An Investigation in Domestic Image Search

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All glory to God, who makes all things possible.

Abstract

The subject of image search has been addressed by many studies along the dimensions of engineering and technology, but very few studies provide a grounded and realistic perspective of the behaviours and motivations that drive image search - especially within the scope of domestic image search on the Internet. This work addresses research gaps involving domestic, non-personal image search on the Internet by investigating the behaviours and motivations behind those activities as they occur in the field. A qualitative approach involving diary studies and interviews was used to gain a more realistic sense of how users make use of images on the Internet. A grounded theory analysis of participants' image search activities shows that users often look for images in the context of other activities and are less likely to perform image searches in isolation, suggesting a need for more holistic approaches in the work of image search. The study presents an analytical framework along with design recommendations to aid designers in exploring solutions along the dimensions of image search motivations. It expands on existing research in the field of image search and puts forth the need for understanding the broader context of users' domestic activities in which image search takes place.

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1 Introduction

The purpose of this study is to address the growing trend of domestic image search, which has become increasingly ubiquitous through greater awareness and know-how by consumers. As images are becoming more central in the experience of interactive technologies, it is necessary to understand how users utilise images in their daily use of the Internet.

As discussed in the Chapter 2 (Literature Review), very few studies have addressed image search on the Internet in the context of everyday life. This study aims to broadly explore the range of image search behaviours, and to understand the main motivations that influence domestic image search activities.

1.1 Motivation

Despite widespread use of images on the Internet, not much is known about the behaviour or motivations behind domestic image search (André et. al, 2009; Cunningham & Masoodian, 2006; Pu, 2008). Most studies on image search focuses on the technology itself rather than image search behaviour (André et. al, 2009). Several studies have addressed the use of personal photographs – i.e. photos taken by individuals for personal use (Rodden & Wood, 2003; Kirk, et al., 2006; Van House et al., 2005). However, this does not include image search on the Internet performed in the context of everyday life.

This study attempts to understand the range of behaviours and motivations for image search, and to address the two main gaps in the research of image search:

1. The gap of domestic and non-personal image search
2. The gap of image search behaviour on the Internet

The main aim of the study is to propose an analytical tool based on the behaviours and motivations of domestic image search, to guide designers in understanding the context of image search activity and aid them in the design process.

1.2 Research Approach

A qualitative approach was used to study a broad range of user behaviours from nine participants over a period of four months. Each participant was observed on their image search activities for approximately one week, and periodically interviewed about habits, goals, motivations and image search strategies. In addition, the study examined contextual information about participants' environments and circumstances as potential factors influencing image search behaviour.

1.3 Research Questions

Two main research questions underpin the study. The first is to understand a broad range of non-personal image search behaviour from a domestic perspective, and the second question is to understand the main motivations that drive image search on the Internet. The questions are aimed at addressing the two gaps that currently exist in the research of image search, which are discussed in more detail in Chapter 2.

This study addresses these research questions by presenting an overview of existing related work, the study approach chosen to address the research gaps, the study findings and subsequent analysis, a discussion of its relevance and application, and a discussion regarding conclusion and opportunities for future work.

1.4 Dissertation Overview

This section describes how the dissertation is organised over the next few chapters.

Chapter 2 Literature Review This chapter discusses previous research work on image search behaviour and how this study addresses this body of work. It provides an introduction to the various mechanics of image search, its application in various domains, and gaps in the research work that this study aims to address.

Chapter 3 Methodology This chapter describes the qualitative approach used in this study. It describes the rationale behind participant selection, the diary study method used in gaining insight about users' image searching behaviours, and explains how grounded theory was used to analyse the data.

Chapter 4 Data and Analysis The main contribution of this chapter is an analytical framework for image search motivations. It also presents the results and analysis of the study from the perspective of the various technologies used.

Chapter 5 Discussion This chapter discusses specific design recommendations based on the results from the study, and provides suggestions

on how the analytical framework proposed in Chapter 4 can be used to aid the design process.

Chapter 6 Future Work and Conclusion This chapter presents a summary of the study, some opportunities for future work in the area of domestic image search, and concluding remarks about the dissertation.

2 Literature Review

This chapter provides an overview of existing research around image search behaviour, gaps in that research area, and opportunities for further research. This is addressed in three sections:

1. Understanding the mechanics of image search
2. Domains addressed by image search studies
3. Research opportunities in image search

The first section addresses existing research related to the mechanics of image search. It provides an overview of the various image search strategies as documented by various studies, such as browsing, exploration, and query-modification.

The second section discusses the various domains that have been addressed by previous research, which is divided into commercial and non-commercial image search. A also addresses several HCI-related studies regarding the use of personal photos, such as digital scrapbooking and cameraphones.

The final section discusses the two main gaps in the research of image search, which this study aims to address.

The chapter shows that most of the research pertaining to image search focuses on developing solutions for image search, but there is a lack of studies focusing on understanding the user behaviour of image search, particularly in domestic settings. Furthermore, although there is some research addressing the behaviour of users regarding image search in professional settings, there is a

wider gap in the area of domestic image search, suggesting a need for further research in this area.

2.1 Mechanics of Image Search

This section provides an overview of current research addressing various strategies employed by users during image search. These studies show that browsing, exploration and serendipitous discovery were very common in image search activities. The studies also revealed that image search queries were quite varied, and depended on the kind of domain the search was performed on. Finally, other studies focusing on personal photos showed that users behave differently in searching for personal content.

Several studies found that browsing was common activity in image search. Westman and Oittinen's (2006) study revealed that users tended to focus on general themes and named people, and that browsing was an essential strategy. Another study by Goodrum et al. (2003) involving the use of web-based search websites and topics showed that there was rapid browsing of thumbnails and individual images over multiple sub-pages and the use of multiple websites to determine the relevance of their findings. Another study involving journalism students who performed image searches on a commercial journalism photo database (Hung, 2005) showed that browsing and enlarging images were very common, accounting for 75% of the search tasks.

Some studies provide clues on the use of query terms in image search. Jörgensen & Jörgensen's (2005) study of employees in a commercial imaging company were reported to have used nouns for 50% of their searches, and that proper nouns made up 9% of the queries. In both of these cases, browsing and

exploration were not very well supported by the interfaces that were being used by the users to obtain images. The study by Goordrum and Spink (2001) on the use of the Excite search engine revealed that the image queries contained an average of 3.74 words, commonly containing the terms “image” or “picture”. It also revealed that search queries contained a high percentage of unique terms, and that query modifications were common. Zhang et al. (2006) conducted a query log analysis of a commercial search engine showing that more than 20% of image search queries were related to location, nature and daily life.

Studies addressing the use of personal photos (i.e. photos taken by individuals for personal use) found that participants could easily find photos using labels they created based on dates and event names, and that it was rare that users browsed large collections of photos because they usually only needed to access those that were taken most recently (Rodden & Wood, 2003; Kirk et al., 2006). Consumers also rarely put effort into annotation, preferring instead to employ exploratory search and serendipitous discovery, often for entertainment purposes (Shneiderman et al., 2006).

The studies above explore the mechanics involved for image search tasks. The section below shifts to a discussion on the specific domains that have been addressed by research work on image search.

2.2 Domains addressed by previous research

Much of the academic work related to image search has focused on technical or methodological innovations to improve how people or systems fetch images, rather than on understanding users behaviours regarding image search (André et al., 2009; Cunningham & Masoodian, 2006; Datta et al., 2005; Pu,

2008). Though there are a number of papers that seek to address the question of image search behaviour, the papers address specific types of image search, such as those pertaining to a specific profession, theme, or types of search. The next section provides more detail discussion on the research of image search and is divided into commercial and non-commercial environments.

2.2.1 Studies of Image Search in Commercial Settings

Several studies have focused on studying image search behaviour in commercial settings, namely journalistic settings and commercial image databases.

A paper by Ornager (1997) discussed an empirical study of several newspaper archives, observing search criteria and types of user queries. Sormunen et al. (1999) did a study on four newspaper journalists performing well-defined tasks (illustrating an article, similarity assessment, grouping photos) in order to gauge the usefulness of Content-based Image Retrieval algorithms in real-world contexts. Hung (2005) studied user behaviour of journalism students to understand search strategies. Finally, Westman and Oittinen (2006) studied the "image needs, searches and uses of the staff" at a newspaper company, focusing on the understanding the overall context of image search in the work process.

Another set of studies focused on image search involving commercial image databases. Zhang et al. (2006) conducted experiments and user studies on a 2.5-million image database to understand user preferences for browsing high-quality images, particularly from a focused image search database (as compared to a general image search engine like Google image search). Another study

analysed image searches and queries from search logs from a commercial image provider over a one-month period (Jörgensen & Jörgensen, 2005).

Image search activities in commercial settings often have rigid characteristics involving specialised knowledge of bespoke search systems and specific work requirements. This suggests that image search behaviour may vary greatly in a non-commercial sense, although not many studies have focused on this domain; this is discussed in the following section.

2.2.2 Studies of Image Search in Other Environments

Image search involving non-commercial domains, such as collections of images from libraries, experimental image database systems, and bespoke image search systems have been the focus on some quantitative and lab-based studies. Despite providing additional perspectives in the field of image search, the studies lacked richer insight such as the influences of user motivations and situational context (Suchman, 1987).

Choi and Rasmussen (2003) analysed user queries from the Library of Congress' "American Memory" image database. Armitage and Enser (1997) analysed user requests from seven libraries containing image archives, while some were focused on the domain of art history (Chen, 2001; Hastings, 1995; Markey, 1998). One study evaluated an experimental image search interface (Porta, 2006) to study search strategies regarding explorative search behaviour. Goodrum and Spink (2003) studied image search characteristics by analysing query logs to for the Excite search engine. Although this study focused on the use of an Internet search engine (which is a research gap this study is

addressing), it lacked finer details regarding users' behaviours, goals and motivations.

Lab studies can often lack contextual relevance when it is applied to real-world scenarios (Suchman, 1987; Wixon et al., 1990). This suggests the need for a qualitative approach for understanding image search activities in the context of users' environment.

One last area of research on image search involves the subject of personal photos. This has been addressed by several HCI-related studies and is discussed in the next section.

2.2.3 HCI-related Studies on Personal Photos

The subject of personal photos has also been the focus of several studies in the field of HCI (Rodden & Wood, 2003; Kirk, et al., 2006; Van House et al., 2005). These studies focus on the annotation, organisation, and sharing of personal photos created using digital cameras or cameraphones. Some of these studies have been extended to include the use of online photo sharing sites, such as Flickr (http://www.flickr.com), where aspects of social networking and sharing are commonly studied, such as tagging and user participation in online groups (Lerman & Jones, 2007; Negoescu & Perez, 2008; Prieur et al., 2008).

While there is ample evidence of user behaviour around using and categorising personal photos, there is still a need to understand the use of non-personal images (i.e. images not originating from the viewer) in the context of everyday life. The next section addresses how two gaps in the study of image

search behaviour provide research opportunities: the gap of domestic and non-personal image search and the gap of image searching on the web.

2.3 Research Opportunities in Image Search

Many of these studies discussed in the sections above focus on three main areas: bespoke image search systems, specific professions, or personal photos. These studies indicate a lack of research focus around domestic image search, particularly on the Internet. More specifically, there is a lack of research that focuses on understanding the image searching activities of existing users in the context of their daily lives, particularly the motivations that influence search behaviour. The research gaps in image search and how the study aims to address them are discussed in the following sections below.

