

IN PURSUIT OF IMAGE: HOW WE THINK ABOUT  
PHOTOGRAPHS WE SEEK

Sara Oyarce, B.A., M.S.

Dissertation Prepared for the Degree of  
DOCTOR OF PHILOSOPHY

UNIVERSITY OF NORTH TEXAS

May 2012

APPROVED:

Brian O'Connor, Major Professor  
Richard L. Anderson, Committee Member  
Joseph Iaia, Committee Member  
Suliman Hawamdeh, Chair of the  
Department of Library and  
Information Sciences  
Linda Schamber, Acting Dean of the  
College of Information  
James D. Meernik, Acting Dean of the  
Toulouse Graduate School

Oyarce, Sara. In pursuit of image: How we think about photographs we seek.

Doctor of Philosophy (Information Science), May 2012, 341 pp., 6 tables, 25

illustrations, bibliography, 133 titles.

The user perspective of image search remains poorly understood. The purpose of this study is to identify and investigate the key issues relevant to a user's interaction with images and the user's approach to image search. A deeper understanding of these issues will serve to inform the design of image retrieval systems and in turn better serve the user. Previous research explores areas of information seeking behavior, representation in information science, query formulation, and image retrieval. The theoretical framework for this study includes an articulation of image search scenarios as adapted from Yoon and O'Connor's taxonomy of image query types, Copeland's engineering design approach for rigorous qualitative research, and Anderson's functional ontology construction model for building robust models of human behavior. A series of semi-structured interviews were conducted with expert-level image users. Interviewees discussed their motivations for image search, types of image searches they pursue, and varied approaches to image search, as well as how they decide that an information need has been met and which factors influence their experience of search. A content analysis revealed themes repeated across responses, including a collection of 23 emergent concepts and 6 emergent categories. A functional analysis revealed further insight into these themes. Results from both analyses may be used as a framework for future exploration of this topic. Implications are discussed and future research directions are indicated. Among possibilities for future research are investigations into collaborative search and ubiquitous image search.

Copyright 2012

by

Sara Oyarce

## ACKNOWLEDGMENTS

To Master Yogiraj Siddhanath I wish to express humble gratitude. Aum Namah Shivaya

To Yaniv Cohen, my appreciation and love for you is beyond all words and images.

To my parents Laurel and Dr. Guillermo Oyarce, both educators, thank you for cultivating my love of learning and exploration, and for encouraging and loving me.

To my brother Manuel, thank you for making the effort to understand and engage. To my grandmother, Mrs. Viola Luna Easley, a devoted reference librarian, thank you for your support and confidence. To Karl Easley, thank you for your humor, wit, and love.

To Dr. Brian O'Connor, thank you for our always-inspiring conversations. To my committee members Dr. Richard L. Anderson and Dr. Joseph Iaia, thank you for your kindness and guidance. To the late Dr. Mark Rorvig, thank you for believing in me.

Thank you to those who graciously interviewed with me. Thank you to everyone at the College of Information. Thank you also to the Newman Family Foundation for awarding me the TAMS Alumnus Scholarship, which helped fund my graduate studies.

To all those who helped along this road in so many untold ways, thank you.  
I am sincerely grateful.

## TABLE OF CONTENTS

ACKNOWLEDGMENTS.....	iii
LIST OF TABLES.....	vi
LIST OF ILLUSTRATIONS.....	vii
CHAPTER 1 INTRODUCTION.....	1
Introduction of Research .....	6
Zeitgeist .....	13
Statement of Problem and Research Questions .....	22
Research Objectives .....	23
Significance of the Study.....	24
CHAPTER 2 REVIEW OF LITERATURE.....	25
Information Seeking Behavior .....	25
Representation in Information Science .....	44
Query Formulation in Information Retrieval.....	55
Image Retrieval.....	59
CHAPTER 3 THEORETICAL FRAMEWORK .....	71
Image Query Types.....	71
Qualitative Research Design.....	77
Functional Ontology Construction .....	82
Definition of Terminology .....	88
CHAPTER 4 METHODOLOGY .....	90
Interviews .....	90
Sampling .....	91

Instrumentation .....	94
Data Collection and Analysis .....	97
CHAPTER 5 RESULTS .....	100
Interview Summaries.....	100
Results of Content Analysis .....	118
Functional Analysis of Results .....	122
CHAPTER 6 DISCUSSION.....	131
Summary of Findings .....	131
Emergent Categories from Content Analysis .....	131
Functional Ontology Construction in Image Search .....	134
Library of Congress Lessons Learned .....	139
Revisiting the Research Questions .....	141
Efficacy of Image Query Types as Framework .....	147
The Perception Flow .....	148
Emerging Model: Shifting the Locus of Representation .....	149
Recommendations for Future Research .....	153
Conclusion .....	170
APPENDIX A INSTITUTIONAL REVIEW BOARD LETTER .....	172
APPENDIX B INTERVIEW TRANSCRIPTS.....	176
APPENDIX C REFERENCES FOR SELECTED TERMS FROM INTERVIEWS .....	323
APPENDIX D TABLE OF FLICKR COMMONS™ PARTICIPATING INSTITUTIONS.	326
BIBLIOGRAPHY .....	332

## LIST OF TABLES

Table	Page
1	Information Seeking Models in Behavior Analysis Framework..... 43
2	Relationship between the Theory and the Interface Behaviors..... 68
3	Emergent Categories, Concepts, and Unique Coding Terms..... 118
4	Emergent Results with ABC coding..... 126
5	ABCs of Emergent Unique Terms by Category..... 129
6	Matrix of Question Types..... 155

## LIST OF ILLUSTRATIONS

Figure	Page
1 O'Connor's perception arrow. ....	9
2 "one thousand words" by Brian O'Connor, 2011.....	18
3 Belkin's ASK model. ....	26
4 Kuhlthau's information search process.....	27
5 T. D. Wilson's revised general model of information behavior. ....	29
6 Dervin's sense-making metaphor. ....	31
7 Bates' berrypicking, evolving search.....	33
8 O'Connor's bumps on the road of life. ....	34
9 Nondeterministic model of engineering design activity, from Copeland.....	36
10 First-level elaboration. ....	37
11 Second-level elaboration. ....	38
12 Third-level elaboration.....	39
13 Information loss, designed by Rich Anderson. ....	47
14 Schematic of a retrieval system.....	48
15 Joint construction of request by patron and intermediary. ....	53
16 A comparison of modernist and postmodernist assumptions. ....	79
17 A model of engineering design in its current instantiation.....	81
18 First permutation of the FOC approach. ....	85
19 Later version of FOC model.....	86
20 Emergent categories .....	120
21 Emergent categories and concepts .....	121



22	Modified perception flow model. ....	149
23	Shifting the locus of representation. ....	152
24	Foster's non-linear model of information-seeking behavior. ....	168
25	Composite non-linear model including three question types. ....	169

## CHAPTER 1

### INTRODUCTION

Photography enjoys a long history of interaction with the culture of humanity and the evolution of this culture over time. While Matthew Brady was photographing the Civil War of the United States in the 1860s, this work was preliminary to photography as an agent of social change, which may have made its debut in the realm of politics.

President Lincoln “joked that he wouldn’t have been re-elected without the portrait of him taken by photographer Matthew Brady” (Niller, 2011). In the 1890s, Jacob Riis used flash technology, which enabled him to capture previously inaccessible scenes, such as children working in various unpleasant conditions (Wells, 2000). These images brought the attention of the American people to the realities of child labor, as well as to the condition of maternal and health services at the time.

Lewis Hine worked in a similar way in the 1900s, as a photographer for the National Child Labor Committee, drawing attention to the conditions of working children and the invisible poor in the United States. He called his work “social photography” and strived “to offer graphic representations of conditions and methods of work” (Trachtenberg, 1989, p. 197). Trachtenberg argues that “American photographs are not simple depictions but constructions, that the history they show is inseparable from the history they enact: a history of photographers employing their medium to make sense of their society” (p. xvi). During the 1920s and 1930s, during the height of the Great Depression, President Roosevelt formed the Farm Security Administration Photographic Project as a part of the New Deal, to document the impact of the Great Depression on rural America through pictures (Wells, 2000).

In the 1930s, Robert Capa photographed the Spanish Civil War, including the famous picture of the dying soldier (Wells, 2000). Sontag (2002) explains that it was during the Spanish Civil War that, due to the “radical upgrade of professional equipment,” for the first time combat could be “covered” by professional photographers.

During World War II, Lee Miller, both photojournalist and model, photographed the war as a correspondent for *Vogue* magazine. Her portfolio includes images of a Leipzig family’s suicides committed in expectation of the Nazi defeat, as well as the liberation of concentration camps at Buchenwald and Dachau. She was also photographed nude in the bathtub of Hitler’s Munich apartment hours before his suicide was announced, admitting later that she took a nap in Hitler’s bed and stating, “I even washed the dirt of Dachau off in his tub” (Burke, 2005, p. 298).

Leni Riefenstahl was a film director who worked on propaganda films for the Nazi party and was regarded as Hitler’s favorite film director. She conceived of and directed *Triumph of the Will*, considered the most compelling propaganda film of the time, and achieved critical acclaim. It is not clear to what extent her work was the result of an internal aesthetic for film or of a political agenda, but the work did reach and influence a number of people during a critical time period (Sontag, 1980).

Meanwhile, in 1943, Ansel Adams was commissioned by the United States government to photograph conditions in Japanese-American Internment camps at Manzanar. These images were intended by the government to show excellent conditions in these camps, and photographers were forbidden “to photograph the guard towers, the guards, or the barbed wire” (Armor, Wright, Hersey, & Adams, 1988). Adams managed to include all three off-limits items, and by choice of subject matter and

cropping technique, he managed to reveal the suffering of the people in the camps.

During the Vietnam War in the 1960s, photographs and video footage of warfare were broadcast by the media channels, often unedited or even live. This represented a change from previously heavily edited images released by the government and the first moment in history that civilians could experience images of warfare taking place in real time. Television then brought these images, and thus the war, into family living rooms (Mandelbaum, 1982). Hoge (1994) writes that “many of today’s officers subscribe to the belief that television coverage turned the public against the war, thus undermining the chances for victory” (p. 140).

At the same time, images broadcast from the civil rights movement were inciting real social change, with images such as protestors being hit with high-pressure water hoses in Alabama, Rosa Parks sitting on a bus, and Martin Luther King, Jr. marching on Washington, D.C. spreading awareness and arousing a spectrum of citizens to action on behalf of equal rights for all. Berger (2011) argues that “if, as many scholars of the civil rights era have claimed, photographs of the struggle helped advance social and legislative change, such photographs also limited the extent of reform from the start” (p. 7). He also addresses the fact that photographs can convey very different meanings, quoting Albert Persons (1965) as writing: “A photograph, which stops a split-second of action, can say anything an editor wants it to say.”

In 1989, images of protestors at Tiananmen Square quickly spread throughout the world, despite efforts by the People’s Republic of China to quell its distribution. Hoge (1994) writes that “the dramatic increase in live television reporting of international crises began just five years ago with the satellite coverage of the Tiananmen square

demonstrations” (p. 136).

In 1991, the infamous beating of Rodney King was captured on videotape by an amateur bystander and then broadcast through media distribution channels, leading to riots throughout Los Angeles and a change in attitude towards police. Sturken (1997) asserts that, unlike previous memorable images from our history, this incident was “not a ‘flash’ of history or a moment when people registered ‘where we were.’ Rather, it was an image of the endless repetition of a history, an ‘ordinary’ image that became history” (p. 38). She further claims that King’s story became “the nation’s story when news organizations across the country deemed it newsworthy” (p. 40). Thus, the image was spread, because the major broadcast channels picked up the story and spread it through their distribution channels.

Fast-forward to 2011. During the Tunisian and Egyptian revolutions of 2011, which began what is being referred to as the Arab Spring, news was produced and distributed via Twitter by networks of “activists, bloggers, journalists, mainstream media outlets, and other engaged participants” (Lotan et al., 2011). These revolutions, which involved the use of social networks in an unprecedented manner, have resulted in a great deal of social change, including the overthrow of both the Egyptian and Tunesian governments. *The Economist* (2011) explains:

After decades of simmering discontent a new form of media gives opponents of an authoritarian regime a way to express their views, register their solidarity and co-ordinate their actions. The protesters’ message spreads virally through social networks, making it impossible to suppress and highlighting the extent of public support for revolution. The combination of improved publishing technology and social networks is a catalyst for social change where previous efforts had failed. (para. 1)

Both social media and social networks fueled this revolution, much like a traditional

army is fueled by supply lines of food and weapons. While local governments experiencing the revolutions attempted to cut off this supply chain, the message had already been picked up and supported by complicit world media, spreading the story further using established lines of distribution. This phenomenon demonstrates that the role of the media gatekeepers has weakened and the roadways into recognition by mainstream media are more varied and numerous. Named “High Priestess of the Internet” by the *Financial Times*, researcher danah boyd explains: "There's a difference between the broadcast and networked worlds. Command and control and hierarchical structures are being disintegrated" (Safian, 2012).

In the final months of writing this dissertation, grassroots protests spread throughout the United States and around the world (Occupy Wall Street, 2011). Many learned about this movement through the use of digital media, and in particular, social media. With an internet-enabled smartphone, tablet, or laptop, people can connect to groups organizing in their area or view photos and streaming video, hosted twenty-four hours a day by citizen journalists worldwide (Occupy Together, 2011; Occupy Wall Street Los Angeles, 2011). Most of the coverage of the Occupy Movement has been citizen produced and social media supported. In this case, mainstream media did not play the same role of distributing this news, but there were new distribution channels in the form of social networks being enabled by continuing advancements in technology. This drastic change in distribution channels has enabled a more bottom-up dynamic and is enabling ordinary citizens to bypass traditional gatekeepers to create and distribute their own messages.

Today, virtual armies of engaged citizens, empowered by advancements in

technology and ever-emerging online social networks, are sharing their images, videos, and voices online with a global audience, and this user-technology collaboration is bringing the revolution into our smartphones. Technology is changing, and how people interact with technology is changing. More to the point, how people use images, as well as how they create or find these images online is changing alongside that technology. In order to serve new generations of users, we must understand their experience.

On November 18, 2011, when Lieutenant John Pike of the University of California Davis was caught on video casually pepper spraying non-violent students during an Occupy protest (Burke & Lin, 2011), the videographer was a member of the protest, not of the press (Greenwald, 2011). Within days, user-generated memes were appearing all over the internet to parody Pike (Williams, 2011). Susan Sontag's experience of, "The Whole World is Watching," has become more like, "The Whole World is Shooting Its Own Video," and even, "The Whole World is Producing Its Own News." In such a radically transitioning media environment, investigating the question of how users think about images and interact with technology to find images is vital.

### Introduction of Research

Barthes (1977a) introduces the "photographic paradox," referring to the confusion of how to determine the "content of a photographic image" (p. 16) in a context where photographs are considered objective.

