and cannot be traced back to the participants’ identity. The screen recording that you used to test your own memory for Facebook threads was permanently deleted as you finished the experiment.

If you would like further information about the study or would like to know about what our findings are when all the data have been collected and analysed then please contact us on the below contact. Please note that we cannot provide you with your individual results, because your data is anonymised.

Researcher: Pawarat Nontasil, PhD student Department of Computer Science,
p.nontasil@bath.ac.uk

Principal Investigator Prof Stephen Payne, Department of Computer Science,
s.j.payne@bath.ac.uk

Ethics Approval Code: 19-268

Appendix E
Experiment 4 Experiment Screenshots



Participant Information and Consent Statement.

Study Name: Interestingness of News Feed Threads on Facebook

Description:

You will need to log in to your Facebook account before starting the experiment. In this experiment, there are three main phases: completing the demographic questions, completing a Facebook usage and Emotional Experience questionnaire and judging the overall emotional experience of this Facebook browsing session. For the questionnaire, you will be asked to complete it while browsing Facebook. You will not be required to disclose any information from your news feed, only to report on how you respond to it.

Eligibility Requirement:

To be eligible to take part in this study you must have an active Facebook account and be a regular user of the Facebook news feed.

Duration: Approximately 45 minutes

Confidentiality/Anonymity:

The data collected in this study will be anonymized. The responses you type during the session are recorded for further analysis but will not be linked to any identifying information you have supplied.

Data Retention and Publication:

The data will be securely archived and retained after this experiment finishes for further research. Other researchers may be granted access to this preserved data for further analysis. Subject to your consent, as given on this form, data extracted from the experiment may be used during a presentation at conferences or published within academic papers.

Researcher:

Pawarat Nontasil, PhD student Department of Computer Science,
p.nontasil@bath.ac.uk

Principal Investigator: Prof Stephen Payne, Department of Computer Science,
s.j.payne@bath.ac.uk

Ethics Approval Code: 20-163

(If you have any questions about the ethical approval of the study, you can contact the researcher in the first instance P.Nontasil@bath.ac.uk and if you still have any unresolved concerns about the ethical conduct of this study, you can contact the psychology ethics committee at psychology-ethics@bath.a.uk)

Before you continue, we need your consent to the following:

1. Do you have an active Facebook account?
2. Have you received enough information about this study for you to decide about your participation?
3. Do you understand you can withdraw without giving a reason for withdrawing?
4. Do you understand you can withdraw my data until it has been anonymised?

Yes, I consent.

Next

Figure F - 1 Study 4: Consent Form

Introduction

This is an experiment asking about the experience of browsing the Facebook news feed, in particular the interestingness of news feed threads.

Before you start:

1. Please open Facebook in a different browser tab to the experiment tab.
2. Please log in to your Facebook account.

There are three parts of this experiment:

Part 1: you will be asked to complete demographic questions and a few questions of Facebook use.

Part 2: you will be asked questions about your emotional experience and background knowledge from the first ten encountered threads. A thread on Facebook is a series of connected post from any updated status.

Part 3: you will be asked question about the overall emotional experience of the Facebook session.

For the threads, please skip any sponsored advertisement or post provided by Facebook.

Next

Figure F - 2 Study 4 Navigation Page

Part 1: Demographics

Please answer the following questions about yourself.

Please enter your Prolific ID:

Gender

- Female
 Male
 Prefer not to disclose
 Prefer to self-describe

How old are you?

Note: Please enter a number only (e.g. 25, 32)

Please estimate how much time you spend daily on Facebook (minutes)

Note: Please enter a number only (e.g. 125, 189)

Please estimate how often you visit Facebook per day (times)

Note: Please enter a number only (e.g. 5, 14)

How many Facebook friends do you have?

Note: Please enter a number only (e.g. 154, 324)

Why do you use Facebook? (Please tick all that apply)

- To find information
 To play games
 To make professional and business contacts
 To keep in touch with family and friends
 To get opinions
 To share pictures/ music/ and videos
 To share your experience
 Other (please specify)

"Using Facebook is important to me"

Strongly disagree Strongly agree

Next

Figure F - 3 Study 4 Demographic Form

Part 2: Emotional Experience of Browsing Facebook

Please have Facebook open on one tab and this experimental procedure on another tab in your browser.

Please switch to the Facebook tab and read the next thread, then return to this tab to answer questions about it. You can switch back and forth to the Facebook tab if you need to, to answer the questions.

Next

Figure F - 4 Study 4 Part 2 Information Sheet

A thread on Facebook is a series of connected posts under any status update.

Please read the next thread and then return to this tab to answer questions about it. You can switch back and forth to the Facebook tab if you need to, to answer the questions.

Please limit your interactions to reading and clicking like. Please do not comment or chat via messenger until the experiment is over.

When you have read the current thread, please click Next.