2.3.1 The Gap of Domestic and Non-Personal Image Search

Domestic search of non-personal images is characterised by any image search activity involving the use of images that have not been created or captured by the individual using it. As there already exists a body of research focusing on personal photos (i.e. photos taken by individuals for personal use), this study aims to address the scope of image search activities involving non-personal images.

This kind of image search activity can occur in many ways, such as viewing images from email attachments, looking for visual content using search engines, browsing thumbnails on news websites, or exploring images on online galleries.

As evidence suggests that technology use in domestic environments can involve very complex and highly situated social interactions (Rode et al., 2005; Brush & Inkpen, 2007), designers can benefit from understanding the broader context in which domestic image search takes place. Thus, the study aims to understand the use of images from more grounded and realistic perspectives by understanding the contexts and motivations that influence users' image searching behaviour.

As many studies have already addressed the subject of image search in commercial, non-commercial domains as well as the use of personal photos in the home, this study will address user behaviour regarding domestic image search on the Internet, which represents the second gap in the research of image search.

2.3.2 The Gap of Image Searching on the Internet

Another major opportunity of research that has not been addressed widely yet is the study of image search behaviour on the Internet. This is contrasted against studies of image search involving specialised systems or domains.

Current studies focusing on web-based image search have focused primarily on keyword queries on search engines (Goodrum and Spink, 2003; Jansen, 2006; Pu, 2005). There is a gap of domestic image search activities outside the scope of image search engines, such as news portals, online photo galleries and social networking websites. As individual factors (e.g. users' technical expertise) can influence the way they apply strategies for search (Aula et al., 2005; Sellen & Shaw, 2002), it makes sense to examine deeper how different individuals perform image searching on the Internet.

2.4 Summary

This chapter summarises the current literature and research opportunities surrounding image search behaviour. An overview of existing research work was discussed, addressing the mechanics of image search, the various domains that have been studied by existing research, and the two gaps that currently exist in the work of image search behaviour – domestic image search of non-personal images and image searching on the Internet. This study aims at addressing these two gaps using a qualitative approach in order to understand the behaviours and motivations behind domestic image search activity. This approach is discussed in greater detail in the following chapter regarding methodology.

3 Methodology

This chapter describes the study design and methodology used in studying the user behaviour of image search activities, and the justifications for its use. The chapter is divided in to four sections – diary study, participant characteristics, recruitment, and data analysis:

The first section discusses the diary study method (Rieman, 1993) and how it is used in this study. It also addresses why this approach is appropriate for the study of image search motivations in the context of domestic use.

The second and third section of this chapter discusses participant characteristics and the recruitment process. It addresses how these characteristics relate to image search activity, such as their interests, daily Internet habits, and technical proficiency. This provides a background for understanding the motivations behind participants' activities, on which the analysis is based on.

The fourth section discusses how the interview data was analysed using the grounded theory method (Strauss & Corbin, 1990), and how patterns of image search motivations were determined and organised.

Overall, the study took four months to complete, and involved nine participants. Each participant was observed for approximately one week and was interviewed periodically about their diary study logs. The observed activities were analysed using the grounded theory method, which provided the basis of an analytical framework discussed in Chapter 4.

3.1 Diary Study Approach

The diary study is a research method involving a combination of contextual interviews and participants' activity logging. It is meant to combine the rigor of quantitative studies and the contextual relevance of qualitative ethnographic studies (Rieman, 1993). It is used to study user activities in the field to mitigate the artificial nature of quantitative methods, which opponents of quantitative studies describe as having little impact on actual usability (Suchman, 1987; Wixon et. al, 1990). However, it can be used to retain some benefits from quantitative methods such as its ability to provide more objective conclusions, which critics of qualitative methods cite as a weakness of ethnographic studies.

The diary study method helps by reducing subjective elements in the data by "hardening" the diary logs based on a specific scope. As an example, this study focuses only on image search involving non-personal images, thus participants were told to ignore non-image-related activities and only consider image-related activities where the images did not originate from them and were of importance to their tasks.

This method is appropriate for this study for several reasons. Firstly, it is rigorous enough as a fieldwork method for understanding a broad range of image search activities. Secondly, it is opportunistic enough to allow observers to probe deeper into specific activities, in order to gain richer insight regarding issues such as the motivations, triggers, and environmental influences of image search activities. Thirdly, it is suitable to be used with a small set of participants (less than 10) within the three-month duration of this study.

Several approaches of diary studies were considered. One such approach was the use of pre-determined categories for data collection. Some studies employed the use of labelled checkboxes or fixed questions in diary forms (Sohn et al., 2008; Van Vugt & Markopoulos, 2003), where participants would select the appropriate labels or answer questions pertaining to their activities to streamline the diary filling process. However, a simpler logging process was chosen for this study to encourage discussion during interviews.

Rieman used another approach where activities were recorded at specific time intervals. This approach was not suitable for this study as image search activities do not occur very frequently throughout the day. The approach used by Rode et al. (2005) was more appropriate, as they instructed participants to record every instance of the types of activities they were studying. The approach by Rode et al. formed the basis of the diary study approach used in this study.

Czerwinski et al.'s (2004) variation of the diary study was also considered, where office employees were encouraged to define for themselves how they should fill up the diary. Czerwinski did this to study how different employees performed various office tasks throughout the day. This approach was also adopted because of the open-ended nature of the entries, which allowed opportunities for insights during interviews.

In summary, participants were asked to log only two items in the diary form (Table B.1): the start time of the activity and a short description of every Internet activity involving the use of non-personal images. When necessary, participants' browser histories were used to fill-in gaps in the data and to validate the data recorded in the forms. They participants were interviewed on a periodic

basis to discuss the details from their diaries. This interview process is discussed in further detail in the following section.

3.1.1 Interview Process

This section describes how participant interviews were conducted. Participants took part in diary studies over a period of approximately two weeks. The interview process for each participant consisted of three parts:

1. Initial Interview
2. Follow-up Interviews
3. Closing remarks and Farewell

Initial interviews were used to explain participants on the purpose of the study, instruct them on how to record their activities, and to gather demographic information regarding the participant and the participants' households through the use of a two questionnaires (B3, B4).

After the initial interviews, participants were contacted via phone or in-person meetings for follow-up interviews. This took place approximately twice a week, as most participants recorded an average of approximately 4 activities per day. Each interview lasted between 30 to 60 minutes. During the follow-up interviews, participants were asked how they defined success their image search activities, how often the activities occurred, the process of the activity, internal or external influencers of that activity (e.g. an email reminder or a high-level goal), and other contextual aspects of that activity (e.g. the environment or situation as the activity was taking place). During interviews, data was recorded as notes by

the interviewer in a large spreadsheet document, along with audio recordings of the interviews (some were lost due to technical failure).

Towards the end of the diary study, the participants were informed to stop recording at a certain date before one final follow-up interview. At the end of the final follow-up interview, participants were asked for their contact details to facilitate delivery of the payment voucher as an incentive for their participation. The diary was also discussed, and they were given opportunities to ask questions before a final farewell.

The next section discusses details regarding the recruitment process, as well as the participants' characteristics in relation to image search.

3.1.2 Participant Selection and Recruitment

This section discusses the criteria for population selection and how the recruitment process was carried out. As a reference, the details of participants' demographics are shown in Table 3.1.

Partici-pant Number	**PS-CF-2**	**PS-CF-3**	**PS-CF-4**	**PS-CF-5**	**PS-CF-6**	**PS-CF-9**	**PS-CF-11**	**PS-CF-12**	**PS-CF-13**
Pseudo-nym	**Sue** the house-wife	**Elle** the eco-blogger and part-time model	**Florence** who has many flatmates	**Gracia** the Hispanic graphic artist	**Colin** the sports-fan and indie film lover	**Elizabeth** the retired lawyer and now-volunteer	**Andy** the account-ant	**Tom** the classic TV-show collector	**William** the family historian and ebay trader
Other members in house-hold	husband (30)	husband (32), child (2)	flatmate (21), flatmate (33), flatmate (22), flatmate (31)	partner (33)	partner (31)				wife (43), child (12.5)
Software									
Organis-ing	iphoto	picasa	regular folders	photo mechani c	n/a	iphoto	folders on hard drive	photobu cket	flickr, facebook
Editing	iphoto	photo-shop elements	light-room, photo-shop cs, microsoft picture manager	photo-shop	photo-shop	n/a	n/a	windows photo gallery	windows picture and fax viewer

Share	email, iphone	im, email	im, email	you-sendit	email	email	email	email, forums, facebook	email, facebook
Search	google image, google search	flickr, google search	google image, flickr	google image, flickr, deviant-art, sxc.hu, getty images	google images, google search	google	google image search	google image search	google image search, flickr
Store	photo-bucket	flickr, facebook	flickr (10 photos)		facebook	n/a	n/a	facebook	flickr, facebook
Where I get images from				sxc.hu					
Demographics									
Gender	female	female	female	female	male	female	male	male	male
Age	32	31	24	26	28	59	39	43	46
Occup-ation	eco-blogger	house-wife	student	graphic artist	recruit-ment consulta nt	lawyer, retired	accoun-ant	civil servant	book-shop assistant
Employ-ment status	self-employe d	home-maker	student	self-employ-ed	self-employ-ed	retired	full-time	full-time	full-time
Highest education	some college	bach-elors	bach-elors, pursuing msc	bach-elors	bach-elors degree	bach-elors degree	high school	some college	bach-elors degree
Current marital status	married	married	single	living w partner	living w partner	single	single	single	married
First language	english	english	english	spanish	english	english	english	english	english
Second-ary lang-uages	n/a	mandarin, malay, cantonese	mandarin, malay, cantonese	english	n/a	french	n/a	n/a	n/a
Ethnic back-ground	white	chinese	chinese	hispanic	white	white	white	white	white
Internet profic-iency (low:1, high:10)	6	8	6	7	7	6	7	9	8
Internet problem resolution	ask husband or friend	look for help online, ask friend	give up	this doesn't happen to me	look for help online, ask friend	look for help online	call a consultant /professio nal	look for help online, self-solve	look for help online, self-solve
Regularity of Internet use	everyday for most of the day	everyday, for a few hours	everyday, for less than an hour	everyday for a few hours	everyday for most of the day	everyday, for most of the day	everyday, for a few hours	everyday, for a few hours	everyday, for a few hours
Internet usage detail									
Weekdays	at home	at home	at home	at home & work	at home	at home	at work	at home, at work	at home, at work
Evenings	at home	at home	at home	at home	at home	at home	n/a	at home	at home
Week-ends	at home	n/a	at home	at home	at home	at home	at work	at home	at home, at work
Regularity by type									
Email	daily	daily	daily	daily	daily	daily	daily	daily	daily
Browse the web	rarely	daily	daily	daily	daily	daily	daily	daily	daily
Instant messag-ing	daily	daily	daily	every few days	never	rarely	never	rarely	never
Digital calendar	rarely	rarely	daily	rarely	daily	rarely	never	daily	never
Word process-ing	rarely	once a week	never	once a week	every few days	daily	daily	daily	daily
Games	never	every few days	daily	once a week	rarely	never	rarely	once a week	every few days
Online banking	never	once a week	rarely	rarely	once a week	once a week	every few days	daily	rarely

Shopping	every few days	rarely	rarely	rarely	rarely	once a week	once a week	every few days	every few days
Play CDs/ DVDs	rarely	once a week	never	rarely	rarely	rarely	once a week	every few days	every few days
Digital music	once a week	every few days	never	daily	every few days	rarely	never	every few days	never
Download music	rarely	rarely	rarely	every few days	rarely	never	never	every few days	rarely
Watch online videos	daily	every few days	every few days	every few days	daily	every few days	rarely	daily	once a week
Look & manage photos	daily	daily	every few days	once a week	daily	once a week	rarely	daily	once a week
Provide computer help	rarely	rarely	never	never	every few days	rarely	once a week	every few days	rarely

Table 3.1 Participant demographics

All participants were recruited via word-of-mouth, and were selected primarily on their profession, technical proficiency, age and gender. The goal was to obtain a varied population group to understand the range of behaviours around image search. Specific professions were avoided, such as architects, photographers, and journalists – to reduce the influence of industry practices. One participant who was a graphic designer was the only exception – and her work-related image search activities were largely ignored during the study.