The photograph, professing to be a mechanical analogue of reality, its first-order message in some sort completely fills its substance and leaves no place for the development of a second-order message. Of all the structures of information, the photograph appears as the only one that is exclusively constituted and occupied by a 'denoted' message, a message which totally exhausts its mode of existence. (p. 18)

Sontag (2002) argues against an assumption that “a photograph is supposed not to evoke but to show” (Section III, para. 10), citing the photograph’s inherent commentary. Namely, a photograph is “always the image that someone chose” (Section III, para. 9), from choice of scene to choice of cropping. Photographs are messages. As an image is necessarily filtered to the viewer through the perspective of the image creator, a viewer’s interpretation and reaction to an image may interact with the intentions and reactions of the image creator to their experience of image creation. O’Connor and Wyatt (2004) explore this concept by discussing the role of the photograph as an interface. O’Connor argues:

The photograph functions as the interface between the photographer and the viewer. We might expand this to say that the photograph is a representation of the photographer’s state of mind (in the broadest sense) and may serve as a representation of some utility to the viewer. The photograph may or may not stimulate in the viewer what (if anything) the photographer would have planned for it to stimulate. (p. 83)

Wyatt responds:

The image surface is the space where two minds meet – across time and space, image maker and viewer exchange meaning on the image plane. It may be that image meaning to one may be different than meaning to the other. Why is it that meaning sent isn’t the same as meaning perceived? Enter entropy. It is the loss of order within structures. The second law of thermodynamics tells us that in time all structure gives way to disorder. (pp. 83-84)

Sontag (2002) considers this phenomenon as she describes “photography as shock therapy” (Section I, para. 3) in the case of Ernst Friedrich’s book *War Against War*. She explains that while this collection of World War I photographs and thoughtful captions intended to mock “the wickedness of militarist ideology” (Section I, para. 4), it may just as well be the case that such photographs may “foster greater militancy on behalf of the Republic” (Section I, para. 8). Barthes (1977a) similarly addresses this flexibility of

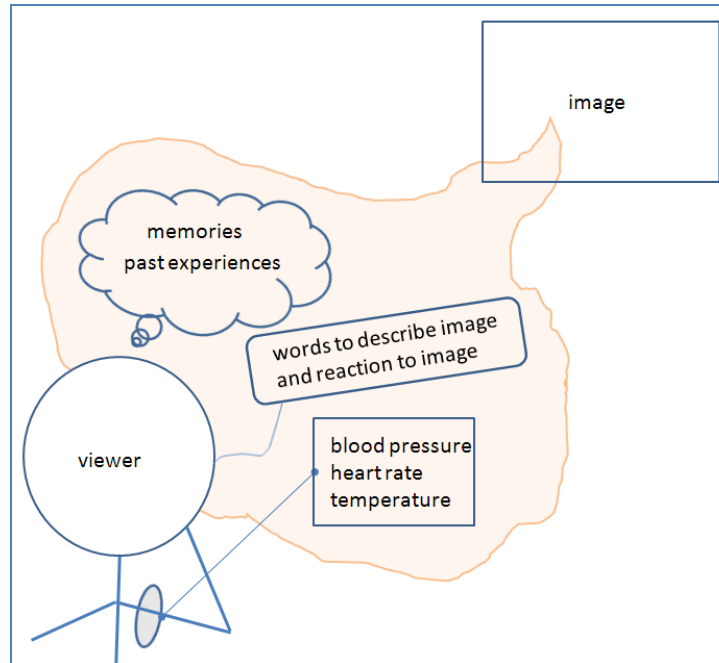


image meaning, stating that “a photograph can change its meaning as it passes from the very conservative L’Aurore to the communist L’Humanité” (p. 15).

Then what determines how a photograph is interpreted and what kind of effect it will have on its viewers?

Greisdorf and O’Connor (2002a) assert that “a picture represents not only what one knows to be in the picture, but also what one sees in the picture” (p. 384). O’Connor describes a visualization of the experience of image perception as a crème colored data arrow flowing between the base of the viewer’s brain to an image on the wall of a gallery (personal communication, September 2, 2011). This perception arrow would include aspects of the overall experience, such as words the viewer may choose to describe that image and their reaction to it, vital signs such as blood pressure, heart rate, and temperature, as well as more difficult to measure aspects, such as past memories and experiences, which may unconsciously inform the user’s interpretation and reaction (see Figure 1). Not all information in the perception flow is of the same type.

In particular, this model exemplifies the duality of perception and conception as discussed by Greisdorf and O’Connor (2008). These authors characterize the latter as consisting of both cognitive synthesis and verbal expression, or in other words, to the aspects of *the perceived* which the perceiver is able to both synthesize cognitively and express verbally. The perception-conception interplay is populated by rather subconscious aspects of the perception flow, such as memories and experiences, which, while not included in the user’s conception, may nonetheless exert an important influence on the user’s reaction to the image and evaluation of its relevance.



*Figure 1. O'Connor's perception arrow.*

Researchers may be interested in investigating the value of extracting relevant information which may exist within the perception-conception interplay. For example, it may be useful to describe memories and experiences explicitly through representations consisting of sounds, images, and words. Minsky (1986) may argue, however, that no bridge is possible to unify the perception-conception interplay, due to the fact that:

Inevitably, by the time you've managed to express yourself, you're no longer in the state you were before; your thoughts were ambiguous to begin with, and you never did succeed in expressing them but merely replaced them with other thoughts. ... This is not just a matter of words. The problem is that our states of mind are usually subject to change. The properties of physical things tend to persist when their contexts are changed – but the 'significance' of a thought, idea, or partial state of mind depends upon which other thoughts are active at the time and upon what eventually emerges from the conflicts and negotiations among one's agencies. (p. 207)

Thus, because perception is necessarily in the present tense and an expression must necessarily refer to an experience which has become historical, expression in the form of words, or even thoughts, according to Minsky, cannot be used as bridge-builder. In

this view, expression is itself a representation of thinking, as “expressing is itself an active process that involves simplifying and reconstituting a mental state by detaching it from the more diffuse and variable parts of its context” (p. 207).

At the same time, neuroscientist Damasio (1999) states: “I am suggesting that ‘having a feeling’ is not the same as ‘knowing a feeling,’ that reflection on feeling is yet another step up” (p. 284). Yet he goes on to assert that this seemingly paradoxical phenomenon of perception-conception is actually how we live, and our brains have adapted to and learned to compensate for the apparent difference. The complexity of this situation is more than initially meets the eye.

If it is nonetheless deemed valuable to derive representations to describe memories and experiences, the question remains of how. In any case, the task of identifying the precise sounds, images, and words which may compile an adequate representation is a challenge central to the task of information retrieval in general and image search in particular.

Greisdorf and O’Connor (2008) assert:

If a picture is worth a thousand words to one viewer, it is worth a million words to 1,000 viewers. No individual or group of individuals, no matter how professional or rule-intensive the approach, could ever capture a full panoply of impressions invoked by an image. (p. 53)

If each user responds to images in even drastically different ways, then is there an effective approach to utilizing words towards a goal of improved access to images?

Minsky (1986) suggests an optimistic perspective on the problem of many meanings:

If every mind builds somewhat different things inside itself, how can any mind communicate with a different mind? In the end, surely, communication is a matter of degree but it is not always lamentable when minds don’t understand each other perfectly. For then, provided *some* communication remains, we can share the richness of each other’s thoughts. (p. 64)

In this analysis lies the implied possibility that a million words may somehow provide insight, when organized and presented in some yet-unknown way, including and beyond that which an individual user may expect or hope for in an image search. The power of crowdsourcing user impressions is a serious area of study today.

In 2008, the Library of Congress undertook a pilot project which involved uploading 3,000 digitized photos from its collection to Flickr.com (Springer et al., 2008). One goal of this project was to develop a better understanding of the synthesis of image tagging and crowdsourcing, as well as possible benefits for both the library and its users. The experiment was a success: “In the first 24 hours after launch, Flickr® reported 1.1 million total views on our account, with 3.6 million views a week later” (Springer et al., 2008, p. 3). The same institution which originated and set the standard with Library of Congress subject headings, an epitome of tradition, is now branching out into the unknown and exploring new methods for describing, and thus improving access to images. The question of how to deal with images within a new paradigm has been officially deemed worthy of attention.

Prompted by a new copyright status of these uploaded images – particularly, “No known copyright restrictions” – Flickr® began a group called The Commons™ and invited other cultural heritage organizations to participate. Today, 55 institutions worldwide share images on Flickr Commons™, soliciting and learning from user input. Technology has enabled these experiments, as well as the continuing development of these new relationships between users and previously inaccessible information.

Of course, even with a sizable collection of novelty-acquired textual descriptions, the problem of discovering the best fit of information remains. P. Wilson (1968) asserts

that “no bibliographer can provide such an apparatus as will allow identification of works under all possible descriptions” (p. 112). Meanwhile, technology is also driving change and challenging how we think about media, about our participation with technology, and about ourselves (Bolter & Grusin, 2000). In this era of 140-character twittering, even one million words stand little chance against the power of first impressions an image can achieve.

Given the importance of images, insight is surprisingly limited when it comes to understanding a person’s thought process as they recognize the need or desire for an image and then go about finding or creating that image. The literature on this topic is limited, and while much effort has been invested in the development of faster and quantitatively smarter image retrieval systems, the corresponding knowledge structures regarding a human being’s image searching process appear unsophisticated. Observations made by Roddy in 1991 and Jørgensen in 2003 remain largely true today that “one of the great failures of image access was its inability to provide reliable information on a typical search session” (Enser, 2008, p. 535). The tools currently available to the general public for image search, therefore, may be incomplete or inadequate to meet the user’s image search needs.

One may ask: What must be understood about the individual user and the individual image search to better understand the image search process? In order to understand image search, we need to tap into an understanding of how individual users think about and perceive images.

This dissertation focuses upon the challenges and questions related to thinking about and conducting an online image search. This chapter addresses issues of interest and introduces the specific questions to be addressed by this study.

### Zeitgeist

Time is a ride, and you are on it.  
*Danny Hillis*

The digital age has arrived and holds much promise for the future of research and knowledge creation. The combination of increasingly inexpensive personal computers and increasingly fast Internet connectivity has revolutionized the way that we interact with information and thus, how we interact with our environments. Today, 35% of American adults own a smartphone, and a quarter of them do most of their online browsing with the phone (Pew Research Center, 2011). More than 75% of American teenagers own a cell phone, and over 80% of them use their phones to take pictures, while over 60% share pictures with their phones (Lenhart, 2010). From November 2010 to May 2011, the percentage of American adults who own ebook readers doubled from 6% to 12% (Purcell, 2011). In the same timeframe, the percentage of online American adults using Twitter rose from 8% to 13% (Smith, 2011). We have worlds of information at our fingertips, but to what extent does this translate into a user's ability to access information and discover knowledge that is actually relevant to them at that moment?

Oyarce (2007) claims that "the vast amount of [information retrieval] systems use text to represent content, even in the case of multimedia" (p. 264). Recognizing the power inherent in the ability to effectively retrieve information, TREC, the Text REtrieval Conference, co-sponsored by the National Institute of Standards and Technology and

US Department of Defense, has worked for 18 years to “encourage research in information retrieval based on large test collections” (TREC, 2011). Over time they have expanded their scope from plain text only to include research into retrieval from image, moving image, and even sound collections. Other examples of conferences focusing on content-based multimedia information retrieval research include the ACM SIGMM Workshop on Multimedia Information Retrieval, the IEEE International Conference on Multimedia and Expo (ICME), and the International Heritage Informatics Meeting (ICHIM), as well as the Challenge of Video Retrieval conference (Enser, 2008).

The problem of image retrieval is distinct from that of text-based retrieval and more complex and unexplored in many ways (Goodrum, 2000). Meanwhile, with rapid advancements in technology and the onslaught of unprecedented amounts of digital images available, we have been forced to improvise before completing a thorough exploration of the lay of the land. O'Connor, Kearns and Anderson (2008) write that “intoxicating updates and advances in any system create the beer goggle effect” (p. xvii). Users are often content to overlook shortcomings in the face of glitzy presentations. Today, systems are so advanced as to include capabilities such as recognizing the area of a picture which might be a human face, and furthermore, whose face it may be, but we still have not solved the problem of understanding what a user really needs.

Questions continue to outnumber answers. Even the process of search itself has yet to be clearly defined. It is unclear whether certain elements must be present in a successful retrieval search, including the recognition of an information need and a process of articulating a query which speaks the language of the retrieval system of

choice. In order to meet the needs of users engaged in image search, it is imperative to understand the user experience during the search process.

### Information Seeking Behavior

Each user approaches a search uniquely, and the particular characteristics of each user affect how they interact with information and conduct searches. There is an entire field of research attempting to describe how users seek information in more traditional text-only contexts (Bates, 1989; Belkin, Oddy, & Brooks, 1982; Case, 2006; Dervin, 1992; Kuhlthau, 2004; Marchionini, 2006; O'Connor, Copeland, & Kearns, 2003). These models provide insight into user behavior, including how users navigate the experience of having an information need and how understanding these behaviors may assist information professionals in developing systems which better meet user needs. Research into various aspects of user behavior includes explorations of characteristics of the user upon which differences in searching may depend. Depending on a user's age, sex, ethnicity, level of education, place of birth, occupation, language skills, height, weight, and any number of characteristics, we may be able to make educated guesses as to how they will conduct a search.

### Representation

The representation of an entity is created based on choices about which aspects of that entity to emphasize, and this selection is informed by underlying assumptions about relative value. P. Wilson (1968) describes bibliographic control as "power over power, power to obtain the knowledge recorded in written form" (p. 4) and goes on to assert that "any indexing activity requires decision about what is worth mentioning" (p. 96). These statements may apply to any documents which may be indexed, including



images. Decision-making about how to index, or represent, documents of whatever form is an inherently powerful process, as decisions made strongly affect the ability others will have to access the represented documents. Oyarce (2007) agrees, stating that “relevant documents may remain invisible because a specific use was not foreseen during indexing” (p. 265).

Mitchell (1995) explains, “Representation is always *of* something or someone, *by* something or someone, *to* someone” (p. 11). Patrick Wilson (1978) further asserts: “Unless the indexing is done not only *for* me, but on the basis of an intimate knowledge of my interests and requirements, the work cannot be guaranteed to identify what is important to me” (p. 101), and thus, “hunting will always be necessary” (p. 112).

Alberto Manguel quotes Archibald MacLeish, then Librarian of Congress, as saying, “The keepers, whether they wish so or not, cannot be neutral” (p. 108). He goes on to claim that:

Every library both embraces and rejects. Every library is by definition the result of choice, and necessarily limited in its scope. And every choice excludes another, the choice not made. The act of reading parallels endlessly the act of censorship. (p. 108)

This description aptly presents the fundamental problem of representation, as well as the predicament faced by those responsible to make representation decisions.

A representation excludes details which are present in the object which is being represented. A representation often describes an object using pieces of the whole, and in some cases uses subjective abstraction as well, such as metaphor, to describe the object. A representation is therefore not equivalent to the original object from which the representation was generated. Sontag opens her introduction to “A Barthes Reader” (Barthes, Sontag, 1983), by quoting Wallace Stevens (in a journal of 1899): “The best

poetry will be rhetorical criticism.” It may be appropriate to suggest that representation may be considered a type of poetry in this style.

O’Connor et al. (2008) discuss representation in terms of the perspectives and intentions of users and creators of representations, stating that “designing surrogates is like dancing with entropy, since the creator assumes to know something about the user and the user about the creator” (p. xix). These authors go on to assert, “Photographs help to make document representation issues more obvious because of the very different ways in which pictures and words work” (p. 93). The old adage that a picture is worth a thousand words may be true, but users and system designers must decide: “Which thousand words?” Figure 1 illustrates a representation of this concept.

O’Connor and Wyatt (2004) explore the idea that words are not parts of images, so while text documents can often easily be represented by portions of the same document, this is not true for images. Beebe (2006) states, “Describing pictures with words is like building trees with lumber” (p. vi). Representation of images is a fundamentally more complex problem than representation of text.

Chapter 2 includes an exploration of the literature, including further discussion of representation of text and representation of images.



## Image Search

Image search, or image retrieval, is distinct from text retrieval. Barthes (1977a) highlights a challenge unique to image search, asserting that “whatever the origin and destination of a message, the photograph is not simply a product or a channel but also an object endowed with structural autonomy” (p. 15), and existing separately from any textual description, made up of “lines, surfaces, and shades” (p. 16). Content based image retrieval refers to the extraction and use of primitive image features and will be discussed further in Chapter 2. One could even consider the even most concrete fact that images are structured data, literally composed of atoms and various qualities of photons, as opposed to words which can exist in non-physical, for example, aural space. This particular level of comparison is better covered in other documents; it is important but not a necessary part of this examination.

Barthes (1997a) asserts that the “special status of the photographic image” is based on the fact “it is a message without a code” (p. 17). He explores the complex relationship of denotative and connotative messages within the photograph. The problem incorporates and goes beyond the challenge of representation and the challenge of language. He explains:

The image – grasped immediately by an inner metalanguage, language, language itself – in actual fact has no denoted state, it is immersed for its very social existence in at least an initial layer of connotation, that of the categories of language. We know that every language takes up a position with regard to things, that is connotes reality, if only in dividing it up; the connotations of the photograph would thus coincide *grosso modo*, with the overall connotative planes of language. (p. 29)

He wonders if there even exists “a pure denotation, a *this-side of language*” (p. 30). It is this type of denotation, or image description, which would inform a certain type of image

representation, less concerned with user reaction and rather concerned with what is.

Barthes (1977b) considers the semiotics of images, and explores both denotative and connotative messages, explaining that connotative messages are based on denotative messages and exist within social, historical, and cultural contexts. He also poses a dichotomy of opposing opinions regarding images and the use of language:

“There are those who think that the image is an extremely rudimentary system in comparison with language and those who think that signification cannot exhaust the image’s ineffable richness.” In either case, it can be agreed that “pictures are not words and words are not native elements of photographs” (O’Connor and Wyatt, 2004, p. 107).

This concept is extended and perhaps also better illustrated by the Pryluck quote cited by Anderson and O’Connor (2009) in their discussion on the semiotic analysis of film:

“Images are not words. Shots are not sentences” (p. 31). It does not serve to regard or treat images as words.