Next

Figure F - 5 Study 4 Reading Page

1. Please describe the thread.

Note: Please make sure the true identity of others is not included in the thread description. Each thread should be anonymous (e.g. "B posted Cornwall trip pictures instead" of "Bob posted Cornwall trip pictures")

Next

Figure F - 6 Study 4 Question 1 Form

2. Please rate how interested you are in this thread

(1 = not at all interested; 10 = extremely interested)

1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	----

3. Please rate how negative or positive the thread is as an emotional experience

(-10 = the most negative emotional experience; 10 = the most positive emotional experience; 0 = indifferent)

-10  10

4. Please select the best emotional label to describe your emotional experience of the thread

- [0] Indifferent
- [Positive] Fun
- [Positive] Satisfied
- [Positive] Excited
- [Positive] Relaxed
- [Positive] Calm
- [Positive] Happy
- [Positive] Surprised
- [Positive] Proud
- [Positive] Amused
- [Negative] Bored
- [Negative] Angry
- [Negative] Frustrate
- [Negative] Guilty
- [Negative] Sad
- [Negative] Lonely
- [Negative] Envious
- [Negative] Irritated
- [Negative] Disgust
- [Negative] Anxiety

5. Please rate how much prior knowledge you have of the content material in this thread.

(1 = I know nothing about it; 10 = I know it very well)

1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	----

Figure F - 7 Study 4 Questions Form -1

6. Please rate how much you have learned from this thread

(1 = I have learned nothing; 10 = I have learned a lot)

1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	----

7. Please select your relationship with the poster of the status update that started this thread

- Family
- Friend
- Acquaintance such as old co-workers /old classmates whom they are no longer socialize with
- Facebook Friend only
- Community such as groups/pages and marketplaces.

8. Please rate how close you feel to the poster of the status update that started this thread

(1 = Not at all close; 10 = Extremely close)

1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	----

9. Please classify the type of thread(i.e. what media it uses)

Note: The thread can be classified as more than just one type, for example, could be text + picture or text + video.

- Text
- Picture
- Video

10. Please report the number of likes Facebook report for this status update

Note: Please enter a number only (e.g. 0, 14, 123)

11. Please report the number of comments Facebook report for this status update

Note: Please enter a number only (e.g. 0, 12, 252)

Next

Figure F - 8 Study 4 Questions Form -2

Part 3: Overall Emotional Experience of the Facebook session

1. Please rate the Facebook browsing session according to how negative or positive it was as an emotional experience

(-10 = The most negative emotional experience; 10 = The most positive emotional experience; 0 = Indifferent emotional experience)

-10  10

2. How strongly you were interested in the Facebook browsing session

(1 = Not at all interested; 10 = Extremely interested)

1

1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	----

 10

Next

Figure F - 9 Study 4: Part 3 Questionnaire



Debrief Information Sheets

Interestingness of Facebook news feed threads

Thank you for taking part in this study. My PhD project, of which this study is one part, asked the question: "Why is social media compelling to many users?" and tests the idea that part of the answer can be found in the way that people are interested in threads on their news feed. This study we will explore what effects make people interested in the threads and whether background knowledge and relationships with posters affect this?

In the experiment, all data that you have provided is automatically anonymised and cannot be traced back to the participants' identity.

If you would like further information about the study or would like to know about what our findings are when all the data have been collected and analysed then please contact us on the below contact. Please note that we cannot provide you with your individual results, because your data is anonymised.

Researcher: Pawarat Nontasil, PhD student Department of Computer Science, p.nontasil@bath.ac.uk

Principal Investigator: Prof Stephen Payne, Department of Computer Science, s.j.payne@bath.ac.uk

Ethics Approval Code: 20-163

Thank you very much!

Next

Figure F - 10 Study 4 Debrief Form

Appendix F

Facebook Usage Questionnaire

1. Participant Number: _____

2. Age: _____

3. Gender

- Female
- Male
- Prefer not to disclose
- Prefer to self - describe

4. Please estimate how long in minutes you think it will be before you open Facebook again: ____ minutes.

5. Please estimate how much time do you spend daily on the Facebook: _____ minutes.

6. Please estimate how often do you visit Facebook per day: _____ times.

7. How many Facebook friends do you have: ____ people.

8. Do you accept friend requests from strangers on Facebook?

- Yes
- Sometimes
- No

**9. What information do you include on your Facebook profile?
(Please tick all that apply)**

- Email
- Real name
- Status
- Date of Birth
- Hobbies
- Mobiles
- Interests
- Picture profile
- Religion
- Town
- Videos profile
- Other.....

**10. Why do you use Facebook?
(Please tick all that apply)**

- To find information
- To play games
- To make professional and business contacts
- To keep in touch with family and friends
- To make new friends
- To get opinions
- To share pictures, music and videos
- To share your experience
- Other (please list)

11. How often do you post status update on Facebook?

- Several times per day
- Around once a day
- A few times per week
- Around once a week
- Less than weekly
- Seldom
- Never

12. Are your Facebook posts public or private (just your friends can see)?

- Public
- Private
- I do not know

13. Are you currently using Facebook more or less than you did six months ago?

- More
- Less
- About the same

14. Do you think you will be using Facebook more or less than you do currently six months from now?

- More
- Less
- About the same

15. Do you ever ask your friends questions on Facebook?

- Often
- Sometimes
- Rarely
- Never

16. Do you use the chat option for Facebook messaging?

- Often
- Sometimes
- Rarely
- Never

17. “Social networking is important to me”

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

**** Thank you for your participation ****