The study also used participants who had similar levels of technical proficiency with the Internet and used the Internet on a regular basis (at least 30 minutes a day or more). This was to avoid recruiting participants that were unfamiliar with general Internet activities such as searching for content on the web, browsing photo galleries, and understanding how to manipulate images on the web (e.g. downloading, enlarging, viewing)

3.1.3 Participant Characteristics

The section highlights the participants' backgrounds, interests, needs and rituals, and how it relates to their image search activities.

A total of nine participants took part in this study. There was one participant in the under-25 age group, four participants belonging to the 26-35 year old age group, three participants in the 36-45 year old age group, and one participant in the 56-65 year old age group. There were five female and four male participants. Out of the nine participants, three of them were employed full-time, another three were self-employed, one of them was a student, another was a homemaker, and one was retired but invested her time volunteering with charities. As mentioned earlier, all participants apart from one graphic designer did not have image-related professions.

All participants were fairly proficient with the Internet, rating themselves between a score of 6 to 9 on a scale of 1 for novice to 10 for expert. Although their technical skill ratings were similar, other factors like age, language, interests and profession were major influences of their Internet usage behaviours. All the participants made use of the Internet on a daily basis for at least a few hours, except for one participant who said she used it for less than an hour each day. They also had access to their own computers, although some would occasionally share their computers with other people in the same household.

The participants often depend on the Internet for getting news, research, communication, shopping, and work. Many of the activities described in their diary forms were samples of their routine activities (e.g. checking the weather or reading the news). However, deeper analysis of the context in which these tasks are performed revealed that participants had different high-level motivations and goals for similar tasks, which influenced the way they searched for images.

The next section discusses how the interview data was analysed and synthesised, allowing several themes to emerge regarding motivations for image search.

3.2 Data Analysis

This section describes the process used in analysing the data from the diary studies. The process is based on the grounded theory method, which refers to "theory that was derived from data, systematically gathered and analyzed through the research process", where the researcher "begins with an area of study and allows the theory to emerge from the data" (Strauss & Corbin, 1990). In this study, the research process involves gathering data from interviews and analysing it for patterns of image search behaviour and motivations.

Term	Definition	Sequence	Examples
Open Coding	The identification, naming, categorising and describing of phenomenon.	1st pass	The activity of reading news on the BBC are labelled as "daily", "news", "homepage", "social"
Axial Coding	The matching of related categories or properties to each other, along various dimensions of image search activity.	2nd pass	The reading of news is a routine activity, often without a clear goal. Commonly starts off as the first item on a user's web browser.
Selective Coding	The process of choosing one category as a core or main category, and grouping other categories or themes under that main category.	3rd pass	The "images as news" category is grouped along with other categories under the "images as a means of connecting or recreating remote experiences" – See Chapter 4: Data and Analysis
Memos	Short documents in which a researcher writes notes to himself throughout the process of analysing and researching the data.	Happens throughout, usually after several iterations	See B-5

Table 3.2 The research process for this study based on grounded theory

The notes that were made during the interview sessions represented the raw data for the analysis. The data analysis process involved the use of open coding, axial coding, selective coding and memos (Table 3.2).

Throughout the course of participant interviews and gathering data, open coding was used to label characteristics of image search activity. Using axial coding, several patterns regarding image search behaviour and motivations that were consistent across multiple participants were categorised, resulting in several themes of image search motivations. Next, selective coding was used to group similar themes under higher-level categories. Finally, memos were used as a "thinking tool" to assist reflection of the analysis as it was carried out.

3.3 Summary

This chapter describes the research approach for the study, consisting of the research focus, the selection of participants, the interview and gathering of data, followed by the analysis of that data. The following chapter provides a discussion of that analysis in greater depth.

4 Data and Analysis

This main contribution of this chapter is an analytical framework for understanding the activity of domestic image search. Based on the findings from the study, this framework illustrates common motivations and behaviours that underpin the activity of image search.

The first section describes the definition of image searching used throughout the study. It provides the scope of activities considered as part of image search, and how this focus is used in addressing gaps in existing research on image search.

The second section highlights the technologies used by participants in their image searching tasks, and summarises key observations regarding the use of those technologies. This includes the types of web sites commonly used and how these sites are typically used.

The third section discusses the main contribution of this study: an analytical framework for understanding the motivations for domestic image search. The framework presents the range of domestic image search activities according to four main categories of motivation:

1. Learning and research
2. Recreating or connecting to remote experiences
3. Facilitating communication
4. Secondary goals

The proposed framework makes several assumptions about the definition of image search, and is described in the following section.

4.1 Definition of Image Search

This section addresses how image search is defined for the purpose of this study, as well as the scope of activities that were observed as image searching tasks.

In this study, image searching is defined as any Internet activity that involves the use of any technologies (e.g. email client, web browser, websites) to obtain content that is directed by the intention of the participant. Also, the images must have had some importance or value to the participants during the activity. For example, if an image was present on a website but was ignored, it would not count as an image search activity. This definition includes activities where finding an image may not necessarily be the end goal, and that some of the activities considered here may not necessarily be searching tasks, thus the term "image search" is, in a sense, a misnomer.

This broader definition of image search is required to embrace a larger spectrum of image-related activities. One motivation of this is to get a more grounded and realistic understanding of the value of images and the activities surrounding it, as this can help the design of more appropriate solutions for users.

Finally, the scope of image search activities considered in this study only includes non-personal photos. Personal photos, which are images that originate from participants, were not considered in the scope of this study.

An overview of the various image search activities are explored in the following section, and provides the basis for understanding search motivations.

4.2 Overview of Image Search Activities

Table 4.1 provides an overview of the various activities that were observed in the study grouped according to the four categories of image search motivations (described in the sections below). It is important to note that the categories are not mutually exclusive (i.e. a participant may have multiple motivations for performing a search).

	Number of image search activities, according to category of motivation				
Pseudonym/ Participant No.	**Learning**	**Remote Exper-iences**	**Comm-unication**	**Second-ary Goals**	**Overall Total**
Elle/PS-CF-2	14	4	5	3	**18**
Sue/PS-CF-3	8	9	0	3	**17**
Florence/PS-CF-4	8	8	5	6	**18**
Gracia/PS-CF-5	19	4	1	5	**22**
Colin/PS-CF-6	16	11	2	5	**20**
Elizabeth/PS-CF-9	11	10	1	8	**21**
Andy/PS-CF-11	14	10	0	5	**17**
Tom/PS-CF-12	14	8	3	8	**16**
William/PS-CF-13	19	13	3	9	**30**

Table 4.1 Overview of image search activities per participant, organised by categories of image search motivations

4.3 Technologies used in Image Searching

This section highlights what kinds of technologies participants used to support their image search tasks. While some of these technologies (e.g. Google Images (http://images.google.com)) are designed specifically to support image searching, most activities involve the use of domain-specific websites that contain images (e.g. news, blogs, e-commerce websites). Maps and map-based technologies such as Google Maps (http://maps.google.com) are also taken into consideration, as maps represent specific types of images.

4.3.1 Technologies Specifically Designed for Images

The study observed uses of three technologies that were specifically designed for images: Google Images, Facebook photo galleries (http://www.facebook.com), and Flickr (http://www.flickr.com). However, participants' use of these technologies suggest that bespoke image search systems may not always be adequate for supporting users' image search needs.

4.3.1.1 Google Images

Google Images is a general image search tool that retrieves images based on keyword queries entered by users. Participants used Google Images to support quick searches for specific images that were easily identifiable via a keyword (e.g. "fitflops" – a shoe brand, "spinnaker tower" – a name of a landmark, "van gogh" – the name of a painter).

Despite its straightforward interface and relative popularity (Cunningham & Masoodian, 2006), it accounted for only less than 10 percent (on average) of participants' overall image search activities. One exception to this was Gracia's use of Google Images to aid in her use of English as it was not her first language:

> **Fieldnotes for Gracia (PS-CF-5) – 'pelt':** She learnt a new word, "pelt", during her English lessons, so she searched google images to find out what it was.
>
> **Fieldnotes for Gracia – camping equipment:** Gracia's boyfriend told her that they were going to camp out at a big festival, so she began looking for mats and something to cook with. She didn't know the name the cooking tool she was looking for, so she used keywords like "cooker" and "outdoors" on Google Images to find the right item through a visual match.

However, as Gracia was a graphic designer, this behaviour could have been influenced by her professional relationship with images.

Most studies on image search focus on technology (Datta et al., 2005) rather than user behaviour. However, many activities observed in this study suggest that it may be necessary to fully understand the context of those activities to make those solutions effective. The following sections discuss how context influences image search behaviour towards more domain-specific technologies.

4.3.1.2 Facebook

Facebook is a social networking website where members can connect with other members. Although Facebook itself is not designed specifically for images, it does provide a comprehensive photo gallery feature that members can use to upload images.

Participants viewed their friends' photo galleries to see what they were up to and posted comments on certain photos as a means of informing them that they had seen the photos or to amuse them. There is an element of serendipitous discovery as participants often visited photo galleries by clicking on a thumbnail of that gallery located on their Facebook home page.

The activities involving Facebook show how behaviour is motivated by participants' goals to connect with friends, and how the thumbnails and photo galleries are designed to cater for this need.

4.3.1.3 Flickr

Flickr is an online photo-sharing website that allows users to upload, search, annotate, and share their photos with other members. Only two participants made use of Flickr during their image search activities. One participant would visit Flickr to view photos from her friends and sister about once a week to find out news about them, as described in the Fieldnotes below:

> **Fieldnotes for Florence (PS-CF-4):** Florence decided to visit Flickr because she was thinking of her sister who said there was a fashion show and thought that she might have uploaded photos to Flickr. She clicked on one of her web browser bookmarks that goes directly to her sister's Flickr page, but she didn't see anything new. She then went to her own Flickr home page to see if there was anything else uploaded by her contacts, but didn't see anything new so she closed her browser. She does this about once a week to see what her sister is up to. Sometimes her sister will alert her to something new so that's how she ends up on Flickr, but sometimes she visits flickr herself when she feels she hasn't been there for awhile.

Another participant would browse Flickr as a means of curing boredom and to get ideas:

> **Fieldnotes for Sue (PS-CF-3) – Flickr to Cure Boredom:** Sue had finished reading all the blogs, and there was nothing else to do. So decided to browse Flickr… she starts looking at her contact's photos and her own activities, which are displayed on her Flickr homepage. She says that she often browses Flickr to cure boredom.