O’Connor and Wyatt (2004) seek to understand the relationship of words and images and discuss the role of words in representing images and aiding image search:

To an external viewer, applying word descriptors to a verbal document and applying words to a photographic document appear to be the same sort of activity. However, they cannot be the same, since describing the word document is [or can be modeled as] an extraction process and there are [usually] no words to extract from the photograph. However, the words for describing the photographs come from some place. Let us propose this: words used to represent photographs are native elements of the verbal expression of a person’s engagement with the photograph. (p. 107)

O’Connor, O’Connor and Abbas (1999) assert that as such, “Extraction, translation, and generalization are not available for the representation of images in the way that they are for the representation of word-based documents” (p. 681). O’Connor et al. (2008) argue that the problem of representation becomes more obvious in the arena of photographs

and images, because while “the word document has easily discernable units and clusters of units of meaning” (p. 94), images do not. The question of ‘aboutness’ can be appreciated in a new dimension when related to image search, where words are not readily available to borrow from and repackage as they could be for text-based representation. Words can be very useful in describing certain types of images in certain ways, such as identifying an object within a photo, like a dog. Minsky (1986) points out that “the things we can express in words are, to a large extent, constrained by the social process through which we learn to use those words” (p. 84), thus introducing an additional layer of confusion. He goes further to suggest an even deeper problem: “Thoughts themselves are ambiguous!” (p. 207)

Greisdorf and O’Connor (2008) look ahead to the larger question of image retrieval and explain:

Because the attributes of an image are different from the attributes of a text-based document, the methods that are used for accessing, storing, and retrieving images, of necessity, must also be different... even if words are used. (p. 50)

Barthes (1977a) claims that the “structure of the photograph” is “in communication with at least one other structure, namely the text – title, caption, or article” (p. 16). This articulation distinguishes the image as an entity distinct from the entity of the text which may be related to the image, while allowing for the possibility that an analysis of the related text may support interpretation of an image. What exactly is this interaction?

Greisdorf and O’Connor (2008) suggest the scenario of an interior designer tasked with creating a harmonious yet not obviously thematic collection of photographs for a corporate headquarters (p. 146-151). This example demonstrates further considerations unique to images and image retrieval, as compared to text retrieval. A

collector of images, especially with such explicit purposes as in this example, is likely aware of the fact that people experience and interact with images differently than with text, and thus have likely developed unique approaches to the task of image collection. How might researchers find opportunities to improve image representation to serve these image tasks? Considering that a particular image may belong to a variety of collections, is there one best representation which integrates each potential context, perhaps even reconciling subjective, potentially conflicting contexts? Of course, even the user who needs only one image must navigate the special challenges unique to image search. This study seeks to explore which factors are relevant to image search.

#### Statement of Problem and Research Questions

Images are sometimes required to satisfy information needs. Image retrieval is still primarily based on text retrieval, and the process of online image search is not well understood. In order to better serve the needs of image seekers, we must understand: How do image seekers think about and attempt to resolve their image needs?

The problem is that the processes involved when a person is thinking about and looking for images are fundamentally not well understood. This lack of knowledge about the image search process may be responsible for false assumptions about image search, as well as resulting decisions about the design of image retrieval systems.

There are those who argue that because people are more comfortable with text-based search interfaces, retrieval system optimization should concentrate on this type of search (Kennedy, 2009). As users have only had access to this modality of search and have not been presented with other viable options, it is not valid to state that users are more comfortable with text-based search options. Until users have been exposed to

other ways of thinking about and approaching image search, preferences expressed for the status quo are not particularly informative.

It may be fair to say that a calculated or guessed level of current user comfort should not dictate future retrieval system design. More important is to understand how users actually do search and how they think they may optimally like to search. In order to close this knowledge gap, a common language may be helpful in exploring these issues. Then, a framework is necessary to explore the cognitive and practical aspects of online image search.

### Research Objectives

The objective of this study is to deepen the understanding of the factors of query formulation related to an online image search.

The primary question of this study is:

1. How do people think about images in the context of online image search?

Secondary questions include:

- 1.1 How do people intend to use images they are looking for?
- 1.2 How does a person know when they have found an image they want?
- 1.3 Which factors influence a person's experience of image search?

### Working Assumptions

In this study, three primary working assumptions are established and may inform interview questions:

1. The intended use of an image influences how a user conducts an image search.
2. The type of image query influences how a user conducts an image search.
3. Users may experience confusion about what makes an image search successful.



A selection of secondary working assumptions will not drive the interview but may result in additional questions which the researcher will incorporate at her discretion:

1. A user's personal background influences their image search, including their education, their writing ability, their knowledge of technology, and so on.
2. Each user experiences image search differently.

#### Significance of the Study

This study has far-reaching implications. Primarily, it will inform further research into the areas of image search and assist researchers in discovering clues which will aid in image retrieval system design. Developing insight into questions of how users think about and use images, how they recognize an image they want, and what frustrates them about image search, will assist researchers and system designers in developing systems which better meet user needs.

Secondarily, it will explore:

1. How users use images.
2. How users interact with image search.
3. Improvements to the user's experience of image search.

## CHAPTER 2

### REVIEW OF LITERATURE

This chapter begins by exploring the broad issues of information seeking behavior, representation, query formulation, and image retrieval. In particular, the chapter includes discussions exploring theories of behavior, the effects of digital technology on information retrieval, query formulation as information seeking behavior, representation in image retrieval versus text-based retrieval, key challenges of image retrieval, and special considerations for image retrieval system design.

#### Information Seeking Behavior

There are a number of theories of information seeking behavior, all drawing from different fields to contribute to the interdisciplinary nature of information science.

Nicholas Belkin

Belkin et al. (1982) describe user seeking behavior using his ASK model, and the concept of an “anomalous state of knowledge” which a user may or may not recognize, decide to act upon, and transform into an expressed request (see Figure 3). In this model, a user may become aware of an information need, which may then be transformed into a verbalization of the information need and then further transformed into an information query. The existence of these phases also serves to define transition points between neighboring phases. Each of these transitions, such as that from a realization of need to a request, is also a new opportunity for increased complexity to arise. If the user chooses to pursue a resolution to her information need, then she may approach some type of retrieval system, such a digital information retrieval system, an

information professional, such as a reference librarian, or even her social and professional networks.

As a user's anomalous state of knowledge can be translated into a query which can be interpreted by an information retrieval system, likewise, the information which would satisfy the user's need exists at varying levels of complexity. It is the representation which the retrieval system will attempt to match with the user's query. When the system returns matches to a query, the user may evaluate the relevance of these matches in terms of resolving the ambiguous state of knowledge. In this step, the user operates once again on the more abstract level and evaluates how well the information to which a representation points matches their own internal information need, and the higher level cognitive interaction takes place initial cognitive state and the cognitive state of the user with the new information. Meanwhile, the process which information retrieval systems facilitate is of an interaction between information queries, or representations of the user's state of knowledge, and representations of the knowledge contained within textual, visual, or multimedia forms of information, as created by someone who creates representations for the user

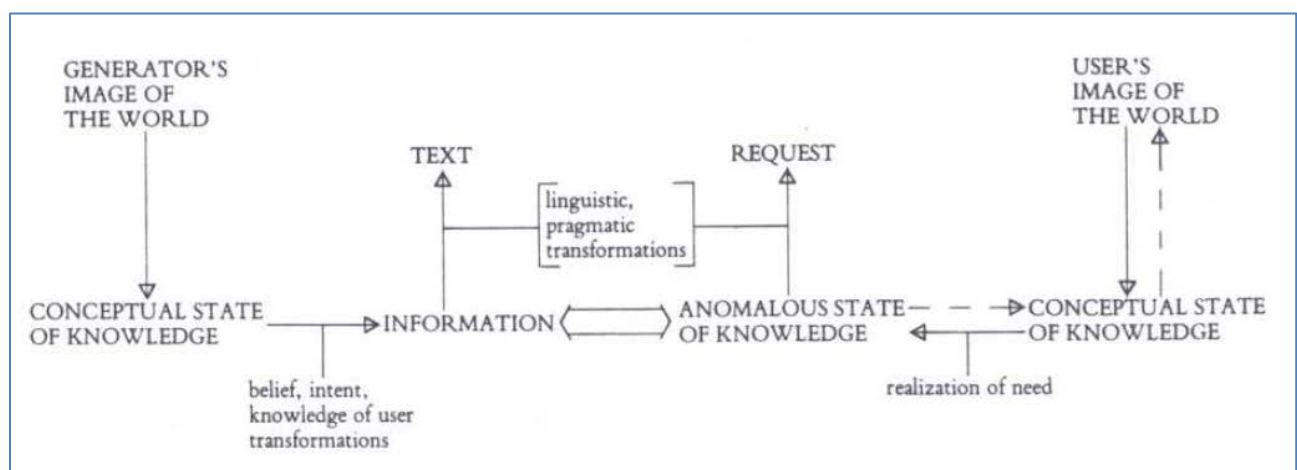
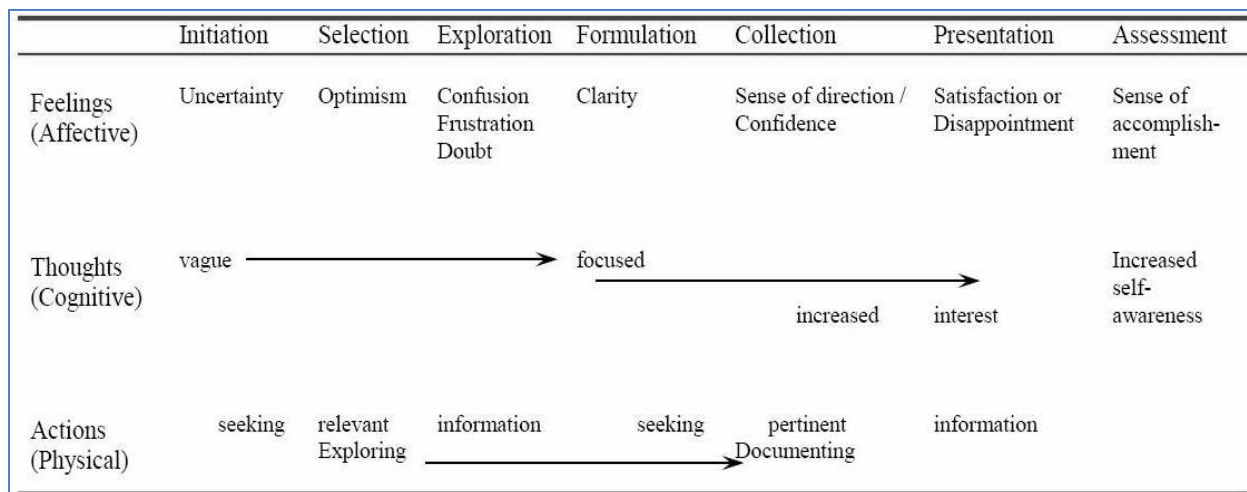


Figure 3. Belkin's ASK model (Belkin et al., 1982, p. 65).

Carol Kuhlthau

Kuhlthau (1991) presents her information search process as a holistic examination of information seeking behavior. She distinguishes six stages of the process: initiation, selection, exploration, formulation, collection, and presentation (see Figure 4).



*Figure 4.* Kuhlthau's information search process (Retrieved from Carol Collier Kuhlthau: Information Search Process, [http://comminfo.rutgers.edu/~kuhlthau/information\\_search\\_process.htm](http://comminfo.rutgers.edu/~kuhlthau/information_search_process.htm)).

Kuhlthau (2004) explains that the acquisition of new information generally leads people to more confusion, initially, in contrast to the “axiom that information reduces uncertainty” (p. 233). However, as the user continues through the process, through initiation, selection, and exploration, it is at the stage of query formulation where a turning point comes and that uncertainty begins to diminish (Kuhlthau, 1991, p. 367). At that point, a user can continue on to the more observable behaviors of collecting, presenting, and assessing potential resources.

Kuhlthau (2004) goes on to suggest that informed information professionals

could guide users through the six stages of her model and thereby efficiently focus their efforts on areas where they can be optimally supportive, in order to get to the desired “no anxiety” end state. She asserts that as this model attempts to describe common experiences that all users share, it “offers an articulation of [these] common experiences which, when shared by the user, the intermediary, and the system, may provide a basis for interaction” (Kuhlthau, 1991, p. 370).

The existing retrieval system, Kuhlthau (1991) claims, “does not recognize different problem states” and would benefit users by if they were “made more proficient at accommodating a range of tasks” (pp. 369-370). She asserts that information services and systems can improve based on an understanding of her model by being sensitive to a user’s affective symptoms of anxiety and uncertainty by providing appropriate support. She cites Vygotsky’s zone of intervention to be used in assessing when an offer of assistance is most needed and will be most effective (Kuhlthau, 2004, p. 233).

Tom Wilson

T. D. Wilson (2006) asserts that the existence of an information need will not necessarily lead to information seeking behavior and emphasizes the importance of understanding which needs do lead to such behavior. He claims that understanding the user within a larger context informed by information seeking behavior may help shift the focus onto the more holistic view of the user and the role of information in her life, or even in a particular use case. This type of shift allows information professionals to better address more fundamental user needs by developing an understanding of why the user is looking for information (see Figure 5).

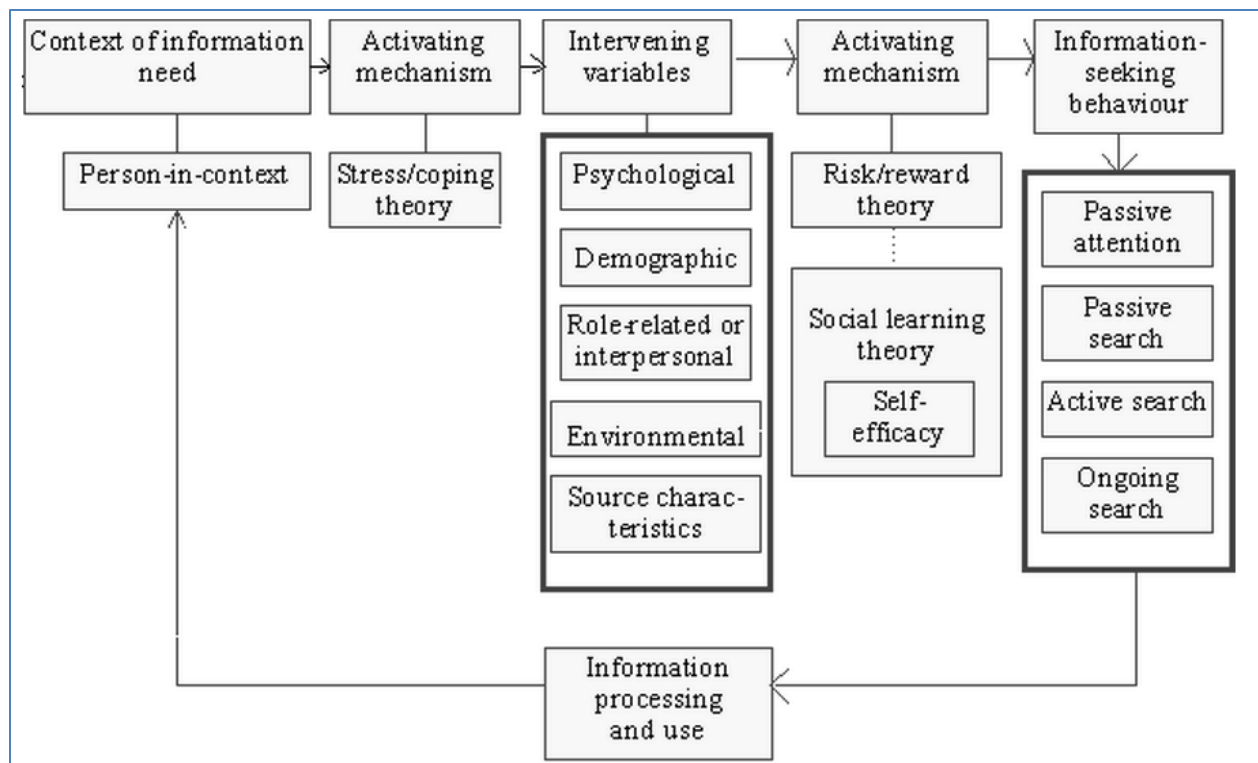


Figure 5. T. D. Wilson's revised general model of information behavior (T. D. Wilson, Walsh, & British Library, 1996, Ch. 7.1).

In this revised model, Wilson integrates material from an extensive review of information science research. He explains that:

Although the situation in which the initial need for information arises has occasioned the investigation of a number of variables in various studies, the situation within which the information is found and processed appears to have been given less analysis and, perhaps particularly in respect of the role of computers in information-seeking, may be of some significance. (Ch. 7.2)

Of particular interest, Wilson also identifies potential barriers to the information seeking process within this model, explaining that “the barriers, particularly those at the level of the person, may act to prevent the initial emergence of a coping strategy, or may intervene between the acquisition of the information and its use” (Ch. 4).

Brenda Dervin

Dervin (1992) introduced her sense-making model as an approach to help

researchers understand how users construct meaning, or make sense of their worlds (p. 67). This model can be applied to situations involving communication. Her metaphor includes the concept that a user moves through life one step at a time, exhibiting behavior at each step. The interaction between (1) a user's current situation, (2) what they want to be able to do, and (3) the gap between where they are and where they want to be form a triangle of sorts, around which a user may be said to be "circling the experience" and potentially making sense of that moment and experience. When an individual encounters a gap, it both halts the momentum of their sense-making journey and presents them with a challenge.

Figure 6 shows the sense making metaphor in its latest iteration. In interpreting and using the model, Dervin suggests that one "assume a moment of discontinuity in which step-taking turns from free-flowing journey to stop" (p. 68). She further suggests:

Determine how the individual interprets and bridges this moment; what strategy he or she used to define the situation which was the gap; how he or she conceptualized the discontinuity as gap and the bridge across it; how he or she moved tactically to bridge the gap; how he or she proceeded with the journey after crossing the bridge. (pp. 68-69)

This metaphor is intended to help describe all behaviors surrounding the information seeking person, including the circumstantial reasoning for why the need for information seeking arose in the first place – a gap.

Dervin (1992) also questions the fact that at the time, most thinking about information seeking behavior was based on a perspective of information use from the perspective of the researcher, rather than of the individual user. She suggests that systems are "predicated on the idea that the system is the essential order and the person/user bends to it rather than the other way around" (p. 64). Dervin advocates for

considering a different paradigm that may address many of the issues that researcher-oriented studies fail to resolve.

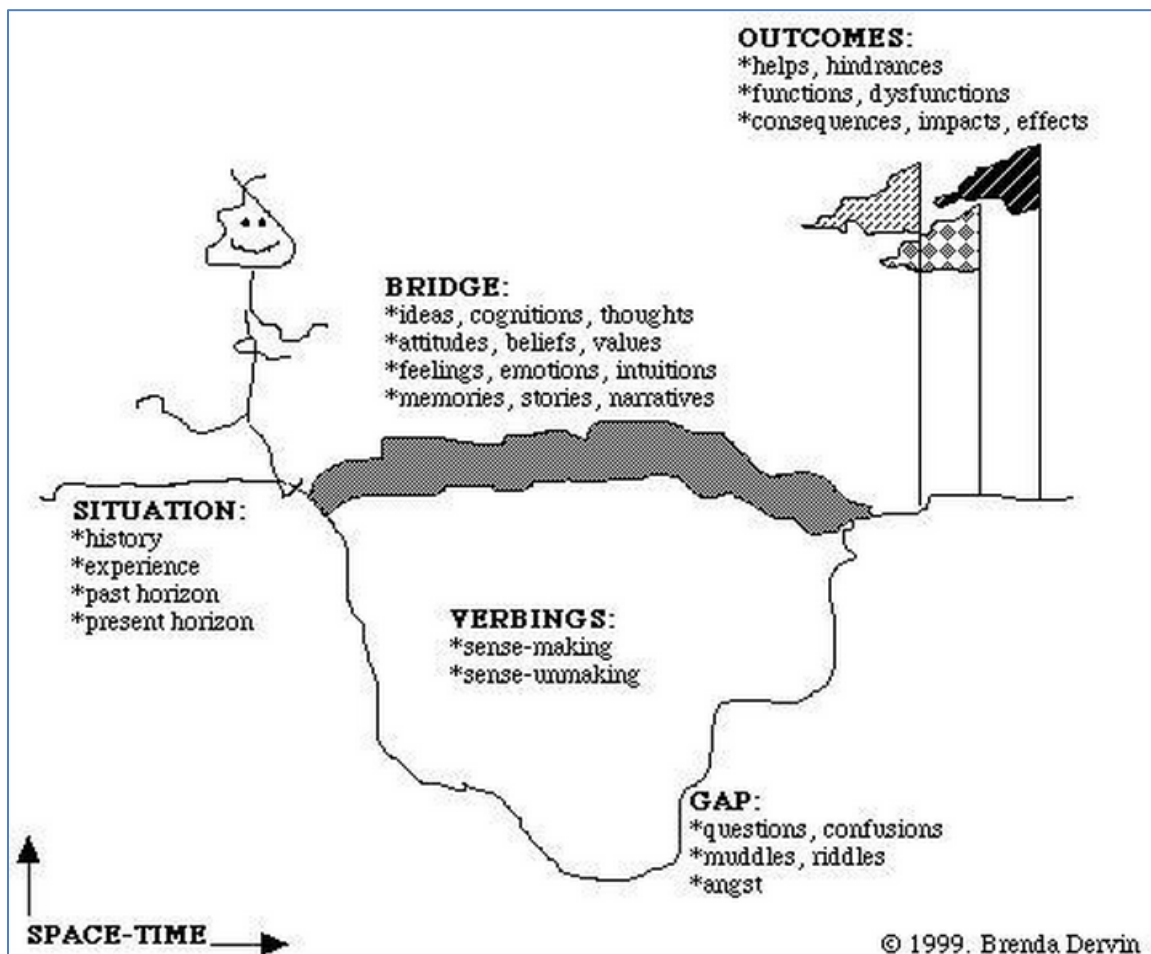


Figure 6. Dervin's sense-making metaphor (Dervin, 2003, pp. 269-292).

This model includes the metaphor of a bridge which a user builds within a process of overcoming the conceptual gap and continuing on her journey.

In recognizing the importance of considering the individual user's ideas, emotions, intuitions, and memories, for example, she oriented researchers toward a more user-centric approach. She considers that a new step "may be repetition of a past behavior, but it is always theoretically a new step because it occurs at a new moment in time-space" (p. 68).



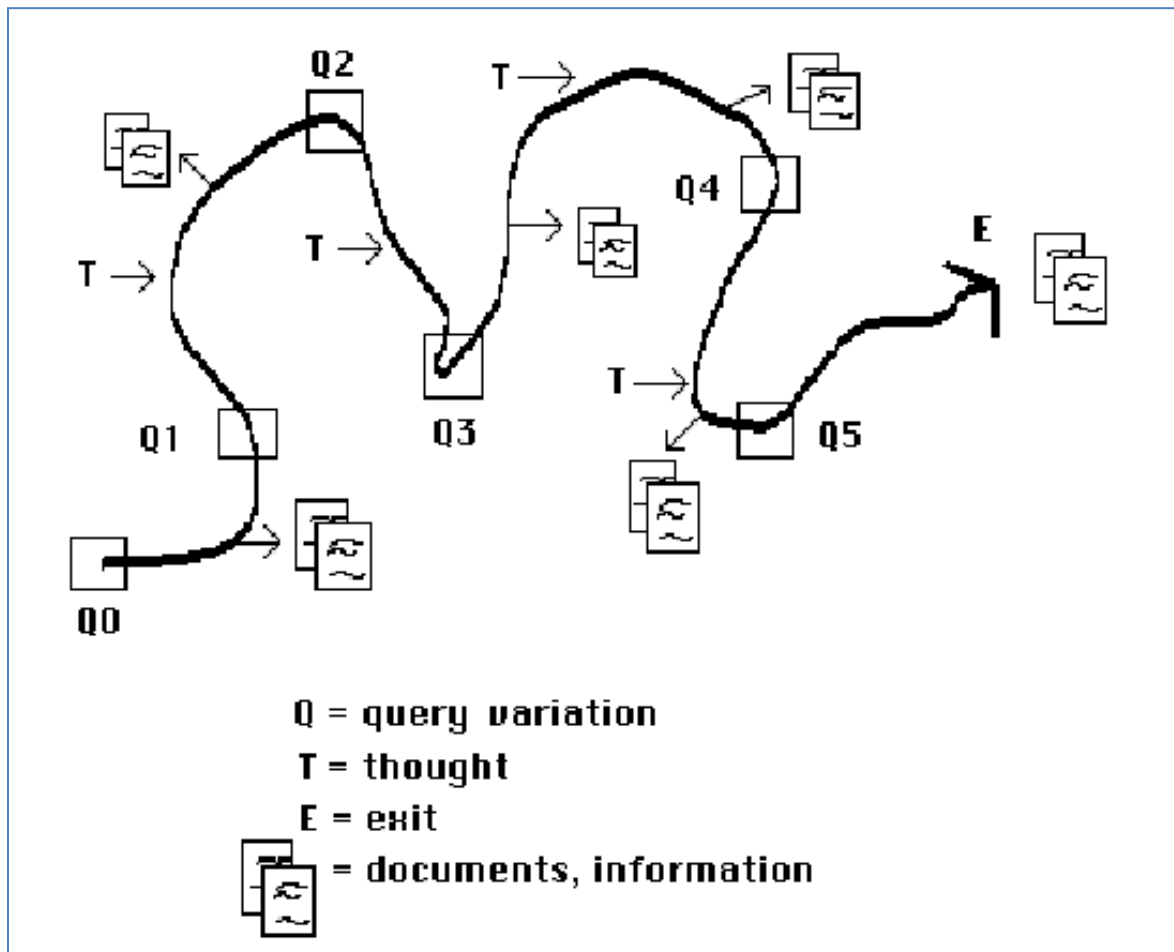
Marcia Bates

Bates (1989) argues that previous models of information seeking behavior were idealistic rather than based on how human searching actually occurs. She describes the classic model of retrieval as consisting of linear relationships between a document and its document representation and an information need to a query. In the middle is a match, ostensibly to signify that success happens when a user has successfully molded a query to align with the representations of the system. Bates suggests a model truer to human experience which addresses issues of the nature of the query, the nature of the overall search process, the range of search techniques used, and information “domain” or territory where the search is conducted” (p. 408). She introduces the concept of an “evolving search,” or a search where:

Each new piece of information they encounter gives them new ideas and directions to follow, and consequently, a new conception of the query. At each stage they are not just modifying the search terms used in order to get a better match for a single query. Rather the query itself (as well as the search terms used) is continually shifting, in part or whole. (p. 408)

Bates discusses the information seeking behavior she describes as *berrypicking*, distinct from what the layperson may consider *browsing*, and which is connected to a query which evolves over time (see Figure 7). O’Connor, Copeland, and Kearns (2003) explain that in Bates’ model, if one “berrypick” is not successful in answering the original question, then “the question has inevitably been changed by the new knowledge, and an evolving question is prompted” (p. 130). Bates (1989) further clarifies that “the query is satisfied not by a single final retrieved set, but by a series of selections of individual references and bits of information at each stage of the ever-modifying search” (p. 408). The primary difference between this model and the traditional model is a shift in focus

from “the match between the document and the query” to “the sequence of searcher behaviors” (Bates, 1989, p. 409).

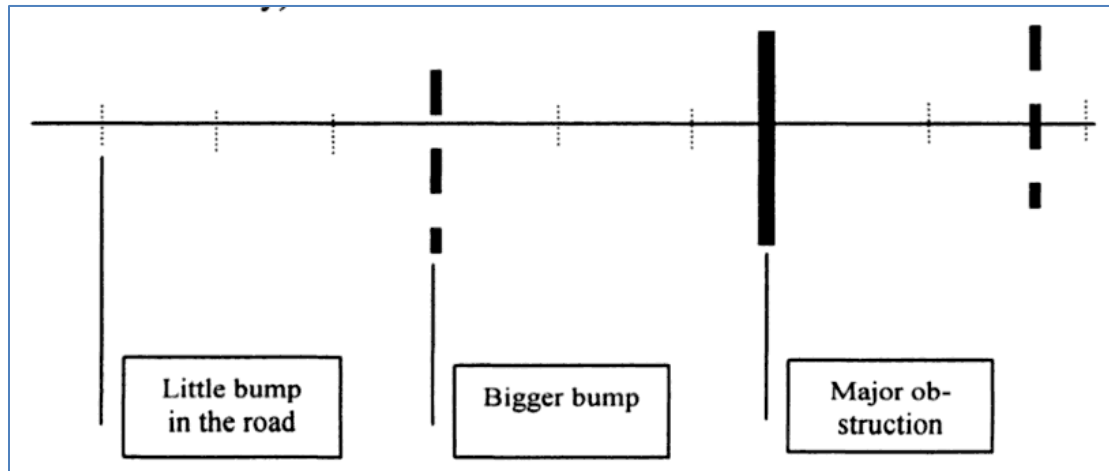


*Figure 7. Bates' berrypicking, evolving search (Bates, 1989, p. 411).*

Promoting an understanding of such behaviors may encourage information system designers to build interfaces which support this model of information seeking, including user-friendly interfaces which contain “rich scenes, full of potential objects of interest, that the eye can take in at once” (Bates, 2007, Implications for Information System Design section, para. 3). It is possible that many systems currently fall short of aiding the user in the process of query formulation, expecting users to simply appear with their formulated query on hand and in a language compatible with the system.

Brian O'Connor

O'Connor, Copeland, and Kearns (2003) developed a visualization of the road of life as a foundational model of information seeking behavior. This illustration demonstrates three differently sized bumps which correspond to differently complex information need cases (see Figure 8).



*Figure 8.* O'Connor's bumps on the road of life (O'Connor, Copeland, & Kearns, 2003, p. 9).

These authors describe that “little bumps along the paths of the journeys of our lives are handled by the evolved and learned capabilities” (p. 8). Larger bumps may “require thinking back to a learned but not frequently used ability or to a known source of help that is not immediately at hand” (p. 8). A major obstruction is one which presents an even more significant and complex challenge to the individual, such as when being faced with the decision to move to another country, for example. This model accounts for information seeking behavior that transcends “the realm of recorded documents” (p. 10) and is rather concerned with the bumps in the road themselves than singularly with the corresponding user reactions and changes in knowledge state.

The same authors later describe the development of their emerging model of

engineering design activity, as originated by Copeland (1977). (This model is discussed in more detail in the following chapter.) The overview of the model is shown in Figure 9. O'Connor, Copeland, and Kearns then created first-, second-, and third-level elaboration models depicting what increasingly complex information searches may involve. Figure 10 shows a first-level elaboration, where various types of collaboration are possible in a simpler information search. Figure 11 shows a second-level elaboration, which is more complex and includes multiple search threads and the interactive response a user experiences with each thread. Figure 12 shows a third-level elaboration which is nonlinear, including many changes of course and more iteration than the previous elaborations.

Both the foundational model and the engineering design models offered by O'Connor et al. represent an attempt at describing circumstances of information seeking behavior. The latter does not claim to be exhaustive but rather demonstrative of the possibilities which the engineering design model can accommodate.

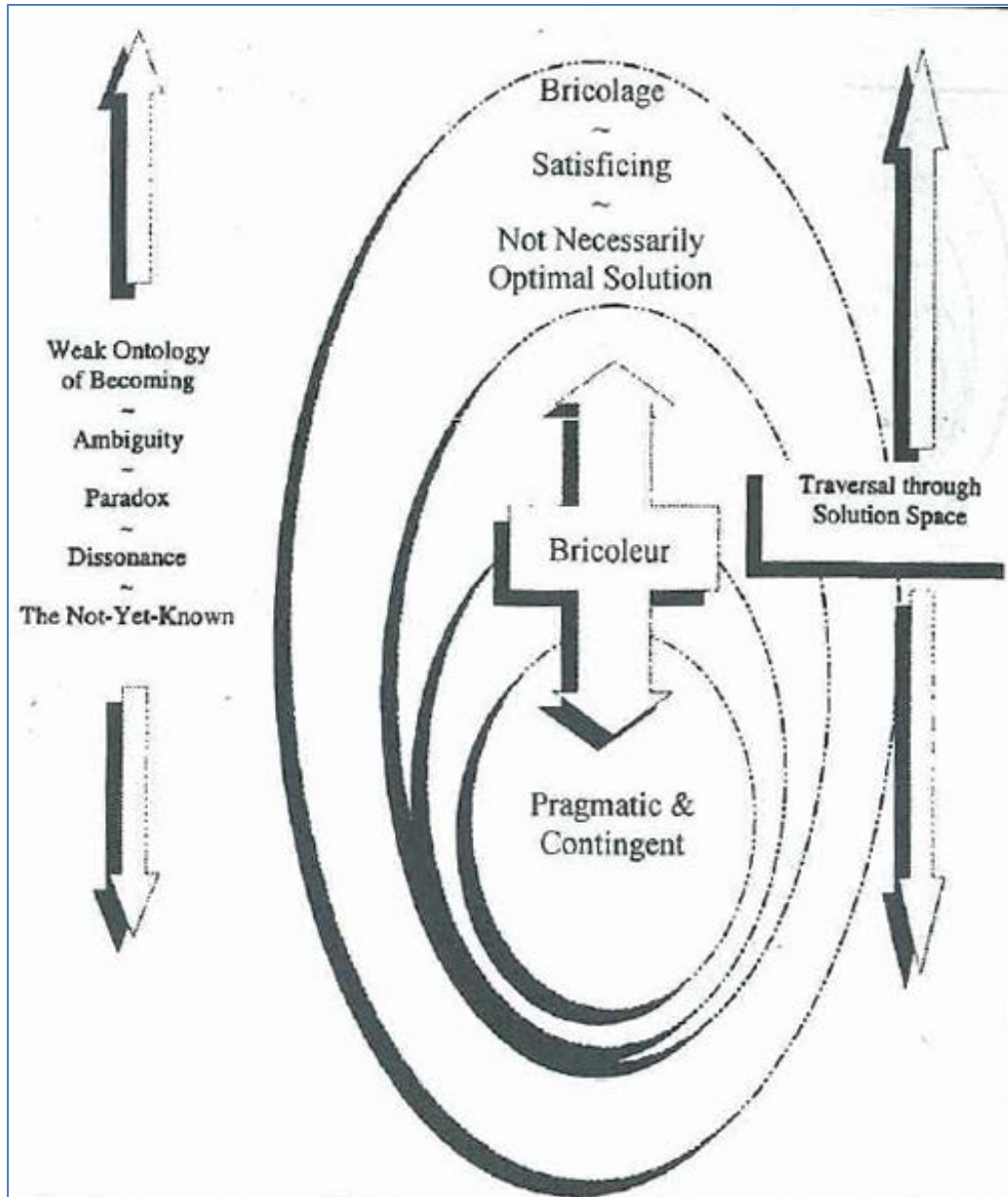


Figure 9. Nondeterministic model of engineering design activity, from Copeland (O'Connor, Copeland, & Kearns, 2003, p. 141).