> **Fieldnotes for Sue (PS-CF-3) - Flickr to get Ideas:** Sue was supposed to bake a cake for her daughters' birthday. She said that she uses Flickr to look for images because it is a "big database", is "easy to find [photos]" on it, and that she was "familiar with the site". She entered the name of the cake she had in mind, but the results were not interesting, so she added the term, "decorating" – and the results were better. She was looking at "how to decorate the top of the cake", and more specifically, "how people do it". Spent a lot of time searching for this "thing" - the right image, and spent 2 hours in total. She wanted images to show the top part of the cake, and not so much the side view. She also didn't narrow down the search via keywords, but "trawled through [the search results]", which was made up of 30 to 40 pages, and had more than 400 results. There weren't any photos that prompted her to decorate her cake, but there were good ideas. She thought the experience could have been better but she didn't know how to make better use of the search features.

These fieldnotes show that Sue routinely uses Flickr in specific ways (i.e. to cure boredom and to get ideas). Similarly, Florence's example of routine involves

using Flickr to get updates of her friends. This suggests that these types of focused image search tasks are not well supported by general image search tools like Google Images, as summarised in the section below.

4.3.1.4 Explaining the Low Usage of Google Images

The infrequent use of Google Images to support image search tasks seems to indicate that users have other ways of finding images on the Internet. This implies that general image-specific tools are unsuited for common tasks that are highly situated. Instead, participants mostly used domain-specific websites to look for images, such as news sites, company websites, e-commerce sites, or blogs. These activities were not always driven by a need to find a specific image using keywords.

4.3.2 Domain-specific Websites Containing Images

A majority of image searching activities involved the use of domain-specific websites such as news sites, company websites and e-commerce sites. Some activities were routine, such as reading the news or checking the weather, and sometimes led to other activities through serendipitous discovery of images. Other activities were focused around a topic of interest such as property hunting, whereby participants were searching for specific types of images such as property floor plans.

4.3.2.1 Routine tasks leading to other activities triggered by serendipitous discovery of images

Participants used a combination of focused tasks with serendipitous discovery during their activities, but made repeated use of specific websites that they were familiar with:

> **Fieldnotes for Florence (PS-CF-4):** Florence has a bookmark on her web browser that links directly to the BBC website. Everyday she would click on the BBC bookmark to check news and look at the weather forecast. Today, the page was full of Glastonbury (a big event in the Glastonbury area) photos and videos. She randomly clicked on a few, saying that she is a big music fan, and that she wanted to see if she could find photos of bands or artists that she knows.

The example above shows how Florence has a routine of visiting the BBC website for news and the weather, and how the serendipitous discovery of the Glastonbury event photos led to deeper exploration for articles and more images relating to artists and bands.

There were three other participants (Colin, Andy and Tom) who used the BBC website routinely and had serendipitous discoveries of photos which led to other activities.

> **Fieldnotes for Andy (PS-CF-11):** Andy launched his web browser, which loaded up the BBC homepage. He took a glance at the sports section – there was a picture of Flintoff (a sports personality) there so he clicked on that. He commented about how the photos are quite eye-catching, more than just the normal text-based headlines. "The quality of the photos on the monitors we use [these days, make] the images really are extremely sharp… they sort of come at you [and catches your] eye. [Plus, it's] so much more appealing to look at compared to loads and loads of headlines".

This task also begins with a routine activity (glancing around for news), followed by a serendipitous discovery of an image leading to another activity (i.e. reading news related to that image). Serendipitous discoveries occur in the context of the participants' interest in the subject matter (i.e. artists and bands for Florence; Sports for Andy). This suggests that understanding situated activities (Suchman, 1987) can assist in the design of image search systems.

Figure 4.1 The BBC homepage contains appealing and attractive images that often engage users to interact with the content

Although the BBC website (Figure 4.1) is effective in engaging regular users through serendipity, not all image search activities involve routine tasks and serendipitous discoveries. The next section discusses how participants also make use of domain-specific websites for more focused search tasks.

4.3.2.2 Routine tasks involving image search with focused goals

In addition to routine visits to websites and serendipitous discoveries of images, the study observed participants make routine visits to certain websites with specific image search requirements. These activities were characterised by clear and focused goals, such as Elizabeth's use of a property agent's website to examine properties for purchase:

> **Fieldnotes for Elizabeth (PS-CF-9):** Elizabeth uses this property agent's website to track property prices. She has been doing this since 2 months ago, and visits the site once a week to browse for houses. The page that she was looking at did not have photos nor a floorplan, which was what she wanted. She says that she wants the photos as they "[give a better] feel for the house", and that floor plans are very important, especially for knowing how to decorate the place. As compared to viewing the property for herself, it doesn't substitute for

> the real thing, but floor plans are actual measurements that helps her judge the size and layout of the rooms.

This activity shows how Elizabeth has specific requirements of the images she is looking for, a common characteristic of activities involving routine and focused goals.

The study also observed routine tasks also taking place on e-commerce sites such as Amazon.com or eBay. Here, participants demonstrated specific image search strategies to accomplish their goals. For example, one participant routinely uses eBay to find old photographs for bid on:

> **Fieldnotes for William (PS-CF-13):** William is searching eBay for things to bid on, specifically – old photographs, as collecting old photographs is a hobby of his. He usually begins searching based on geographical region – [a place somewhere in the UK], where his family is from. He would use the advance search feature on eBay, and specify the search to return newly listed items. Then, he would click on every single thumbnail, unless it is specifically marked with [the name of a location in another country], because he's only interested in the UK [location] of the same name. This time, there were not many photos that appeared in the search results, so he stopped after 5 to 10 minutes. He says that he looks for these old photographs on eBay about 2 to 3 times a week.

This example shows the use of the advanced features to return newly listed items and interactions with thumbnails that match specific requirements. With routines tasks such as this, it seems natural for users to adopt certain search strategies for repeated use, which suggests how routine can be useful in supporting the design process (Tolmie et al., 2002).

The examples above show how domain-specific websites can be more effective than general image search tools (e.g. Google Images) in supporting domain-specific image search activities. This is because domain-specific

websites are designed to support various search strategies that are relevant to users goals (e.g. searching for new items to bid on eBay), making it easier for users to associate those websites with related search needs.

Not all image search activities are routine, as participants did perform occasional image search tasks that were motivated by focused and clear goals. The next section discusses how participants choose domain-specific sites to support their image search activities over general image search tools such as Google Images.

4.3.2.3 Focused, non-Routine Image Search Activities on Domain-specific websites

In addition to routine image search activities, the study also observed occasional Internet activities involving image search. The fieldnote below describes an example of this:

> **Fieldnotes for Florence (PS-CF-4):** Florence's flatmate asks if she's heard of the Radley brand before. Florence replies 'no', and her flatmate got excited and wanted to show her the bags and asked her to view the website. Her flatmate was convinced that she would love the bags. She went to the Google search site (www.google.com) and searched for "radley", which returned a link to the official Radley website at the top of the search results. She entered the Radley homepage and clicked on "handbags" and scrolled through the products using left-right arrow buttons, and then using the page numbers. She looked at all the pages because her flatmate was convinced that she would like it but it wasn't quite her taste.

This activity shows how Florence is unaware of the Radley brand and uses Google (not Google Images) to perform a general search using the keyword, "radley". Florence's choice to use the Radley homepage instead of a general

image search tool suggests users' natural association with domain-specific websites.

Florence's activity also indicates a preference for exploration using the left-right arrow buttons and the page numbers, as opposed to an advanced search feature such as "product search", which was present on the Radley website. Using domain-specific sites in combination with explorative search strategies can be used to support image search activities.

One final dimension not previously addressed is the use of maps to support image search activities, and is discussed in the following section.

4.3.3 Maps

Maps are a unique type of image search activity, as they are visual in nature and afford various visual tasks such as exploration and recognition. The study observed the use of interactive maps (e.g. Google Maps) as well as illustrated (static) maps. The maps were used to confirm the location of a particular landmark (e.g. the location of a real estate property) and to provide confirmation and assistance regarding navigation (e.g. obtaining the general direction to walk from the underground station).

4.3.4 Summary of Image Search Technologies

Participants' use of technologies for image searching depends on several factors. Google Images are often used to support quick searches for images that are easily matched with keywords, but accounted for less than 10 percent of activities on average. Instead, participants performed most image search activities on domain-specific sites. Some of these activities were routine and

involved either serendipitous discovery or specific search strategies, while occasional search tasks involved exploration.

As participants' motivations were key influences of search behaviour, further analysis was made on these motivations. The next section addresses these primary factors that influence image search.

4.4 Motivations for Image Search

The primary focus of this research was to understand the underlying motivations that influence domestic image search behaviour on the Internet. A total of thirteen image search motivations were observed, many of which related to one another in various ways. Thus, an analytical framework was created to illustrate at a higher level how these motivations were operating. The framework is made up of thirteen themes of image search motivation that are grouped into four major categories (Table 4.2):

High-level Categories	Themes: Image Search Motivation
Learning and Research	Images for discovery
	Images to support ongoing interests or research
	Images as ideas
	Images to satisfy curiosity
Recreating or connecting to remote experiences	Images as "getting a feel for the place"
	Images for re-living past experiences
	Images as news
	Images as personalities
	Images as ideas
Images as the Objects of Communication	Images to do the work of communication
	Images for social interaction
Images as Secondary goals	Images as intermediate steps
	Images as mementos for navigation
	Images as indexes

Table 4.2 Framework for Image Search Motivation

The motivations are linked to patterns of behaviour that were observed regarding the participants' image search activities. More importantly, the

consistency of these patterns across multiple participants suggests the framework's potential to assist the design process.

As participants may have multiple motivations influencing behaviour, the categories and themes are not mutually exclusive and are meant to provide dimensions of user behaviour for further analysis and exploration. These categories and themes are discussed further in the sections below.

4.4.1 Learning and research

Participants sometimes used images to gain new insight regarding pre-established facts or ideas. There are three main themes where learning or research reflects the main motivation for image searching: "images for discovery", "images to support ongoing interests or research", and "images to satisfy curiosity". The following sections discuss the differences between these motivations and how the motivations are characterised.

4.4.1.1 Images for Discovery

Some activities involve the use of images in gaining new knowledge while performing a related, high-level search task.

> **Fieldnotes for Sue (PS-CF-3):** Sue searched on Amazon began searching for "meat mincers", and as she was browsing the search results, realised that there were two types of meat mincing devices – a clamp-type and a table-top type. She said that she could tell from the images that there were clearly two types. After reading descriptions in more detail, she concluded and confirmed this assumption.

The example above shows how Sue was looking for meat mincers and learns that there are two variations of the device while browsing the search

results. Her high-level goal was to shop for meat mincers, although she didn't know exactly what kind of meat mincer she needed.

Sue's high-level goal was an occasional need, not a routinely occurring one. The next section discusses routine tasks where images are used to support ongoing interests or research.

4.4.1.2 Images to Support Ongoing Interests or Research

Participants' existing interests, hobbies or research were major motivating factors for image search (Table 4.3), and were characterised by regular, repeated activity around specific topics or domains.

Pseudonym/ Participant No.	No. of Activities related to Interests/Research/Hobbies	Total No. of Activities	Percentage
Elle/PS-CF-2	14 (parenting, DIY crafts)	18	77.78%
Sue/PS-CF-3	7 (modelling, health, lifestyle)	17	41.17%
Florence/PS-CF-4	3 (handbags)	18	16.78%
Gracia/PS-CF-5	11 (tattoos, graphic design, shopping)	22	50%
Colin/PS-CF-6	10 (sports, independent films, vacation spots)	20	50%
Elizabeth/PS-CF-9	11 (politics, IT news, charities)	21	52.38%
Andy/PS-CF-11	11 (golf, cricket, accounting, researching clients)	17	64.7%
Tom/PS-CF-12	11 (classic TV shows, DVDs)	16	68.75%
William/PS-CF-13	14 (family history, eBay trading)	30	46.67%

Table 4.3 Occurences of image-search activities related to interests, hobbies or research

Several participants were looking to purchase property for relocation and investment, and consistently examined thumbnails of real estate images for details such as the condition of an apartment and the external area of the location.

Elle regularly visited modelmayhem.com and Gracia often searched for illustrators' portfolio websites, looking for new things around their areas of interest.

In this respect, the learning aspects were characterised by looking for new images during each regular visit. While these activities were motivated by personal interests, the next section discusses activities motivated by ideas.

4.4.1.3 Images as Ideas

Three participants browsed images and photos for inspiration and creativity. The example of Sue's search for cake decorating ideas in 4.3.1.3 is an example of this. Gracia searched for ideas about Incan symbols as she was interested in getting a tattoo as an expression of her Mexican heritage.

> **Fieldnotes for Elle (PS-CF-2):** She loved looking at the photos of the hotel, saying how it is "[such a] beautiful place". She says she keeps looking at stuff to remind herself of her goals in life.
>
> **Fieldnotes for Sue (PS-CF-3):** She was looking at a Chinese watercolour painting, saying that "[it] kinda put her off" as the quality of the photo wasn't so good.
>
> **Fieldnotes for Gracia (PS-CF-5):** Gracia just likes to look at other people's photos - to learn from others or to see how far she's grown as a graphic designer. She does this as a way of comparing her own graphic design portfolio with others. She called this constant ogling at other people's work a "fixation".

These participants enjoyed looking at photos that were beautiful, and the quality of images would often influence their behaviours and emotions. The search activities for ideas are also a form of self-expression, as the participants were browsing for specific images that were personally appealing to them.

Finally, images also served to satisfy participants' curiosities, as discussed in the next section.

4.4.1.4 Images to Satisfy Curiosity

Participants occasionally engaged in casual search for images to satisfy their curiosity:

> **Fieldnotes for Tom (PS-CF-12):** He was reading that people were claiming that [TV presenter Christine Bleakley] was older than she actually was. It was interesting just to find out, but he couldn't find anything conclusive. He engages in random browsing on a daily basis, he says - "[it's] quite a nice thing to do before you go to sleep".

A similar study also showed how some image search queries were informational and motivated by "curiosity or pursuit of entertainment" (Cunningham & Masoodian, 2006).

The themes discussed here in Section 4.4 reflect how images have intrinsic value, thus are used for learning, research, inspiration or to simply answer a question. Another related dimension of using images involves recreating or connecting to experiences, where images are used to piece together perspectives of physical locations, feelings, memories, or concepts.

4.4.2 Recreating or Connecting to Remote Experiences

Participants use images to understand and imagine experiences by examining or assessing details within images. The high fidelity of images helps viewers visualise experiences in ways that text-based content cannot. Table 4.4 shows the various dimensions in which images are used in this context:

Themes about Recreating or Connecting to Remote Experiences	Characteristics of Use
Images as "Getting a Feel for the Place"	Physical location not previously visited, visualising how it would be if they were to visit the place
Images for Re-living Past Experiences	Physical location previously visited, to rekindle memories
Images as News	Intellectual – wanting to understand events, happenings, stories, causes
Images as Personalities	Celebrities or famous people who are important because of interest or informational value

Table 4.4 Dimensions of experiences for image search activities used to recreate or connect to remote experiences

Some of these themes involve tangible experiences, while others are about intellectual experiences. The different dimensions of these motivations are discussed below.

4.4.2.1 Images as "Getting a Feel for the Place"

Images were sometimes used by participants to "get a feel for a place", referring to the sense of being physically present in a specific physical location not previously visited. In one activity, a participant was looking at his friend's photos of the Wembley Stadium on Facebook:

> **Fieldnotes for Colin (PS-CF-6):** Colin found it interesting how his friend managed to capture Michael Owen taking a goal. There were photos of celebrations at Wembley. He had never been to the stadium before so it was nice to see inside. There were very close shots of the player, and players celebrating. He didn't think you could get so close to the station. He didn't know much about the stadium, and it was interesting to see it from his friend's viewpoint.

This involves multiple photos of a given location showing various perspectives of the space, as well as 'episodic' snapshots of things that can happen in a physical location (e.g. Michael Owen taking a goal).

Images can also be used to provide details about a past experience as much as a future experience. An example of Florence's use of images to reconnect with past experiences is discussed in the section below.

4.4.2.2 Images for Re-living Past Experiences

When a participant has been present at a physical location before, images help as a way of connecting that person to a past experience of that location. For example, Florence was informed of a snowstorm that hit the town of Dunedin, New Zealand, where she had previously lived:

> **Fieldnotes for Florence (PS-**CF-4): Florence had heard from a friend that there was a snowstorm in Dunedin, New Zealand, where she used to live. She visited the Yahoo NZ news site and began searching for photos on news articles, and found one with 8 or 9 photos of the snowstorm. She enlarged every thumbnail because it was a better experience, saying that it was more "fun [and satisfying]" and that she could see more details, such as "[bits] of grass, and [being able to] identify which building that was". She missed Dunedin, and the photos helped her re-live the experience.

The example describes how the images provided a sense of nostalgia. Participants looked for specific details within the images and also at specific scenes depicted by the images.

In addition to tangible experiences, images also help users to connect to experiences intellectually. One example of this is the use of images as news.

4.4.2.3 Images as News

Images can also represent news, which participants use to connect to remote experiences intellectually. These activities often occurred regularly, repeating on a daily to weekly basis. Florence's regular visits to her sister's Flickr page were a way of getting news (discussed in 4.3.1).

Another motivation of image search involves the additional dimension of personalities such as TV presenters or football players, discussed in the next section.

4.4.2.4 Images as Personalities

Some news-related activities involved celebrities or popular personalities such as football players.

> *Wow, look at her now. [It's amazing] what good styling, good makeup can do… it's ridiculous that people praise her for being an icon, but when she was younger she was doing drugs, heroin - and [I was] just thinking that the 'world is so screwed' just because someone is wearing the right clothes.*

In the quote above, Elle describes her opinions when looking at a slideshow of Nicole Richie (a TV personality) on the Glamour Magazine website (Nicole Richie's Style Evolution, n.d.). Participants viewing the photos were motivated to know about the personality and the stories or situations surrounding the personalities. In this example, the experience was about connecting with the experience of people's external perceptions of a personality.

4.4.2.5 Summarising Images for Experiences

As images are often used to tell a story, they are valuable in helping users connect to tangible or intellectual experiences in many ways. An insightful behaviour is the act of "selecting" certain photos that tell an overall picture or story, such as the Wembley Stadium example (4.4.2.1) and the Dunedin Snow example (4.4.2.2) where some photos were valued over others.

The next section addresses how images are also used to facilitate communication and social interaction.

4.4.3 Images as the Objects of Communication

Images are useful as objects to facilitate communication and social interaction. This occurs in two ways – one in which images are used as a means of communication (i.e. images to do the work of communication), and another where images are used to encourage social interaction with other people (i.e. images for social interaction). These themes are further described below.

4.4.3.1 Images to do the work of communication

Images can be more effective in communicating something better than words can. This example of a conversation between Florence and her flatmate involves finding a photo of Van Gogh:

> **Fieldnotes for Florence (PS-CF-4):** Florence did a quick scan at the Google Image search results - she pointed to Van Gogh's self-portrait and asked her flatmate, "is it that one?" and the flatmate said yes and they both laughed at it because it did remind her of someone that they both knew.

The image of Van Gogh's portrait was the object of communication, as no words were used to describe it in other means. The following section describes how images, in addition to facilitating communication, act as objects that encourage social interaction.

4.4.3.2 Images for Social Interaction

Images have also been used by participants in social games, usually played on online forums or social networking websites such as Facebook. This example shows how images of personalities in a guessing game on an online forum:

Fieldnotes for Tom (PS-CF-12): The aim of this particular game on the forum was to upload a photo of an obscure person without specifying the name. The person who guesses the right identity gets to post the next picture.

The social interaction here involves locating images that are worth using, sharing them with other people, and encouraging a response. Browsing through photo albums on Facebook and putting comments on certain photos are also examples of this. The game example also shows the element of play involved in the utility of images in these themes.

4.4.3.3 Summarising Images as the Objects of Communication

The examples above show how participants make use of images as efficient ways to communicate or facilitate social interaction. These motivations can influence users to search for images to be used for communication, or to engage in social interaction around a found image.

One final dimension of image search motivation involves the use of images as visual tools to support other goals, as images are sometimes easier to work with and are used to make an overall task more efficient.

4.4.4 Images as Secondary goals

Image search is sometimes used to facilitate other types of activities. The images are used as a means of accomplishing other goals:

Themes about Secondary Goals	Characteristics of Use
Images as Intermediate Steps	Economical perception of image search, visual matching, parent goal guiding the activity,
Images as Mementos for Navigation	Visual mementos for navigation of a physical space
Images as Indexes	Visual matching across a list of items

Table 4.5 Dimensions of Use for Themes on Secondary Goals

4.4.4.1 Images as Intermediate Steps

Intermediate steps are characterised as brief, economical search tasks for images to assist another goal. For example, Garcia's recipe search for an authentic Mexican dish returned American versions of the recipe:

> **Fieldnotes for Garcia (PS-CF-5):** She first she looked for recipes via Google and then used Google images when she couldn't find the recipes she wanted with regular text search. On the Google Image results page, she clicked on an image of a dish that looked authentic, and then clicked the back button to click on another image of the same dish to check to see if the recipe was right. When she had decided on the recipe, she left it on the screen and proceeded to cook the dish.

The activity shows how images were more efficient than text in finding the right recipe.

Images can also be used to support navigation in this way, as users make mental notes (i.e. mementos) of images to help them navigate through physical locations.

4.4.4.2 Images as Mementos for Navigation

Images can act as mementos, especially in the use of maps, to confirm the location of a particular landmark or for orientating oneself within a map. Although participants were already familiar with the location, they used images to obtain visual cues (e.g. landmarks, directions) to aid the physical navigation of a place.

Images are useful placeholders for things that are useful for judging placement, orientation, distance and meaning. As with maps, images such as thumbnails or icons can be used to assist the browsing of grids or lists, and is discussed as the final theme below.

4.4.4.3 Images as Indexes

Participants make use of images as indexes to locate an item on lists or grids, such as search results, product listings or catalogues. One example of this is Elizabeth's search for a radio programme on the BBC iPlayer website returns search results containing illustrations or photos that represented each programme, that assisted her search for a particular programme (Figure 4.2).

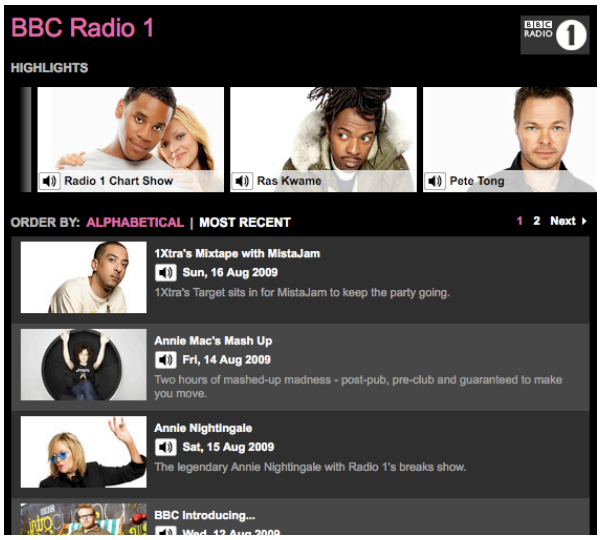

Figure 4.2 Images provide visual cues to assist the viewer in finding the right radio programme

Again, this represents an economical alternative to scanning headline text, especially when it involves visually scanning for a known image. Because users are familiar with other means of search on the Internet, they often make quick calculations and select the path that seems most likely to produce a "satisficing" outcome (Simon, 1957).