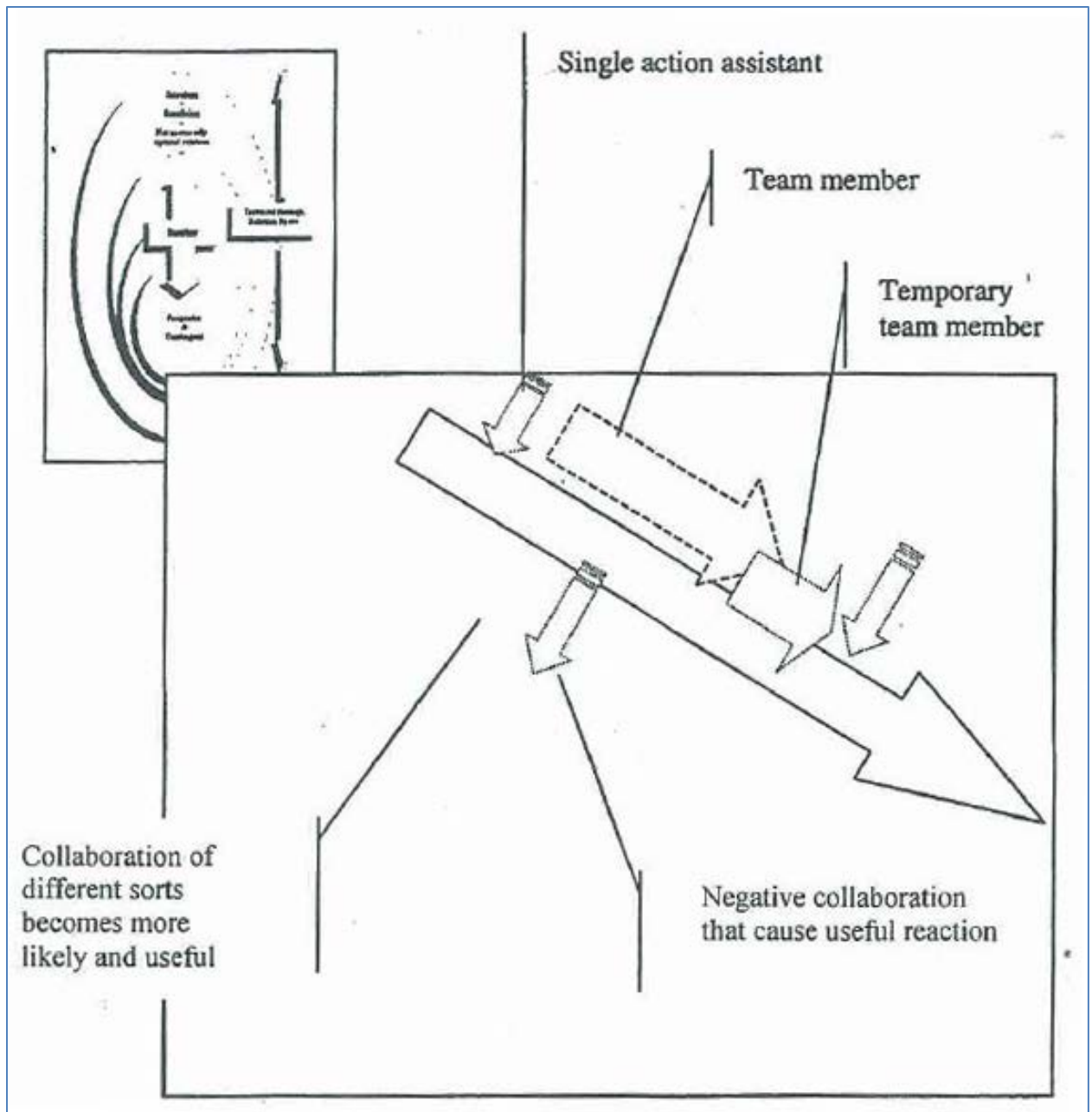


Figure 10. First-level elaboration (O'Connor, Copeland, & Kearns, 2003, p. 142).

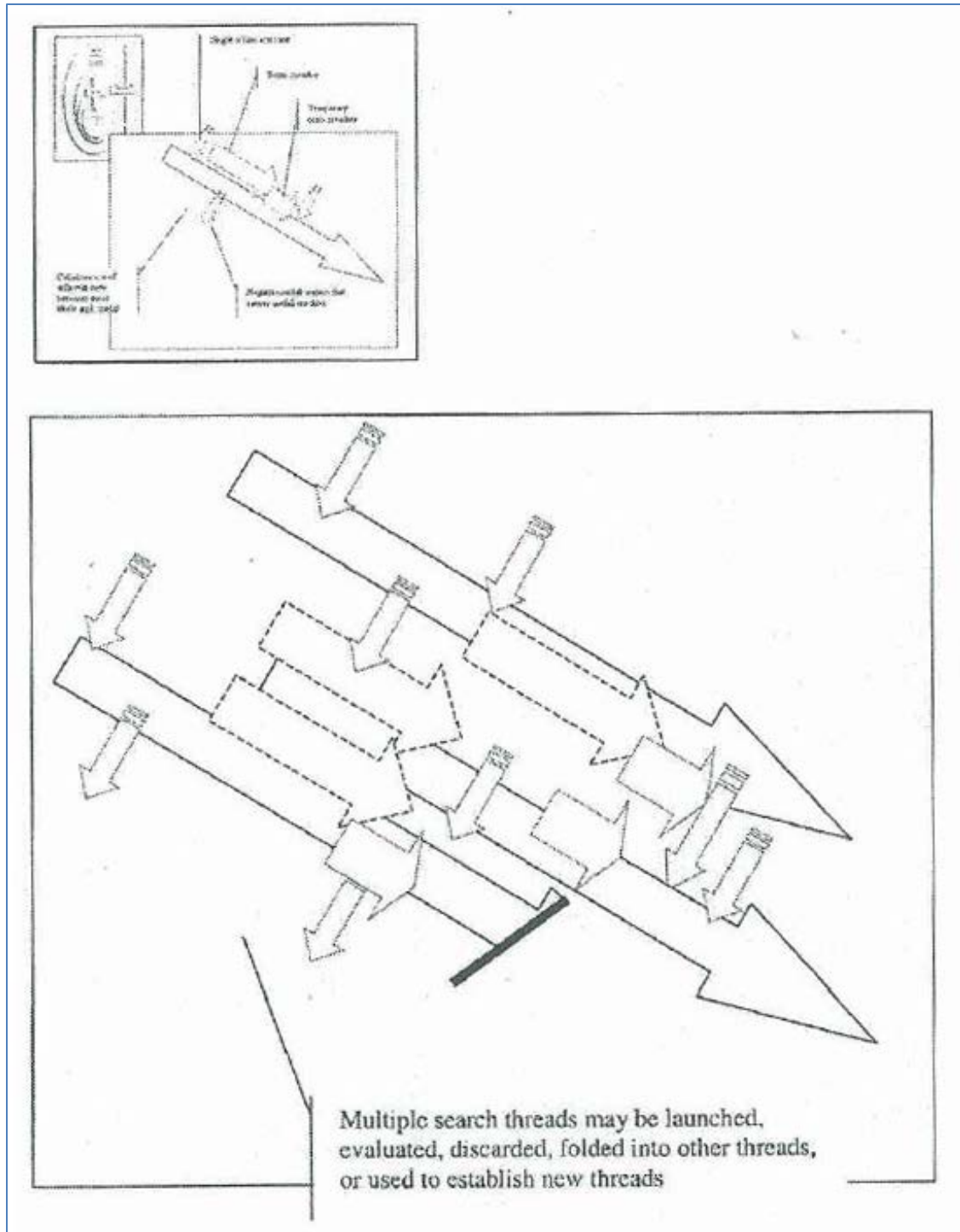


Figure 11. Second-level elaboration (O'Connor, Copeland, & Kearns, 2003, p. 143).

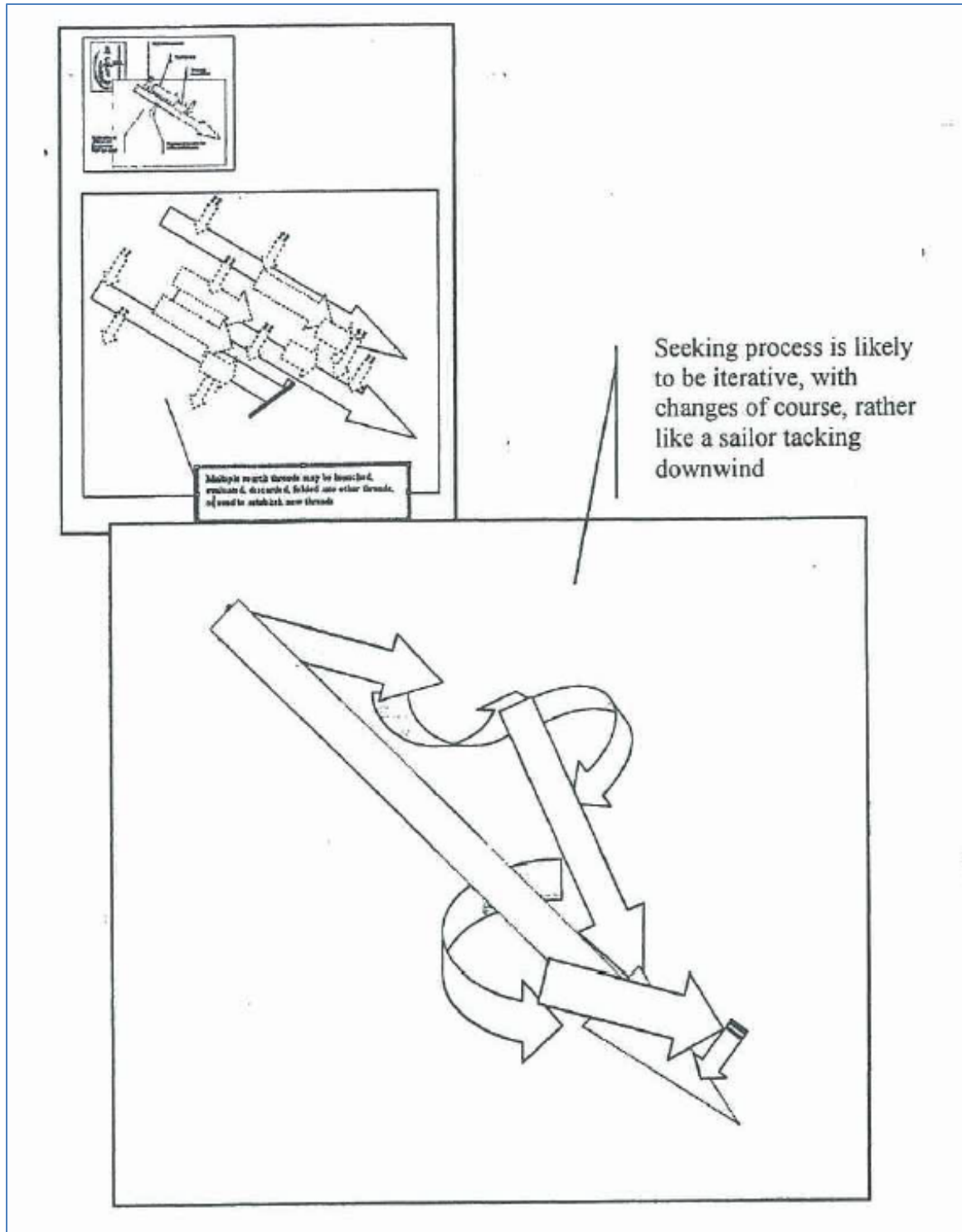


Figure 12. Third-level elaboration (O'Connor, Copeland, & Kearns, 2003, p. 144).



## Behavior Analysis

Skinner (1953) asserts that models such as those by Belkin and Kuhlthau which are concerned with measures of “knowledge states” and “anxiety” are examples of how “the practice of looking inside the organism for an explanation of behavior has tended to obscure the variables which are immediately available for scientific analysis” (p. 31).

Chiesa (1994) writes as a proponent of Skinner’s work and radical behaviorism about how to ask questions about behavior in the context of scientific study. She evaluates a variety of theoretical approaches to the study of human behavior and asserts that the ubiquitous concepts of the normal distribution and the test of statistical significance in contemporary psychology contradict the biological concept that “variation is far from being an undesirable deviation” and is rather “the raw material for selection and evolution” (p. 72). She asserts that “the task of science is to account for variation, to seek out the order in variability rather than to silence it,” explaining that “before the development of experimental control, aspects of the physical universe that are now the subject matter of physics, biology, and chemistry also seemed infinitely variable” (p. 82).

She quotes Sidman (1960) as arguing that “if we take intrinsic variability as a starting point, we are led to develop methods that mathematically control variability and in doing so, close off the possibility of finding further order” (p. 83). She explains that in contrast, “radical behaviorists take order as their starting point” (p. 83), and quotes Skinner as explaining science as “a search for order” (Skinner, 1959, p. 369). Chiesa asserts that the radical behaviorist asks, “Of what is this variability a function?” and views variability as “[guiding] the scientist toward greater refinement of techniques for gaining control over the multitude of factors influencing a situation” (p. 84). Sidman

(1960) goes so far as to suggest that “the process of systematically tracking down sources of variability, and thus explaining variable data is characteristic of the scientific enterprise” (p. 192).

Anderson (2006) argues that Patrick Wilson and Skinner share a tradition of pragmatism in their studying and thinking about human behavior (pp. 13-17). Skinner (1953) asserts that the most interesting behavior is that “which has some effect upon the surrounding world” (p. 59). He suggests that “the consequences of behavior may ‘feed back’ into the organism,” thus influencing “the probability that the behavior which produced them will occur again” (p. 59). The principles of behavior analysis consider human behavior in terms of which behaviors may be observed and measured. As such, there is an emphasis placed on the ability to measure observable behavior, and methods within this field share this goal in their attempts to describe human behavior. The concept of operant behavior is central.

### Operant Behavior

Anderson (2006) explains that “behavioral processes, such as reinforcement, punishment, and extinction, function to change the frequency of the occurrence of a given behavior in a given circumstance” (p. 37). He goes on to explain:

Operant behavior is behavior that is selected by the events or consequences that follow an instance of a behavior. If the behavior in question increases in rate or probability, the consequence is considered a reinforcer. If the consequence that follows the instance of behavior decreases the rate of the behavior of interest or the probability of future occurrence of the behavior of interest, then the consequence is considered to be a punisher. Once a particular stimulus or consequence has acquired behavioral function (e.g., as a reinforcer or punisher), then a contingency emerges between the behavior of interest and the consequence. It is not necessary for the consequence to occur every time the behavior of interest occurs to maintain the contingency between the behavior of interest and the consequent stimulus. The frequency at which the consequent stimulus is delivered following the behavior of interest is the schedule of

reinforcement. Extinction is the process of breaking a contingency by removing the contingent relationship between the consequent stimulus and the behavior of interest. (pp. 37-38)

Skinner (1953) further explains that “a response which has already occurred cannot, of course, be predicted or controlled. We can only predict that *similar* responses will occur in the future” (p. 64). He points out that “operants grow strong because they are followed by important consequences” (p. 90). Note that the strength of the operant is unrelated to the function of the operant, namely reinforcement, punishment, or extinction.