4.5 Summary

The findings from the study show how image search activity is not always characterised by the act of looking for images alone, but rather the images are often part of a larger goal or context. This challenges the assumption that users' primary image search needs can be improved purely through technical

innovations or by addressing image search mechanics. In contrast, users often use images in the context of other technologies and activities, and those image-related activities are part of a larger, more seamless experience of Internet use.

The analytical framework presented above builds on the fact that image search is highly contextual, based on the motivations of building experiences, learning, communicating or assisting as secondary goals. This suggests a greater need to focus and assess the context in which image search is performed in the design of image-related technologies, as the use of images can greatly affect the use and experience of an interface.

The following chapter discusses how this framework, based on the motivations of image search, can be used to provide design recommendations to improve image search.

5 Discussion

The last chapter provided a framework for understanding the various motivations of image search, and the dimensions in which those search activities occur. These themes help provide a broad understanding of image search activities performed in the context of everyday life, but more importantly – why they occur and in what circumstances.

This chapter will focus on design recommendations based on the four categories from the framework discussed in the previous chapter.

5.1 Overview of Design Recommendations

This section presents an overview of the various design recommendations that are presented here in this chapter. Table 5.1 provides an overview of the recommendations: each design recommendation addresses the specific categories of image search motivations (see Chapter 4); A description of each recommendation provides more detail about its use and relevance; Finally, examples are provided for each recommendation to illustrate its application.

Design Recommendations	Related Categories	Descriptions	Examples
Provide speed and exploration over fidelity	• **Learning and Research**	Trade off image quality and file size for speed and browsing larger sets of images (e.g. thumbnails)	Flickr's photo search allows for search results to be shown as small or medium sized thumbnails. Browsing is faster with smaller thumbnails.
Provide multiple views or perspectives	• **Learning and Research** • **Recreating or Connecting to Remote Experiences**	Provide multiple photos of an object, place, or idea to help users get a better sense of what it is	Amazon allows customers to upload their own photos of products onto product pages.

Show meta-information within images	• **Learning and Research**	Providing additional information for specific parts of an image or photo	Flickr allows members to add notes to a photo, which is used to highlight portions of a photo and annotating them with messages
Use higher fidelity photos/images	• **Learning and Research** • **Recreating or Connecting to Remote Experiences**	Higher resolution photos or images	Vector-based images (e.g. the Scalable Vector Graphics file format) for illustrations can scale to larger resolutions. Allowing users to view enlarged images in higher resolution can also help.
Provide zoom-detail functionality	• **Learning and Research**	Zooming-in on an image/photo to view parts of it in high resolution	See Figure 5.1
Allow bookmarking for future reference	• **Learning and Research** • **Recreating or Connecting to Remote Experiences**	Allow users to save or bookmark the location of an image so they can refer it in the future	Istockphoto (istockphoto.com) allows members to save images to a "lightbox", which is a placeholder for photos saved by members on the site. (see Figure 5.2)
Show related content around images	• **Learning and Research** • **Recreating or Connecting to Remote Experiences**	Provide additional content that describes or refers to the image in question – improves keyword search and general information retrieval as users will also scan surrounding areas	Some photos require additional context in order to provide meaning and value to the search activity. Examples of this are image descriptions, tags, and links to related websites.
Use appealing images	• **Recreating or Connecting to Remote Experiences**	Images that are visually appealing, and targeted at specific content or purpose.	Use appealing photos to supplement news headlines. See Jottings for Participant PS-CF-11 – 4.2.2
Display new image content notification	• **Recreating or Connecting to Remote Experiences**	Inform users if specific images or photos have been newly uploaded to the site.	Flickr lists photos uploaded by members reverse-chronologically, so that the latest photos always appear first on member's photo pages.

Provide efficiency, accuracy and consistency in search results	• **Communication** • **Secondary Goals**	Ensure that images are used correctly to reference relevant content or information, and that they are presented in a consistent manner to aid browsing and visual recognition. The images should load rapidly to support transient and assistive tasks.	Icons, symbols, thumbnails are examples of images that users look for to visually locate relevant content, and need to be used in a efficient, accurate and consistent manner to support the users' tasks.
Provide convenient means of posting images to others	• **Communication**	Provide a convenient means for users to share image content with others, where appropriate.	Some sites provide a "share this" feature (e.g. Flickr), which enables users to share photos with others.
Provide helper features that make common tasks easier	• **Communication**	Make common tasks easier according to users' needs. Some tasks such as image resizing or pre-formatting URLs can place burden on users. Providing helper features in convenient ways can alleviate this burden.	Some photo hosting services allow users to conveniently "cut and paste" pre-formatted URLs that link to the image for use in online forums and embedding in HTML scripts. Another feature is to allow users to conveniently post a photo to their blogs. (see Figure 5.2)
Allow comments to be posted beside photos/images	• **Communication**	Support the communication needs of users if there is a tendency for users to interact around the image or photo	Flickr, as a photo sharing site allows members to add comments about the photo. Facebook photo galleries have a similar feature.

Table 5.1 Overview of Design Recommendations presented in this Chapter

Figure 5.1 Zoom-detail functionality: Gap.com shows details of its clothing when the mouse cursor hovers over an area

Figure 5.2 Flickr's "Add to Fave" feature allows members to keep track of noteworthy photos. The "blog this" feature also makes it easy for members to posts photos to blogs from within the site.

Figure 5.1 illustrates an example of a "zoom-detail" feature, which is useful for providing rapid means of examining parts of an image in higher fidelity. Figure 5.2 illustrates the bookmarking feature, which allows users to track specific images for future reference.

The design recommendations shown above are meant as guidelines for design to encourage further exploration and research. The sections below discuss in greater detail how the design recommendations are applied to the analytical framework presented in Chapter 4.

5.2 Designing for Learning and Research

Designing for image search activities for learning and research involve two dimensions, i.e. whether the observed parts of the image are intrinsic or extrinsic (Table 5.2). For example, if the user is observing the image at a surface value (e.g. whether the picture is blue), then the quality is extrinsic. If the observation is being made about specific details within the photo, such as the condition of a room within an apartment for sale, then the quality is intrinsic.

Themes	Dimensions of Activities	Design Recommendations
Images for Discovery	Extrinsic	• Provide speed and exploration over fidelity • Provide multiple views or perspectives • Show related content around images
Images to Support Ongoing Interests or Research	Intrinsic	• Display meta-information within images • Use higher fidelity images • Provide zoom-detail functionality • Allow bookmarking for future reference • Show related content around images
Images to Satisfy Curiosity	Extrinsic	• Show related content around images

Table 5.2 Dimensions of use for Learning and Research Themes

Extrinsic observations may not require high fidelity images, and therefore images can be compressed or resized (e.g. using thumbnails to preview larger images). This can be used to improve speed and allow for more flexible screen layouts, and is suitable for image searching tasks where the primary goals require only thumbnail-sized images from which users can swiftly browse and identify.

In contrast, intrinsic observations may require higher fidelity images. Features that help users in their research needs may be useful, such as tags, meta-

information within the photos, zooming in to view portions of the photo, or bookmarking photos for future review.

Learning and research activities often involve queried search, browsing and exploration tasks. To support these tasks, the system must remain consistent and efficient. Trade-offs such as image size and fidelity need to be assessed in order to provide the right experience for the user. The designer needs to understand the dimensions in which users will most likely interact with the system in order to support those activities.

The next section discusses design recommendations to support image search for recreating or connecting to remote experiences.

5.3 Designing for Recreating or Connecting to Remote Experiences

Images are used to recreate or connect to two types of remote experiences – tangible experiences and intellectual experiences. Tangible experiences refer to objects in the real world (e.g. geographical locations, physical objects). Intellectual experiences refer to concepts, stories or ideas. Understanding the difference between the two is important for designing to support image search.

Users will try to seek clarity and details in the images they acquire to be able to connect to tangible experiences. Thus, high fidelity images are often desired for finer level of detail. Multiple images or photos are often required as tangible experiences can consist of multiple 'perspectives' – viewpoints from which the observer reasons about the space, location or object.

In the case of intellectual experiences, the content surrounding the images may be equally important to the image itself, as it provides the contextual basis for understanding what those images mean. Conversely, as users are often attracted by vivid imagery, it may be useful to utilise visually appealing images to draw attention to content. Activities involving image search for ideas may benefit from a 'bookmarking' feature that allows users to keep track of meaningful images for future reference. **Error! Reference source not found.** summarises design recommendations that are beneficial for recreating or connecting to remote experiences.

Themes	Dimensions of Activities	Design Recommendations
Images as "Getting a Feel for the Place"	Tangible	• Provide multiple views or perspectives • Use higher fidelity images
Images for Re-living Past Experiences	Tangible	• Provide multiple views or perspectives • Use higher fidelity images
Images as News	Intellectual	• Use appealing images • Show related content around images • Display new image content notification
Images as Personalities	Intellectual	• Use appealing images • Show related content around images
Images as Ideas	Intellectual	• Use appealing images • Allow bookmarking for future reference

Table 5.3 Design recommendations for image search activities motivated by recreating or connecting to remote experiences

In order to support image search activities for recreating or connecting to remote experiences, designers need to be aware of the users' information needs. For example, some of these themes may coexist, such as the use of photos with news involving a physical location (i.e. tangible and intellectual experiences at the same time). Thus, these recommendations are only meant to provide general guidelines, and it is up to the designer to research the user needs of the system.

The next section discusses design recommendations to support image search for communication.

5.4 Designing for the use of Images for Communication

As discussed in the previous chapter, there are two ways in which images are used as communication – firstly, as the object performing the work of communication, or secondly, as a means to encourage or facilitate communication (Table 5.4).

Themes	Design Recommendations
Images to do the work of communication	• Provide efficiency, accuracy and consistency in search results • Support convenient means of posting images to others
Images for Social Interaction	• Provide efficiency, accuracy and consistency in search results • Provide helper features • Allow comments to be posted beside the photo

Table 5.4 Design recommendations for supporting image search activities for communication

Most image search activities for communication occur in an ad-hoc fashion. The best way to support this activity is to ensure that the search engine behaves consistently and efficiently, so that users can test various search queries to sample various search results until they get the right match.

Images used in social interaction often occur over social platforms such as blogs, online forums, instant messaging, and social networking websites. Thus, convenient features that aid the process of using images for communication may be useful, such as allowing users to comment, post to blogs, email images to others, or pre-formatting URLs for use in online forums or message boards. For example, Flickr provides a feature to allow members to easily publish photos on their blogs (**Error! Reference source not found.**).

Designers will need to understand the underlying dynamics of the social interactions taking place on online communities, as users may be hesitant to use new features if using it does not make sense.

Finally, the next section addresses design recommendations to support image search activities as secondary goals.

5.5 Designing for Image Search as Secondary Goals

As discussed in the previous chapter, image search activities as secondary goals are activities that are used to support another end goal. There are two dimensions of use regarding image search activities as secondary goals – transient activities and assistive activities.

Transient activities are search activities performed in order to support another goal and then ignored or forgotten when the end goal is complete. The example in 4.3.4.1 of Gracia's authentic Mexican recipe search illustrates this well – the photo of the dish was a throwaway once the end goal, the recipe, was attained.

Assistive activities involve the use of images within an interface in order to make the search more efficient. For example, by visually browsing photos of DVD album covers on Play.com, William was able to track down the product that he was looking for - the thumbnail images of DVD album covers assisted the task of locating an item. There is also an aspect of recall and recognition of a specific item, as opposed to transient activities where images are forgotten once the end goal is achieved.

Designing to support transient activities (e.g. Gracia's recipe search example – see Section 4.3.4.1) involve efficiency, accuracy and consistency, as users will likely consider general image search technologies like Google Images or focused websites such as Amazon.com where search results are displayed in a consistent manner. Without efficiency, accuracy and consistency, it is difficult for users to rely on image search to support their primary goals.

Assistive activities involve the efficient use of images alongside list items to support browsing and recognition tasks. Because participants visually scan for recognition to identify the right item in the list, the images must accurately reflect the item content it is associated with, just as indexes serve as reference points in a book.

Themes	Dimensions of Activities	Design Recommendations
Images as Intermediate Steps	Transient	• Provide efficiency, accuracy and consistency in search results
Images as Mementos for Navigation	Transient	• Provide efficiency, accuracy and consistency in search results
Images as Indexes	Assistive	• Provide efficiency, accuracy and consistency in search results

Table 5.5 Design recommendations for image search activities for secondary goals

Image searching for secondary goals may also be an indication of the lack of support for accomplishing that goal. If there were better means for distinguishing between authentic Mexican and American dishes of the same name, there might not have been a need for Gracia to use Google Images. Again, this emphasises the need to fully understand the motivations, behaviours, and goals of users in the design process.

5.6 Summary

The design recommendations here provide some possible solution guidelines for the various types image search activities. In summary, the following dimensions aid in understanding the problem scope:

- Understanding whether the observed aspects of the image are extrinsic or intrinsic
- Understanding whether the connected experiences are tangible or intellectual
- Understanding if the images are doing the work of communication or facilitate social interaction
- Understanding whether image search supports secondary goals in a transient or assistive way

These guidelines point to a greater need to fully understand user motivations for image search, as well as the context in which their activities take place, and are simple tools for exploring various design solutions.

The challenge here will likely be a shift in emphasis – from the cognitivist view of simple affordances (Norman, 1990) to a more situated approach involving complex and often overlapping motivations, goals and behaviours (Suchman, 1987). This is particularly more so for image search activities as compared to text-based search activities, as images, as well as users' intentions to find them, are highly subjective and have overlapping qualities (e.g. aesthetic, conceptual, visual accuracy). The observations of participants' routine use of the BBC homepage, Facebook, and parenting blogs combined with serendipitous discoveries of seemingly unrelated content seem to indicate that users do not always have clear reasons in their search for images.

Designers will also need to pay close attention to the underlying limitations and capabilities of image-related technologies (e.g. image compression and file formats) in order to understand what solutions are feasible and appropriate for the task at hand. This is becoming increasingly necessary, as users grow more aware and accustomed to new ways of working with images, not just for themselves, but in group or community situations as well.

The next and final chapter will present the summary and conclusions of the study.

6 Conclusion

The aim of this study was to expand on previous research surrounding image search, by understanding image search behaviour on the Internet from a domestic perspective. The study addressed two gaps in image search research – firstly, the gap of domestic image search involving non-personal images, and secondly, the gap of image searching on the Internet. The main outcome of the study is an analytical framework based on image search behaviour and motivations for guiding designers in the design process. The study stresses the need for understanding image search more holistically, as users often perform image searching in the context of other activities, and not often in isolation.

6.1 Study Contributions

The main contribution of this study is an analytical framework for understanding the motivations of image search as a domestic activity, which provides guidelines for designers to explore various design solutions.

The study builds on previous research by addressing two gaps in the research work of image search behaviour: domestic image search involving non-personal photos and image search on the Internet. It used a qualitative approach to understand a broad range of image search activities, involving nine participants of different age groups and backgrounds.

The results show that image search activities are highly contextualised, and that participants did not always have clear reasons for searching images, suggesting the need for designers to understand users' motivations, goals, and

contexts. To aid designers in this, an analytical framework was proposed in Chapter 5, and is made up of four major categories:

1. Image search activities for learning and research
2. Image search activities for recreating or connecting to remote experiences
3. Image search activities for facilitating communication
4. Image search activities as secondary goals

The study showed that many participants often perform their image search activities in the context of routines such as reading the news at the start of each day. Routine activities often included serendipitous activities that were triggered by visually appealing images that captured participants' attentions. The activities reflected the perspective that users are guided by high-level goals and that their actions are highly situated (Suchman, 1987).

Despite the fact that participants were aware of image search sites such as Google Images, they utilised it approximately less than 10 percent of the time. Most image search activities involved the use of focused websites such as blogs, company websites, online retailers (e.g. eBay and Amazon), and Facebook. Many of these websites were used regularly, indicating how participants have their own lists of frequently visited websites. Many activities involved visual browsing, serendipitous discovery, exploration or recognition of images in combination with quick scans of content as a means of maximising their use of the site, such as browsing for the latest independent films on Play.com.

Several design recommendations were made, based on the analytical framework that was presented in Chapter 5. These recommendations summarised the behavioural and motivational dimensions in which image search activities

tend to occur. Understanding these patterns can help designers understand the scope of the problem solution, and evaluate it against their own user research and design ideas.

In summary, the design recommendations are meant to guide designers in thinking about the broader picture and to seek clarification regarding users' motivations, behaviours and circumstances.

6.2 Future Work

There are several areas that are worth exploring as a progression to this study. Firstly, there is a need to evaluate the analytical framework for domestic image search on a larger population to understand how the framework might apply to a broader scope of Internet users. Secondly, the design recommendations that were explored here should be applied and evaluated, as the process of implementing a design solution and understanding its resulting impact are equally important as the motivations behind user behaviour. Finally, there is further qualitative work that can be done in order to gain a deeper understanding of how domestic image search fits into a broader picture of domestic life. This study has focused primarily on image search motivations, but it is worth exploring additional perspectives involved in influencing how image search is carried out in the context of everyday life.

6.3 Summary

The outcome of this study addresses gaps mentioned earlier in the research of image search, and represents a starting point for evaluating how we design solutions involving image search for domestic settings. This study challenges conventional notions of image search, and the solutions of simply

understanding the basic mechanics of image search or purely focussing on technological improvements. This is because user behaviour is highly situated, especially in the context of image search where users sometimes rely on high-level goals such as personal interests and routines.

In conclusion, in order to maximise the benefits of our research contributions, it is imperative that we explore the underlying reasons that explain why users have adopted certain behaviours for coping with limitations and affordances in the system.

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B Appendix

B.1 Diary Study Form

Date: __ /__ /2009 Participant Number: PS-DS-__

Day of Week: M/T/W/Th/F/S/Su

Start time	Brief Description of Activity

If today you didn't perform any image-related internet activity at all, please describe why?

Any comments on today's image-related internet activity? Did everything go as expected?

Table B.1 The Diary Form

B.2 Interview Guide – during Diary Form Interview

How did the S get to site?

S Self-initiated: Used a search engine
B Self-initiated: Through a bookmark (via menu or on customized homepage)
A Self-initiated: Went looking for a link in archived email
R Self-initiated: Remembered name of site
U Reactive: Saw and used a URL in another medium (e.g., mag, newspaper, journal, book, poster)
E Reactive: Saw and used a link in an email received recently
H Serendipitous/forced: Default site on opening browser
T Serendipitous: Came across site while doing another task
Oth Other

How routine or frequent is this Web activity?

A A one-off: this is the first and probably last time this activity carried out
D Routine-daily: the kind of site checked almost on a daily basis out of habit
C Routine-occasional: a site visited from time to time out of habit
R As needed or in response to certain events
Oth Other

What was the process of the task?

IEF Self-contained: Task was initiated, executed and finished with no interruptions
I-EF Intention to do task and doing the task separated in time.
IE-F Task was interrupted before completion (either through forced interruptions or because of getting sidetracked into other tasks).
I-E-F Lag between intention and execution, and also completed after some kind of interruption.
Oth Other

Was the Web activity goal-driven?

Y Yes: the S had a specific reason or purpose for going to the site.
N No: the S went there for no particular reason
? Don't know

What was the nature of the goal? (Can be more than one)

PD Produce a document, or a digital artifactID Gain ideas or inspiration
OP Obtain a physical product (e.g., ordering something that is to be physically delivered)
OD Obtain a digital product (e.g., software, digital music, document, part of a document, screensaver)
FF Find a simple fact or answer a simple question
FS Find a set of facts (answers a question)
UG Understand a general topic or be generally informed
RC Do research to compare something or to make a choice
RP Do research to plan something
RR Do research for a project
EN Be entertained
CO Communicate with someone
Oth Other

What characteristics of the image was sought after? (Can be more than one)

PF Person – Face
PB Person – Body
ID Matching an idea or mood or feeling
EN Something entertaining or interesting
OB An object, or thing
OD Detail of an object
PL Place, location, scenery

What defines the quality of the image? (Can be more than one)

RE Image resolution
AE Image aesthetics (e.g. high art)
CO Conceptual accuracy
DE High detail (e.g. object detail)
MU Availability of multiple matching images

Was there a specific question in the S's mind?

Y Yes: the S could formulate the question
N No: there was no particular question in mind
? Don't know

Was the activity related to work or not?

W Work
N Non-Work
? Don't know

What was the domain of activity? What kind of activity was it?

Non-Work	Work
Purchasing (shopping/auctions)	Research
Hobbies	Travel
Travel: get information or plan	Administrative
Product information	Project management
Medical information	Social
Education	News
Government	Customise or update software
Social	Other
News	
Entertainment	
Job search	
Banking or managing finances	
Religious	
Community	
Other	

Was printing of Web-based information involved at any point?

Y Yes: Web-based information was printed and used before, during or as a result of the activity
N No
? Don't know

Were any other documents or technologies used in conjunction with the Web activity (e.g., books, articles, telephone, pager, Palmtop)?

Y Yes: list the items
N No
? Don't know

Was this site or service personalized or customized in any way?

Y Yes: it was either customized or personalized beforehand or during the activity
N No
? Don't know

What was the nature of the information delivered, or what kinds of media were involved in the Web activity? (can be more than one)

T Text/graphics
P Photos
V Video
A Audio
Oth Other

Was the Web activity carried out alone, with another person or people present?

AL Alone
CP Co-present: other person or people in same place
RE Remote: other person or people on phone, in chat room etc.
AS Asynch; involving communications sent by others at another point in time. Does not include using other people's emailed messages just to find links.
? Don't know

Did the activity require entering any personal information?

N None
P Password and/or username only
M More than a password/username
? Don't know

Enter Web story

Enter question

How long did the activity take? Enter duration of activity (in minutes)

How important was it that you to accomplish this activity today? (1-10)

Was goal achieved or desired outcome reached?

Y Yes: the goal was achieved (even if it wasn't easy to do so)
P Goal was partially achieved (not entirely satisfactory)
If yes, how valuable was it to you? (1-10)

N No: goal was not achieved.
If no, did they resort to another method? Describe.