It is possible to analyze the image seeking behavior of humans in terms of their operant behaviors and in the context of their individual environments. Such study may provide insight into why certain image seeking behaviors develop or extinguish, and why and how users differ in their image seeking behaviors. Chiesa (1994) explains that because “behavior is functionally related to events in the context in which it occurs, then change can be achieved by analyzing those relations and altering aspects of the context” (p. 208). The power to create both more successful searches and more successful searchers may lie in the informed manipulation of the initial image searching environment and the subsequent image search results.

#### Behavior Analysis Information Seeking

As shown in Table 1, Anderson describes models from several major thinkers of information seeking behavior in terms of a behavior analysis antecedent-behavior-consequence (ABC) three-term contingency framework (personal correspondence, December 23, 2011).

Table 1

*Information Seeking Models in Behavior Analysis Framework*

Model	A	B	C
Belkin	ASK	Information Seeking Behavior	No ASK
Kuhlthau	Anxiety	Information Seeking Behavior	No Anxiety
T. Wilson	Need	Information Behavior	Use
Dervin	Gap	Sense-making Behavior	Use
Bates	Need	Berrypicking / Evolving Behavior	Clarified Query, Need Resolution
P. Wilson	Need	Use	!
O'Connor Kearns Anderson	SD, SR, EO (Information)	Behavior	Consequence (Information)

If a researcher wished to apply techniques of behavior analysis to study one of these models of information seeking, then they may frame it in terms of these ABCs. As discussed earlier in this chapter, behavior analysts are most concerned with studying observable behavior and determining which measures may be most appropriate to study. From this table it can be determined that some of the C-consequent states described here cannot be measured in this way, as they refer to internal, and thus non-observable behaviors. In particular, this applies to the first two theories – Belkin’s no ASK state and Kuhlthau’s no anxiety state.

In the case of O'Connor, Kearns, and Anderson (2008), the antecedent in their model is consistent with the understanding of antecedent conditions in the field of behavior analysis – namely, consisting of discriminative stimuli (SD), reinforcers (SR), and establishing operations (EO). Anderson (2006) explains that a “discriminative stimuli is a stimulus that occasions a particular response and is correlated with reinforcement” (p. 54). A reinforcer is a type of consequence which follows an operant behavior and increases the probability that the behavior will occur. The presence of a reinforcer in a person’s environment may also act as an antecedent for their future behavior. An establishing operation is a stimulus which exists in an antecedent space and may influence behavior by affecting the effectiveness of reinforcers but without directly being reinforcers themselves (Michael, 1982). The application of these concepts and the three-term ABC contingency from behavior analysis to the study of information seeking behavior is introduced by Anderson (2006) and his evolving model of functional ontology construction (FOC). His work provides a “formal calculus to talk about relationships between the individual and the informing environment” (Anderson, personal communication, December 23, 2011). This FOC model is discussed at greater length in the following chapters and explored in terms of its efficacy in understanding information seeking behavior.

### Representation in Information Science

Representation is a core issue of information science, spanning the scope of questions within the field. In theory, representations simplify the search process by acting as concise surrogates for the real objects in a given search. The representation may also exist in order to shed light on what the object of representation is really *about*.

As such, for as many interpretations of *aboutness* there may be, there may also be multiple representations of any given concept.

P. Wilson (1968) refers to the concept of aboutness as the *subject* of a document. He writes of the *text* as being no physical object, whereas its expressions, which can be many, are “quasi-permanent representation[s] of the text” (p. 7). Even memories may be considered bibliographical objects, or representations, and as such, are still referring to more complex aboutness. Wilson asserts that if knowledge is power, then the power to obtain knowledge as representation is a power over power.

Aboutness is discussed by Hutchins (1977) as one of the most crucial problems of information science. He describes layers of document aboutness, from the level of sentence structure, to semantics, to document structure, to the presupposed states of knowledge of both the document producers and those to whom these documents would be relevant. Even in the case that an indexer accurately presupposes the knowledge-state of a user, including their needs, it is not clear how the indexer will best represent a given document for that user. Furthermore, in the case that it is possible to create a document representation ideal for one particular user at a particular time, corresponding to one particular knowledge-state, this representation will not necessarily be optimal for other users or even for that same user at a different time or in a different knowledge-state. Similarly, P. Wilson (1973) writes on the issue of situational relevance, asserting that a specific representation may be differently relevant, depending on each individual user and the individual’s current situation.

Maron (1977) describes three types of aboutness –subjective, objective, and retrieval aboutness. Objective aboutness is “obtained by considering an external or

observer's point of view" (p. 41), subjective aboutness refers to the "relationship between a document and the resulting inner experience of its readers" (p. 41), and retrieval aboutness refers to "the information searching behavior of a class of individuals" (p. 41). This characterization emphasizes the central role of aboutness in the process of indexing and retrieval. The type of aboutness to which indexing in a particular scenario corresponds may reveal biases of the indexers about which type of aboutness they find to be most relevant in that situation.

O'Connor (1996) describes aboutness as "extra-descriptive" (p. 147):

Aboutness is the term we use to distinguish functional representation from mere description or application of a topic. ... It goes beyond that to include 'what this means to me.' Aboutness is the behavioral reaction of a person to a document. Each patron may have a different experience with the same document. (p. 147)

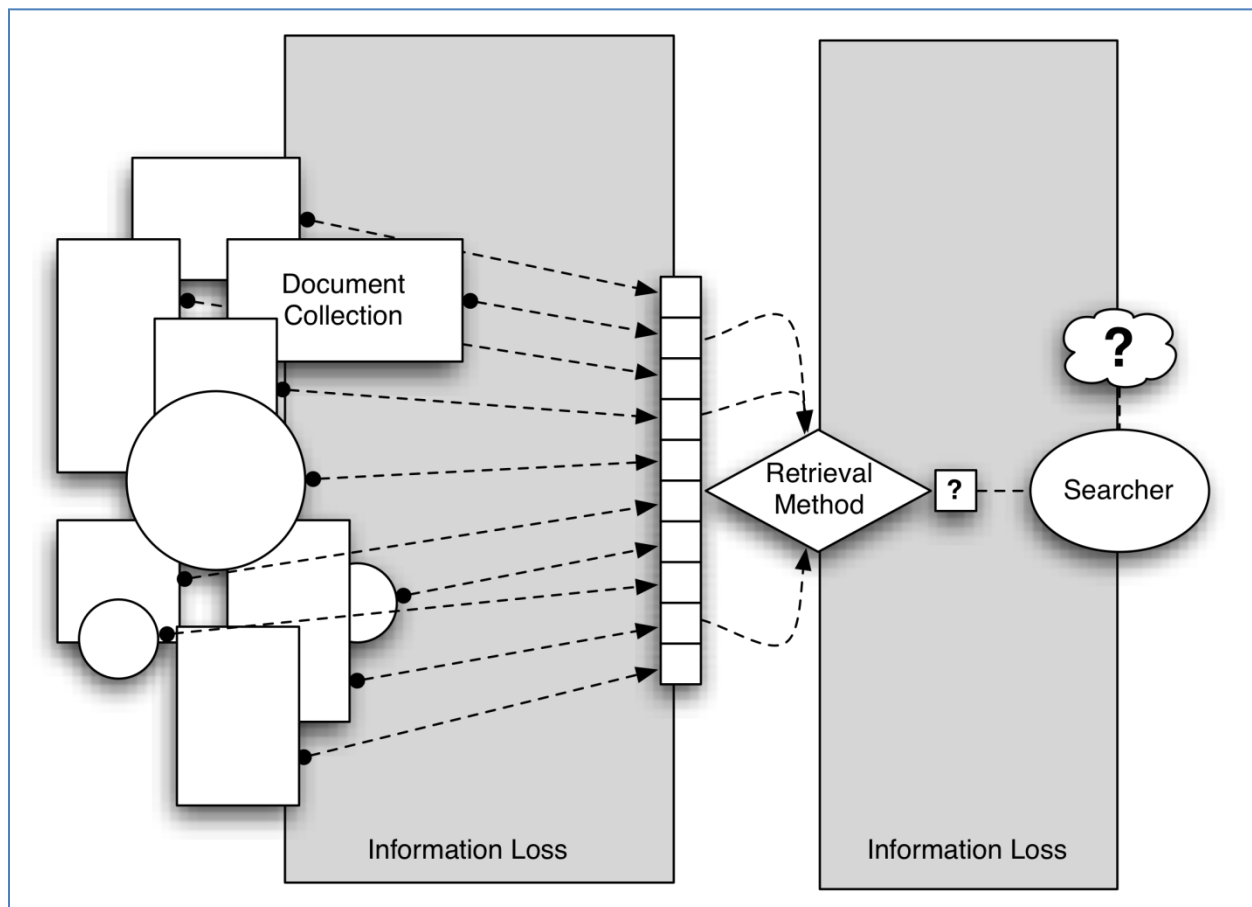
The question of "what that means to me" is one without a well-researched answer.

Much of what may comprise this type of aboutness is of an intangible nature and may therefore be especially difficult to ascertain.

Buckland (1991b) discusses the nature of knowledge as intangible and distinguishes its physical expressions, descriptions, or representations as tangible forms which are "the only form of information with which information systems can deal directly" (p. 54). He refers to these representations as "information-as-thing," one of several types of information he identifies. He emphasizes that systems are necessarily based on physical representations of knowledge, rather than on the knowledge itself (Buckland, 1991a). It is only with the tangible "information-as-thing" which information professionals may actually do anything.

Smiraglia (2007) asserts that knowledge representation plays a key role in information science, both conceptually and in application. Knowledge organization

requires that one has at least a conceptual understanding of a document's aboutness, whether that understanding is recorded or not. Information retrieval, however, requires that the understanding of aboutness is recorded into a physical expression, or representation of some form.



*Figure 13.* Information loss, designed by Rich Anderson (O'Connor et al., 2008, p. 3).

P. Wilson, (1968) points out that “what is not said may interest us more than what is said” (p. 18). Representation is in fact a loss of information (O'Connor & O'Connor, 1998), yet representation is a necessity of information retrieval. As Figure 13 illustrates, in the practice of information retrieval, there are several opportunities for information loss. By whichever methods a representation is created, this loss of information acts as an impediment for a user seeking relevant information. Considering the need to create

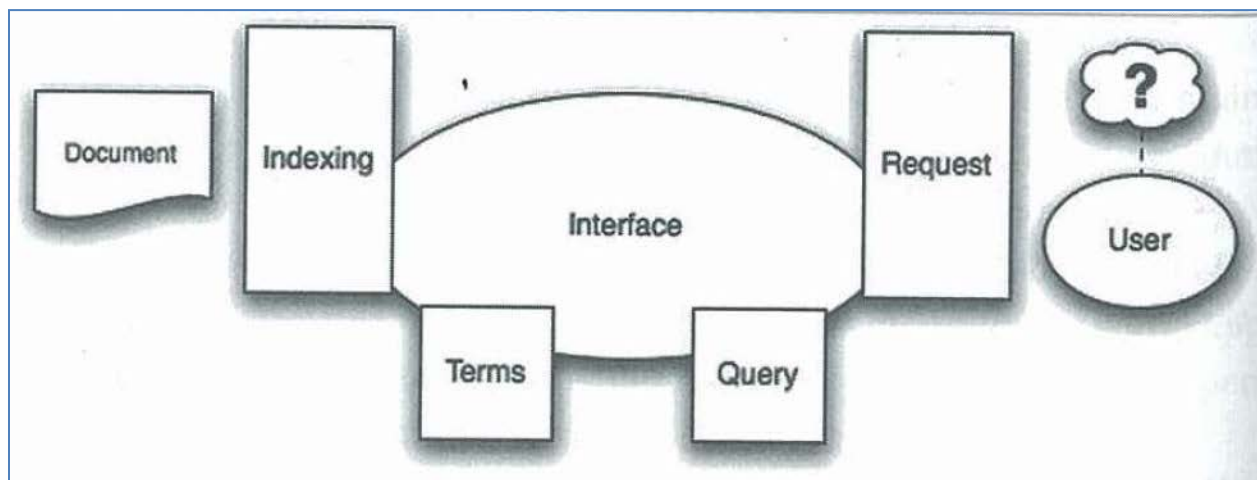


representations which could be appropriate for each potential user and each possible situation, and then to help interpret those representations as per the situation, attention to the concept of representation in information science is necessary and still incomplete.

### **Representation in Information Retrieval**

The needs and challenges associated with representation may vary based on the particular circumstances of an individual image search. Information retrieval is about a specific user, a specific need, and a specific set of circumstances. O'Connor, Kearns, and Anderson (2008) claim the “research literature suggests that inappropriate representation results in failed searches a significant number of times, perhaps even in a majority of cases” (p. xi). Conway (2010) describes his study of expert users of image archives at the Library of Congress and reports:

Few found any value in the subject catalog terms assigned by librarians. It is possible that expertise and experience, combined with a deep engagement with producing a tangible product, obviates the value of subject classification. Future studies of the actual use of digitized photographs should explore the role played by subject classification of individual items in augmenting the user experience. (p. 459)



*Figure 14.* Schematic of a retrieval system (O'Connor et al., 2008, p. 6).

Figure 14 shows a “traditional conceptual schematic of an information retrieval system”

which could also be described as a “complex web of relations between a user and a document” (O’Connor, 1996, p. 6). This illustration demonstrates several layers of representation between a user and a relevant document. Indexing terms represent a document, and a query represents a user’s information need. It is the terms and the query which directly interact in a traditional retrieval situation.

Representation in information retrieval includes representation of a user need and representation of the documents which may meet a need. As discussed above, both types of representation are generally less multi-faceted, and less information-rich than the objects which they represent, and any representation is inherently incomplete. While this fact means that information retrieval will be imperfect, both representations and retrieval may be *good enough* for a particular user and a particular information need. An image may be considered a successful representation in a particular situation when the user is satisfied that it has adequately met her information need. Alternatively, O’Connor (1996) writes that an image may be considered a successful representation if a user does not feel surprised by encountering the original, or that which the image was intended to represent.

Representation of documents is intended to facilitate the retrieval of documents appropriate to a specific user need. Without any type of document representation, a user would be required to interact with full documents, and full collections of documents, without the intermediary of representational clues. Documents are represented in a retrieval system by versions of the original which adhere to some kind of coding, as per the indexing rules of the system. Blair (1990) writes that this coding must be “similar to the ways ordinary language is used” (p. viii). The key to successful retrieval is that rules

of this coding must be known to the user in order to be of much use.

In discussing her sense-making model, Dervin (1998) describes the benefits of allowing users to articulate their queries in natural language. Following this model, a user may have more freedom to discover her own answers and directions and thus have a more satisfying experience of information search. Many existing and functional information retrieval systems require that users express their need in a language which conforms to the system's retrieval design. The language used in representations has a great effect on how a user may retrieve those representations.

### Representation and Retrieval Systems

An information retrieval system as a whole is a result of initial choices made by the designers of a system. These choices are likely informed by a particular philosophy of representation, and this philosophy includes particular perspectives on the question of how to handle representation, and more fundamentally, assumptions about what should be represented.

While more fundamental questions of representation are further explored, information retrieval systems continue to be developed. O'Connor et al. (2008) use the apt metaphor that "freight trains don't have steering wheels" (p. xi) to describe the manner in which users of retrieval systems only have the option of choosing whether to get on or off of a train but not the option of which direction the train will take. The metaphor applies further to the way that retrieval systems are designed according to existing rules and processes. Especially in the context of rapid technological and social changes, designers are struggling to keep up and accommodate image and multimedia search, in addition to the more familiar text-only search. Until the development of well-

informed guidelines for representation of images, image retrieval systems will continue on the current freight train course grounded in text-only retrieval. It is the job of researchers to explore the surrounding areas outside the current course of the freight train, in order to determine whether and where new tracks may be laid.

### Effects of Digital Technology on Information Retrieval

Information retrieval has been affected over time by continuing developments in digital technology, ranging from methods of electronic storage to modes and accessibility of access to technology. Computers are capable of processing and storing more than ever before, and due to the development of the Internet, its increasing popularity, and increasingly universal access to the Internet, users, designers, and theorists must consider effects of these changes on traditional information retrieval. Today, for example, with the proliferation of social networking tools as ubiquitous information retrieval, even basic users have the ability to easily tag photos with keywords to aid access, thus bypassing a dependency on trained professionals using conventional indexing rules of library science (Greisdorf & O'Connor, 2008).