How usable was this site? Were there aspects of it that annoyed you? Good features? (1-10) Enter usability ranking: list particular problems or features S mentions

B.3 Home-Visit Questionnaire: Household

Home Visit Questionnaire- About the Household

Researcher Use Only
Part No: PS-CF-HQ -___
Interviewer:
Date

IMPORTANT: Please complete this questionnaire **as a group,** you only need to complete it once for the entire household. Your last name will not be tied to your responses on this questionnaire**.** Your answers will be used to help us better understand how to create Norton products that are easier to use.

1. Please **list every one that lives** in the household?

Name	Age	Role (mom, daughter, nanny etc)

2. Are there **other people** who do not live here that spend **significant amounts of time in the home using the computers?** For instance,
   - grandmother's who come visit for a few weeks
   - stepchildren who visit for holidays
   - regular babysitters
   - close friends

Name	**Age**	**Role** **(babysitter, grandma Harris, Tommy's friend)**	**Do they stay overnight?** **(yes or no)**
			❒ Yes ❒ No
			❒ Yes ❒ No
			❒ Yes ❒ No
			❒ Yes ❒ No
			❒ Yes ❒ No
			❒ Yes ❒ No
			❒ Yes ❒ No
			❒ Yes ❒ No
			❒ Yes ❒ No

INSTRUCTIONS: *The following question focuses on your use of software to protect your home computer, or people using your home computer?*

3. Do you use any sort of **software or websites to organise, search, edit, or share** non-personal digital images?

    - ❑ Yes, I use software and/or websites to organise, search, edit and/or share digital images
    - ❑ No, I do not use software and/or websites to organise, search, edit and/or share digital images

    If yes, which of the following do you use (check all):

- ❑ Software to organise images/photos:
  - ❑ iPhoto
  - ❑ Picasa
  - ❑ Other (please specify: _____)
  - ❑ Not sure which

- ❑ An image editing software:
  - ❑ iPhoto
  - ❑ Picasa
  - ❑ Photoshop Elements
  - ❑ Other (please specify: _____)
  - ❑ Not sure which

- ❑ Software to share images:
  - ❑ Instant Messenger
  - ❑ Email Client (please specify: _____)
  - ❑ Other (please specify: _____)
  - ❑ Not sure which

- ❑ Websites to search for images:
  - ❑ Google Image Search
  - ❑ Flickr
  - ❑ Other (please specify: _____)
  - ❑ Not sure which

- ❑ Websites to store images:
  - ❑ Flickr
  - ❑ Facebook
  - ❑ Other (please specify: _____)
  - ❑ Not sure which

The following questions ask about the computers in your home.

1. How many **computers** do you have ***in your home***? _____

	What's it called? **(e.g. Susie's laptop/ Study PC/ Family PC)**	**Where is it?** **(e.g. Susie's room/ Bob's office/ Family Room)**	**Who uses it?** **(e.g. Susie/ Bob & Danny/ Whole family)**	**Who *owns* it?** **(The household, or work)**	**Desktop or laptop?**	**Type of computer?** **(Windows, Mac, other)**	**Does the machine have internet access?** **(If yes, what kind.)**
#1				❒ Household ❒ Work Owns	❒ Desktop ❒ Laptop		❒ No ❒ Yes, it has Access: ❒ Wired ❒ Wireless
#2				❒ Household ❒ Work Owns	❒ Desktop ❒ Laptop		❒ No ❒ Yes, it has Access: ❒ Wired ❒ Wireless
#3				❒ Household ❒ Work Owns	❒ Desktop ❒ Laptop		❒ No ❒ Yes, it has Access: ❒ Wired ❒ Wireless
#4				❒ Household ❒ Work Owns	❒ Desktop ❒ Laptop		❒ No ❒ Yes, it has Access: ❒ Wired ❒ Wireless
#5				❒ Household ❒ Work Owns	❒ Desktop ❒ Laptop		❒ No ❒ Yes, it has Access: ❒ Wired ❒ Wireless
#6				❒ Household ❒ Work Owns	❒ Desktop ❒ Laptop		❒ No ❒ Yes, it has Access: ❒ Wired ❒ Wireless
#7				❒ Household ❒ Work Owns	❒ Desktop ❒ Laptop		❒ No ❒ Yes, it has Access: ❒ Wired ❒ Wireless

Please return this questionnaire to the interviewer.

If you forget, please mail to:

Jennifer Rode
MPEB 8th floor
University College London
Gower Street
London
WC1E 6BT
United Kingdom

B.4 Home-Visit Questionnaire: Adult/Individual

Questionnaire for Adults
Home Visits

Researcher Use Only
Part No: PS-IV-AdultQ -___
Interviewer:
Date

IMPORTANT: Each **adult** member of your household will need to fill out this form. Your name will not be tied to your responses on this questionnaire**.** Your answers will be used to help us better understand how to image search can be improved.

4. Your **gender**: ❒ Male ❒ Female
5. Your **age**: _____
   (or age range if you prefer ❒Under 25 ❒26-35 ❒36-45 ❒46-55 ❒56-65 ❒Over 65)
6. What is your **occupation**? _____

7. Which of the following best describes your **employment** status (check one)

- ❑ Homemaker
- ❑ Self Employed (not including students)
- ❑ Full Time (not including students, even during summer)
- ❑ Part Time (not including students)
- ❑ Unemployed (not including students)
- ❑ Retired
- ❑ Student
- ❑ Other: _____

8. What is the **highest level of education** you have *completed*? (check one)

- ❑ Some High School
- ❑ High School Graduate
- ❑ Some College
- ❑ Associates Degree
- ❑ Bachelors Degree
- ❑ Masters
- ❑ PhD, MD, JD or equivalent

If you are currently enrolled as student, what degree are you working on?

❒Associates ❒BA/BS ❒MA ❒PhD ❒MD/JD ❒Other: _____

9. Which best describes your **current marital status**? (check one)

- ❑ Single
- ❑ Living w/Partner & Unmarried
- ❑ Married
- ❑ Separated, but not Divorced
- ❑ Divorced
- ❑ Widowed

10. What is **your first language**? (check all that apply)

❑ English ❒ Other (please specify: _____)

11. Do you speak (conversational or better) **more than one language**?

❒ No ❒ Yes (specify languages? _____)

12. Which of the following best describes **your ethnic background**? (check one)

❑ White/Caucasian
❑ Black/African American
❑ Hispanic
❑ Asian
❑ Pacific Islander
❑ Native American
❑ Indian Sub-content
❑ Other: _____

13. On the following 10-point scale circle the number that best represents your internet proficiency, where 1 means a "novice user with virtually no experience with a computer" and 10 means "technical professional expert"?

Novice User									Technically Proficient Expert
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*

14. When you're having difficulty during an internet activity involving the use of images, what are you most likely to do? (check all that apply)

❑ this doesn't happen to me
❑ read the owner's manual
❑ look for help online
❑ contact customer service
❑ call a consultant / professional
❑ ask someone ***who lives with me*** for help (who? _____)
❑ ask a relative/friend who ***doesn't*** live with you to help (who? _____)
❑ purchase a replacement
❑ other (describe: _____)

15. **How often** do you perform an internet activity that involves the use of images (searching, viewing, sharing, editing, organising, etc.)? (check one)

❑ Everyday, for ***most of the day***
❑ Everyday, for ***a few hours***
❑ Everyday, for ***less than an hour***
❑ Every few days
❑Once a week
❑Less often than weekly
❑Don't know

16. **When** do you perform an internet activity that involves the use of images (searching, viewing, sharing, editing, organising, etc.)? (check all that apply)

- ❑ Weekdays during the day?
  Where? ❒ At home ❒ At work ❒ Other: _____
- ❑ Evenings?
  Where? ❒ At home ❒ At work ❒ Other: _____
- ❑ Weekends
  Where? ❒ At home ❒ At work ❒ Other: _____

17. ***INSTRUCTIONS:*** *Please circle the item on the scale which best approximates how often you do each of the following* ***on your computer.***

Email	*Daily*	*Every Few Days*	*Once a Week*	*Rarely*	*Never*	*Don't Know*
Browse the web/ Read News Online	*Daily*	*Every Few Days*	*Once a Week*	*Rarely*	*Never*	*Don't Know*
Instant Message (AOL IM, etc)	*Daily*	*Every Few Days*	*Once a Week*	*Rarely*	*Never*	*Don't Know*
Digital Calendar (Outlook, iCal)	*Daily*	*Every Few Days*	*Once a Week*	*Rarely*	*Never*	*Don't Know*
Word Processing, Spreadsheets, Presentations	*Daily*	*Every Few Days*	*Once a Week*	*Rarely*	*Never*	*Don't Know*
Games	*Daily*	*Every Few Days*	*Once a Week*	*Rarely*	*Never*	*Don't Know*
Paying Bills or Banking Online	*Daily*	*Every Few Days*	*Once a Week*	*Rarely*	*Never*	*Don't Know*
Shopping	*Daily*	*Every Few Days*	*Once a Week*	*Rarely*	*Never*	*Don't Know*
Play CDs or DVDs	*Daily*	*Every Few Days*	*Once a Week*	*Rarely*	*Never*	*Don't Know*
Listen to Digital Music (iTunes)	*Daily*	*Every Few Days*	*Once a Week*	*Rarely*	*Never*	*Don't Know*
Download Music	*Daily*	*Every Few Days*	*Once a Week*	*Rarely*	*Never*	*Don't Know*
Watch Online Videos (YouTube)	*Daily*	*Every Few Days*	*Once a Week*	*Rarely*	*Never*	*Don't Know*
Look at & Manage Photos	*Daily*	*Every Few Days*	*Once a Week*	*Rarely*	*Never*	*Don't Know*
Provide Computer Help to Others	*Daily*	*Every Few Days*	*Once a Week*	*Rarely*	*Never*	*Don't Know*
Other:_____	*Daily*	*Every Few Days*	*Once a Week*	*Rarely*	*Never*	*Don't Know*
Other:_____	*Daily*	*Every Few Days*	*Once a Week*	*Rarely*	*Never*	*Don't Know*
Other:_____	*Daily*	*Every Few Days*	*Once a Week*	*Rarely*	*Never*	*Don't Know*
Other:_____	*Daily*	*Every Few Days*	*Once a Week*	*Rarely*	*Never*	*Don't Know*

Thank you!
Please return this questionnaire to the interviewer on the day of your interview.

If you forget please mail to:

Jennifer Rode
MPEB 8th floor
University College London
Gower Street
London
WC1E 6BT
United Kingdom

B.5 Example of a Memo

Images as Experiences
Colin is a big sports fan and he reads a lot of sports news and says he looks at photos a lot because he enjoys it, as it's "like being there" or that the photos help him "believe it more". In a more recent scenario, Colin was recounting his experiences of the Blur concert, where he was looking through photos of the concert posted up by his friends on Facebook. The photos helped him enjoy the fact that he was there as well, and that it helped him connect back with that experience.

Florence used to live in Dunedin, NZ. So, when recent news surfaced about a huge snowstorm, she was combing through the photos on the Yahoo! NZ news site to get a sense of what actually happened – looking for familiar details like buildings, the makeup of the ground (to the point of articulating the grass that was there), and the people who were there. When the images were presented as thumbnails, she clicked on every single one of them to view them in enlarged format, because it was more "fun, more satisfying", and that she could see more details (e.g. could "identify which building that was") – admitting that it was about '[re-living] the experience'.