Changes in technology are not new, as the move from card catalogs to electronic databases is a prime example. Today's developments, however, may challenge the information professional more fundamentally. Buckland (1992) describes this challenge "for all concerned with libraries" as the task "to determine how, whether, and when these new means should be used" (p. 1). He explores the "constraints of paper" and potential benefits of a more automated library, along with considerations necessary for a successful transition into a new reality for information professionals. Schamber (1996) claims that as "perceptions of traditional documents have been shaped by print

technologies” (p. 670), so perceptions of electronic documents are shaped by electronic technologies. The concept of the digital library has manifested and may rival the physical library in terms of relevance to the user. Buckland (1992) writes:

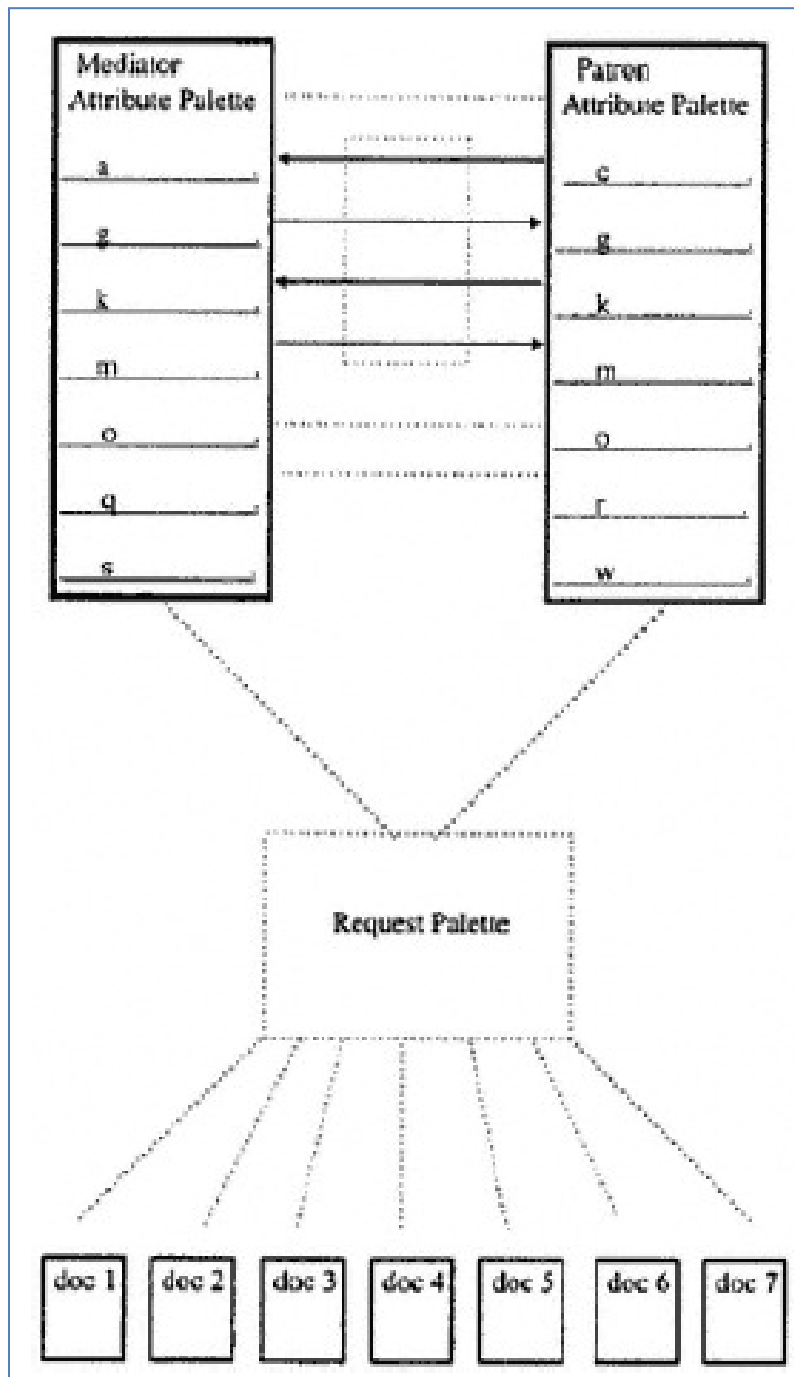
Just as the change from the Paper Library to the Automated Library, in conjunction with the rise of on-line bibliographies, changes our perspective on the catalog, so also the rise of the Electronic Library changes our perspective on collecting and local collections. Instead of our thinking being dominated by local collections, as is unavoidable with the Paper Library and the Automated Library, the effect of having electronic documents is to make local storage optional rather than necessary. (p. 40)

Users must no longer trek to a physical location; they need only navigate electronically to an online database. For effective retrieval of these new multimedia documents, retrieval systems must adapt and accommodate the document, in its myriad and multimedia forms.

Aspects of the traditional role of the reference librarian in the retrieval process may be seen as being incorporated into the design of successful retrieval systems, where advanced search options and user prompts mimic the traditional reference interview. Bopp and Smith (2001) define the reference interview as being “essentially a conversation between a reference staff member and a user, the goal of which is to ascertain the user’s information need and take appropriate action to satisfy that need through skillful use of available information sources” (p. 47), and consider such an interview a first step towards resolving information need.

Figure 15 models the interaction between a user and an intermediary, resulting in an enhanced request palette. O’Connor (1996) explains that this joint venture benefits the search by virtue of the librarian’s contribution, including her “subtle understanding of formal representation conventions, ability to translate user terms to system terms, and critical evaluation abilities” (p. 75). As retrieval systems grow to better mimic this aspect

of the reference interview, reference librarians may be inspired to develop and emphasize other aspects of their service to users.



*Figure 15.* Joint construction of request by patron and intermediary (O'Connor, 1996, p. 75).

Gorman (2001) assert that technology has increased access to information in an unprecedented way. If there was a problem before of not enough information, there is now a problem of too much. Terms such as “information anxiety” and “information overload” have thus entered mainstream usage. Copeland (2010) asserts that while loss of tangible information does occur in the case of image digitization, “such loss may not necessarily equate to diminished value or weakening of the emotional aura of the original source” (p. 458). He offers the example that “even in the popular case of American baseball, the joy of discovering a previously unrecognized player closes the gap between analog and digital” (p. 458).

Baeza-Yates and Ribeiro-Neto (1999) write about the challenges posed by the advent of the web. They discuss the fact that information online is not necessarily reliable, it is not always available, and it is often scattered with “unstructured and redundant data” (p. 368). Online data is stored across computers and servers all over the world, including different platforms. Similarly, data can be found in many kinds of media types and different formats. Digitalization of information becomes increasingly relevant, a key part of information retrieval. Databases now include scanned copies of older print articles, whereas journals publishing today offer primarily electronic copies of articles, increasingly forgoing the print altogether. Furthermore, documents in foreign languages are now increasingly available, but there is not always a reliable way of translating and thus using these documents.

Greisdorf and O'Connor (2008) discuss issues related to image retrieval being enhanced by more sophisticated digital technology. They assert that a task of the information scientist is to learn to harness the power of new technologies not only house

new forms of data, but also to provide access to the data in useful and dynamic ways.

Despite these developments, it serves the reader to remember Patrick Wilson's assertion, "The central problems are the same before and after the introduction of electronic data processing in libraries" (Munch-Peterson, 1993, p. 234). The same could be said today, as sophisticated digital technologies continue to evolve. These advancements may influence the trending concerns of information science but do not transcend the fundamental questions of the field.

### Query Formulation in Information Retrieval

P. Wilson (1977) proposes the concept of an information doctor who "aims at making prescriptions, at recommending effective techniques for attaining one's goals" (p. 118). He suggests that rather than simply providing a person with one or two documents which meet their need, the information doctor serves to provoke thought and discovery, saying, "Take this, and you'll find that good things happen to you" (p. 119). Researchers at the MIT Media Lab, for example, are working on a "sixth sense tool that would allow us to interact with our environment and information that enhances it in seamless unprecedented manners" (Neal, 2009); however, this idea is not yet a reality. Individual users must still interact with and provide queries to an information system.

The language of a system, or the use of controlled vocabularies, from which systems derive their indexing terms, is an aspect of concern in the arena of query formulation. As discussed previously, decisions of how to index, based on assumptions about representation for a particular system or user group, affect how users interact with the system. If a user is aware of the vocabulary or language of a system, then they will likely be more effective in formulating a query which will result in successful matches in



their searching. Allowing users to tag documents with their own descriptors is one method of incorporating user input and better serving users by communicating with them using their own vocabularies. The Library of Congress report on their Flickr pilot project includes an example of users applying a “Rosie the Riveter” tag 73 times for an image which had been cataloged by the library using the terms “Women—employment” and “World War, 1939-1945” (Springer et al., 2008, p. 24). The report authors suggest that it may be prudent to “incorporating popular concepts or variants into [their] controlled vocabularies” (p. 24). In any case, the formulation of a query to express and communicate an information need is a key aspect of information retrieval.

#### Query Formulation as Information Seeking Behavior

Information seeking behavior includes how a user goes about pursuing clarification for an information need. The process of articulating a particular query, or multiple queries, is a part of the process of seeking clarification. Many models of information seeking behavior emphasize the importance of exploration in the process of query formulation (Bates, 1989; Kuhlthau, 2004; O’Connor, 1993; T. Wilson, 2006).

In O’Connor et al. (2003), Kearns explores the issue, “What is a question?” She discusses various attempts to define the nature of a question and links this search to the concept of relevance, stating that one person’s relevance may not be relevance for another. She cites Cohen as defining a question as “the beginning of thought” (p. 119) and refers to O’Connor’s taxonomy of question types. Although the process of formulating a more direct query is an information seeking behavior, a completely formulated query is not always necessary for finding information that fills the knowledge gap or minimizes an information need.

It is likewise important to note that not all information retrieval activities require the same level of query formulation. Case (2006) describes information seeking activity motivated by factors such as a user wanting more stimulation, or less boredom (p. 88). Even these motivations may be formed into relatively non-specific queries, and in any case, this type of information search can begin processes of more specific query-formulation.

O'Connor (1993) describes browsing as an information seeking behavior which often begins with "a vague notion of a problem" (p. 215). He suggests a "scholar as detective metaphor" (p. 230), in which a person browsing will run a series of simultaneous subroutines, with the goal of eliciting new data, evaluating new data, evaluating browsing efficacy, and connection-finding amongst all data. The articulation of this browsing process can be understood as an attempt to represent, at least cognitively, the information need in question within a larger context. Minsky (1986) seems to support a similar networked model of meaning, writing: "The secret of what anything means to us depends on how we've connected it to all other things we know ... a thing with just one meaning has scarcely any meaning at all" (p. 64). He further claims that "learning from success tends to aim and focus how we think, while learning from failure also leads to more productive thoughts, but in a less directed way" (p. 96). In O'Connor's metaphor, a scholar learns from both successes and failures. By this iterative process of discovery, users may come to a better understanding of their own information need, and be thus better equipped for further query formulation.

During Kuhlthau's stage of query formulation, she says "a focused perspective is formed and uncertainty diminishes as confidence begins to increase" (p. 231). The

model also articulates the thoughts, feelings and actions accompanying a user's journey through the six stages. Query formulation corresponds to a feeling of clarity and a thought-state of increased interest in the information search, and on the level of actions, a user transitions from seeking relevant information to seeking pertinent information. In other words, the process of formulating a query is a crucial step in the search for resolving an information need.

### Query Formulation in Image Retrieval

Often a user does not know exactly what she is looking for but believes that she will recognize it when she sees it (Goodrum, 2005). Goodrum describes image retrieval as "an act of translation" and asserts that "users' cognitive image needs must be translated into external descriptions or depictions to communicate these needs to other humans and to information systems" (p. 46). This process adds additional dimension to the challenge of query formulation in text-based information retrieval and must be addressed in order to successfully proceed in the design of better retrieval systems.

Jørgensen & Jørgensen (2005) conduct a study of image querying by information professionals and report findings that:

The ability to follow a series (a rapid succession of terms input to the system) of semantically related queries suggests that ... *quite a bit of exploration takes place*. Another indicator of this is the researchers' observations that a number of queries across a couple of days are very, very similar, suggesting that an idea or theme is being explored, whether by one individual or by a team. (p. 1357)

These results suggest that there may be cohesiveness amongst a large group of terms "punctuated by reversion to earlier query terms" (p. 1357). The authors point to a process of query formulation in image retrieval as rather complex, sometimes spanning multiple sessions of searching.

## Image Retrieval

Hillis (1985) describes the ease with which a human user can look at an image and describe it, at least cursorily. Whereas for computers, the challenge of even the most basic image description, is significant.

The computer first has to process the hundreds of thousands of points of visual information in the picture to find the lines, the connected regions, and the textures of the shadows. From these lines and regions it then constructs some sort of three-dimensional model of the shapes of the objects and their locations in space. Then it has to match these objects against a library of known forms to recognize the faces, the hands, the folds of the hills, etc. Even this is not sufficient to make sense of the picture. Understanding the image requires a great deal of commonsense knowledge about the world. For example, to recognize the simple waving lines as hills, one needs to expect hills; to recognize horses' tails, one needs to expect a tail at the end of a horse. (pp. 1-2)

This failure of machines to mimic the human ability to automatically recognize images, which remains true 25 years after this comment, reinforces the necessity of recognizing current technological realities and optimizing image retrieval capabilities accordingly. Ten years after this statement, Hillis (1995) explained that in order to “make a thinking machine smart... it would have to interact with humans and be part of that human culture” (p. 383). He also acknowledged that his perspective on pursuit of ‘the thinking machine’ had changed, stating that he did “still believe that would be possible in principle, but it would take three hundred years to do it” (p. 381).

Greisdorf and O'Connor (2002b) consider image retrieval “a process of reconceptualizations – the merger generated by the concepts embodied by the initial query and the concepts raised by viewing retrieved images” (p.7). A series of iterative searches, accompanied by ad-hoc self-reflection, may help the user to narrow in on what she actually wants to find while taking direction from those previous results which show her what she does not want to find. Or a user may already have a mental image of

what she wants, including parameters for types of images she may find acceptable for the particular scenario (Greisdorf & O'Connor, 2002).

### Representation for Image Retrieval

Image retrieval can be considered as a subset of information retrieval that includes retrieval of multimedia documents like those which are text-based, image-based, or sound-based. Here, problems of representation are explored in terms of how they manifest in image and text-based retrieval. Whereas text-based retrieval relies exclusively on text which is either extracted from or describes a document, image retrieval has the benefit of including text descriptors, as well as content-based image descriptors.

Rorvig et al. (2002) describes a content based image retrieval (CBIR) system which uses measures of image primitives, in addition to extracted text. In this system, images extracted from the collection are used as query representations and then fed into the system to match selected features, or attributes, of the image, leading to significantly higher precision than text-only retrieval. Goodrum, Rorvig, Jeong, and Suresh (2001) describe primitive features of color, shape, and texture as measures “automatically extracted from the images themselves” (p. 948) and explore the efficacy of combining histograms of image content properties for image clustering, searching, and viewing. They note that while these features are clearly relevant to image description, it is not clear how to best use the measurements for image retrieval. Goodrum et al. (2001) discusses the “considerable gap between the primitive image features such as color, texture, lines, edges, and angles, and the higher level cognition necessary to equate these features with terms that occur to human beings in the course

of a search” (p. 949). These authors claim that CBIR can therefore only be applied successfully in a limited capacity.

Greisdorf and O’Connor (2002a) advocate for the pursuit of research which has “moved beyond single level approaches to look at multi-dimensional mechanisms to extract features at several levels of perception” and require in addition to the “metadata scheme, the indexed terms, or the content-based extraction algorithms,” an incorporation of “some community of user feedback” (p. 388). O’Connor and Wyatt (2004) discuss an example of a curator comparing digitally processed images with the original items in her collection:

You are delighted, at first. The use of multiple lights and careful exposure calculations have yielded stunning images, far beyond what could have been accomplished with a simple camera with a single flash right by the lens. But then you begin to notice that there are significant instances where there is not a one-to-one correspondence between the images and the items in your collection. As a curator, you want people to see the reality of fading, of tearing, of repairs that had been left “obvious” so that the original would seem all the more intriguing. (p. 43)

This example highlights a challenge of representation for image retrieval unique to the digital realm. Questions arise, such as, “Which version is better?” and “Which representation is ‘right’?” In this case, the curator decides the answers to these questions, but in the general case, answers are not straightforward.

O’Connor et al. (1999) suggest that user-generated reactions to images may offer a more useful form of image representation for retrieval. They find that using conversational descriptors in representation of images results in significantly more effective retrieval.

Enser (2008) discusses the phenomenon of social tagging, explaining that it makes possible what he calls “a new dimension to the representation of the semantic

content of visual materials” (p. 534). He states that “the ability to contribute personal tags to image and video metadata challenges the supremacy of professional sources, authoritative subject representation, whilst introducing opportunities for beneficial enhancement of both exhaustivity and specificity in subject indexing” (p. 534).

Early attempts towards user knowledge-based recognition to bridge the semantic gap included a plan to build models consisting of “digitized reference images which depicted the object in a variety of light conditions, and at different angles, sizes, and perspectives” (Enser, 2008, p. 538). This has not yet been successful.

Greisdorf and O’Connor (2008) claim that despite the ability to search on primitive image properties such as color, composition, and texture, “There is still no simple way to describe or arrange or search for an image at a level above the image primitive ... and below or beside the name of the object in front of the lens” (p. 70). The semantic gap has yet to be bridged.

### Description of Images

Rorvig, Turner, and Moncada (1999) explain the value of describing images in the “language of the image” (p. 795). It is unclear which alphabet this language of images may have, and which grammar. Are words a part of the language of images, or images alone, or perhaps multimedia documents, including sound? It has already been established that pictures are not words. Perhaps the language of the image is more accurately the language of the user of the image.

Lee and Neal (2010) consider the application of user-assigned descriptors (UADs), also referred to as tags in environments such as Flickr. Such descriptors may serve as improved accessed points to online images, as user becomes indexer. They

describe the basic level theory that “any given object has one particular level of semantic description at which it is first processed in one’s mind,” and their study assumes that the “user’s first reaction to an image can be used, and is frequently used, as an entry point during the retrieval process” (p. 549). Meanwhile, collections of online images may be described at a superordinate level. If this is the case, then images which have been organized into collections may be described by both descriptors of the individual image and the collections to which it belongs. The Lee and Neal study found that existing image description models did not accurately anticipate UADs assigned to photographs by participants in their study and that users in their study tended not to choose words which describe their reactions to photographs when asked to assign indexing terms. This result warrants further investigation if UADs are to be considered as access points.

The Library of Congress interview detailed later in this study revealed that users were more likely to include personal reactions in the comments of Flickr photographs, rather than in the tags they assigned explicitly as access points. It is further interesting to note that Flickr currently allows users to search the full text of image descriptions (set by the image uploader) and image tags (added by users), but not comments. The Google search engine, however, indexes Flickr image comments as well. While this wider approach may result in more textual access points for users in image search, this is not an answer to the question of how to best describe images.

O’Connor and O’Connor (1998) discuss the utility of actually using images to describe words. Now that there is technology to support this kind of storage and retrieval, it has become possible, at least in terms of availability of technology, to make



use of the rich representational data inherent in the picture, which is fabled to be worth 1000 words. In their case, the images in question are book covers which also include textual information, which they refer to as “conversational representations” (Discussion section, para. 5), pointing out the potential usefulness of the images, because “those engaged in representing the document have a vested interest in presenting characteristics in a manner useful to the searchers” ((Discussion section, para. 5). To make the issue even more complex, some book covers include no graphics at all, but simply their inherent image-ness, including choice of words, presentation, style, hints about intended audience, and any evaluative comments, provide readers and information seekers with valuable information which text alone could not supply.

Zhang (2008) describes a study of “visual words,” or image feature descriptions, which can be applied quickly so that the indexing process doesn’t take a long time, like it can with typical content based image retrieval systems (CBIR). This system should allow queries of both keywords and visual words and intends to “bridge the gap between the scalable industrial image search engines, which are based on the keyword search, and the slower content based image retrieval systems” (p. iv), which exclusively use image content. He reports that results from a working prototype “confirm efficiency and effectiveness” (p. 115) of these methods.

Oyarce (2008) discusses visual information representation and describes an application of the shape recovery method for evaluating text documents in which “relevant documents cluster closer together and towards the center of the plot; nonrelevant documents scatter towards the periphery” (p. 1483). This visual methods approach may be useful in determining best practices for selection of indexing terms.

Kennedy (2009) likewise attempts to map a user's textual search queries to a "space of [semantic] visual concepts" (p. 149). Users may thus be able to communicate or interact more directly with the system, and as such, query formulation may thus involve less complexity. The goal of these tools is to provide the user with increasingly seamless interaction with the collections of interest, thus approximating and even exceeding the efficacy for the user of interaction with an expert reference librarian and personal assistant.

### Roles for Online Image Search

The type of search conducted is related to the context surrounding the particular image search. The same user may exhibit different behavior or take a unique approach depending on her current role, for example, if a query is self-generated or imposed (Gross, 1995). Likewise, the vocabulary and grammar within a professional or academic context varies from those in social or other informal settings. Human beings are adept at adapting to different environments, and thus, differences in their approach to tasks will likely vary from one context to another. Examples of possible contexts include professional, commercial, non-profit, research, academic, educational, and personal. By necessity, designers of image retrieval systems make assumptions about their users and the contexts of image search for which their systems may be used. To better understand these contexts is to have the opportunity to design systems more appropriate to specific contexts.

### Satisficing

Often when looking for images online, users want to quickly search and find something that more or less matches some description without expending much effort.

Rather than insisting upon the perfect image, users may find a photo that is acceptable to them, according to some internal evaluation system, and accept it as the answer to their information need. This alternative to investing more effort to find an optimal set of results in the context of complex information needs is satisficing (Simon, 1976), and is explained by Zipf's Principle of Least Effort, (Zipf, 1949; Bates, 2009).

Satisficing extends beyond only users of retrieval systems. Kearns (in O'Connor Copeland, & Kearns, 2003) writes that "all hunter-gatherers are prone to satisficing rather than optimizing at times that require quick, and possibly temporary, answers to immediate questions" (p. 131). Even designers of retrieval systems satisfice. Copeland (in O'Connor et al., 2003) writes:

The engineer is adept at intensive introspection that is sometimes characterized by whimsical patterns of behavior. The product of the engineer's labor is a bricolage, an artistic, "reflexive, collage-like creation" (Lincoln and Denzin, 1996, p. 3) that metaphorically represents the engineer's images, understandings, and interpretations of human problem solving. Bricolage is a pragmatic, practical solution to a given problem. It is often a satisficing, less than optimal solution that works in a given design context. (pp. 114-115)

It is likely that satisficing is present in every aspect of daily life.

### Image Retrieval System Design

In ideal system design, a complete analysis has been done of the situation, including of user needs. It is essential for a designer to understand the intended use of a system, so that they can design to these specific needs. Knowing exactly who the intended users will be allows features to be customized towards the particular audience (Allen, 1996). Another aspect of image retrieval system designers is a set of decisions about how to format, store and present images for retrieval. Images often take up significantly more space than do text-only documents. Even in systems where

representations consist of images, compression of these images to save space and expedite retrieval is generally necessary. Furthermore, designers will decide whether users will be allowed access to an image in different qualities.

Digitalization of images and related challenges is another consideration for image retrieval system design. Generally representations should be of high quality, which means high resolution and large file size. Considering the issues of creating these high quality scans and using high resolution cameras is a corollary to system design.

O'Connor & O'Connor (2009) discuss various considerations which must be made with regard to creating high quality images, including the complex set-up of photographic equipment for photographically archiving objects for retrieval.

O'Connor and Wyatt (2004) discuss techniques for photography intended for archival and retrieval purposes, and they explore the fact that even images which could be considered “bad” in terms of photographic qualities such as resolution, light, and color, may still have relevance for some users. For web users who will be satisfied with lower-resolution images, designers need not build in access to high-resolution images with large file size. Magazine editors, on the other hand, are likely to require high-resolution images. Meanwhile, in a discussion on “The Lost Art of Storytelling,” Ferren (1999) states that “the reason photographers use diffusion filters to weaken the technical performance of their camera systems is because it does a better job of storytelling (p. 62). In some cases, he explains, “adding technical resolution beyond a certain point takes you out of the story, rather than bring you in deeper” (p. 62).

Furthermore, while some image retrieval systems offer users the option of browsing lower-resolution images before navigating to higher-resolution digital images they will

actually use, some systems use digital images for searching and then point users to the location of a physical image. Museum curators, for example, may make use of a digital retrieval system but will ultimately require access to a physical painting, for example, or sculptures. Retrieval systems including collections of fine art and targeting users such as curators of museums and high-end galleries have an entirely different aim than systems associated with online social networking systems, such as Flickr.com. The intended uses in this latter case are manifold but primarily to provide space for any interested users to share personal images with a larger public and to provide access to those images for often more informal projects (Greisdorf & O'Connor, 2008).

Table 2

*Relationship between the Theory and the Interface Behaviors (Benoit, 2011)*

Theory	Interface Implementation	Interaction Implementation
New information	Changing theme images	Control over amount of record data to show per item
Strengthening old	Display similar records	User selects specific event values for interpretation
Weakening old	Display dissimilar records	User selects intellectual level and other record properties
Canceling	Delete record from retrieval set	User sense of control to reduce explications and implicative opportunities
Recovering facts	Situation item in larger subject theme	Flip-card, rather than drill down, to read more about the record, subject, value

Benoit (2011) describes a model of “feature integration applicable for image-driven, user-guided exploration of digital collections” (p. 1), as outlined in Table 2. This

is an example of work which attempts to use theories based on previous research (in this case, Sperber and D. Wilson (1986)) to design image retrieval systems with specific corresponding features and then test the use of these systems in order to determine the utility of the theories.

Allen (1996) claims, “Analyzing the information needs of a user population is the first step of user-centered information-system design” (p. 29). He explains that a system should be designed to meet the needs expressed by the target population, and he explores a variety of issues related to expressing information needs, including categories of world knowledge, knowledge of a language, shared knowledge, and social constraints. If information professionals were working within this paradigm, it would help inform how to address each information search.

Yoon (2008) discusses her study of connotative meaning in a cross-cultural context, agreeing with the semiotics assumption that socio-cultural context matters. She proposes therefore that “to enhance browsability, it would be preferable to display clustered sets of images rather than a random display” (p. 317). Providing enhanced visual browsing tools may improve the user experience of image search.

Conway (2010) studied participants who are heavy users of the Library of Congress Prints and Photographs image collections and who have specifically “produced a tangible product, such as a book, scholarly article, motion picture, complex website, online exhibition, etc.” (p. 434). He conducted semi-structured interviews with the components of “1) self-assessment of expertise with photographic materials and digitized photographs; 2) overall decision-making strategies for the identified project; and 3) assessment of the visual, technical, and archival properties of individual digitized

photographs selected for inclusion in the project” (p. 436). His stated intention was “to develop a theory of the use of visual archives” using the raw material of the conducted interviews. This research has a similar aim but uses participants who are heavy image users with a variety of image tasks and who may be searching for images in a variety of online locations.

It may be wise to ask questions such as: “What types of individual approaches to image search exist? What characterizes one search from another? Which approaches do individual users utilize? When and why do they choose one over another? When do they know to change approaches?”

## CHAPTER 3

### THEORETICAL FRAMEWORK

In this chapter, the vital pieces of this study's theoretical framework are addressed in detail. First is a summary of thoughts on the topic of image query types and a description of three resulting image search scenarios. Secondly there is a discussion of qualitative research design with an emphasis on an inductive engineering approach, questions regarding the role of variability in human behavior, and support for the use of exceptional subjects for study. Finally there is an exploration of the functional ontology construction model by Anderson (2006) to be used as a formal calculus for shifting focus to the user experience and describing functional relationships between the behavior of the individual image-seeking user and the individual's unique, dynamic, and information-rich environment.

#### Image Query Types

Panofsky (1962) writes from an art history perspective and in an exploration of subject matter in visual art, he defines three levels of meaning for images:

- 1) Pre-iconographical description, referring to primary or natural factual or expressional subject matter
- 2) Iconographical analysis in a narrower sense, referring to secondary or conventional subject matter
- 3) Iconographical synthesis or interpretation at a deeper level, referring to intrinsic meaning or content

These levels of meaning may be valuable as an aid in analysis of visual materials and a foundation for research into image usage and an overall goal of improved access.



Barthes (1977) shares a categorization of the image's three messages which correlates rather directly with Panofsky's levels and may therefore provide further insight into the significance of these distinctions. Barthes' three image messages are:

- 1) The linguistic message, could be denotative or connotative in nature
- 2) A coded iconic message, denotative in nature
- 3) A non-coded iconic message, connotative in nature

Note that the first message refers directly and exclusively to any text that may be clearly connected to an image, namely captions and labels, and the messages of this text may contain both denotative and connotative aspects. The second and third messages, in contrast, refer to the image as a visual entity without printed verbal text beyond that which may incidentally be recorded in the photograph.

Enser (2008) characterizes the three Panofsky levels as subject matter which, respectively requires no interpretation of meaning (pre-iconographical description), depends on an interpretation of the image (iconographical analysis), and “[embraces] the intrinsic meaning of the image... demanding of the viewer high-level semantic inferencing” (p. 533) (iconographical synthesis).

The research of Shatford-Layne (1986) focuses on subject access to images and asks, “Is it possible to analyze the subjects of pictures so that these different kinds of information would be accessible, available to satisfy a multiplicity of uses and users?” (p. 42). She expands the first and second of Panofsky's meanings to define image attribute types:

- 1) Generic Of
- 2) Specific Of

### 3) About

These three attribute types address both the questions of what an image is “of” (denotative) and what it is “about” (connotative), thus allowing different access levels to image subject.

Yoon and O'Connor (2010) articulate a new categorization of image types, extrapolated from the Panofsky and Shatford-Layne models, to articulate three types of image searches:

1. Simple noun search
2. Varied noun search
3. Abstract (subjective) search

The first is a search which can be conducted with a set of one or more nouns which could describe the simple caption of an image and which thus requires no interpretation. Yoon and O'Connor offer the example of a prompt to find images for a story on dogs (p. 751).

The second, varied noun search requires a user to first interpret a search prompt and choose which aspect of the subject to illustrate with an image. The user then conducts a search for that interpretation using a set of one or more nouns. This varied noun search is a degree removed from the simple noun search, due to the level of interpretation which will vary depending on the context of the search task. Yoon and O'Connor give the example of the American West (p. 751), which different users may likely choose to represent differently.

The third type of image search is the most complex, representing a higher level of connotative meaning and requiring a higher degree of interpretation. This type of

image search highlights the subjectivity of image meaning, and images found to match the search may vary widely from user to user. Images which satisfy this type of search can not necessarily be captured by any particular set of noun descriptors. Each individual user must be the judge of whether a particular image meets their search need. In this case, the word “abstract” is used as O’Connor (1996) describes it: “To abstract is to pull out the virtue and power of some larger entity or set of entities, but these could well be different for different people” (p. 9). The word “abstract” is used in this sense as a subjective determination of what is most fundamental to a particular image. If a user were to describe the image she is seeking, she would likely use terms which describe her reaction to that image and which may be very different, and even opposite in semantic meaning, than terms which a second user may choose to describe the same image. An example of this type of image query may be a search for images that represent the concept of “love.” In this example, one user may choose an image of a mother and child, or embracing lovers, while another may choose a picture of her favorite animal, or a heart.

It is interesting to note that a more colloquial usage of the word “abstract” may also apply here in its adjective form. The Oxford English Dictionary defines the adjective “abstract” as “withdrawn or separated from matter, from material embodiment, from practice, or from particular examples” (Abstract, n.d.) Then an abstract image search is a search for something other than, or beyond, the material embodiments depicted in an image. While the first two image query types refer to concepts which may be visible in an image, the third image query type refers to a withdrawn concept, *which a user must see into the image*.

These image query types are explained by Yoon and O'Connor in the context of developing a more dynamic and effective image searching environment, and particularly one populated with photographs. The practicality of this taxonomy, however, extends into a broader context. Each of the three query types represents a different approach to image search. The behaviors of a user involved in searching for an image of a tree versus a user seeking images representing the phenomenon of forest destruction in the Northwestern United States are likely different and must be recognized as such within a research context. Furthermore, searches for more complex concepts, such as “human vs. nature,” most likely involve yet another type of search approach. These three image query types can be reframed as the basis of a framework which reflects the user approach to image search.

### Three Image Search Scenarios

Yoon and O'Connor's three search types may be explored from the perspective of the user. Consider that a user in the current image search environment must interface with a text-based image search retrieval system and will most likely be required to begin an image search by selecting an appropriate set of keywords. Some searches can more easily be translated into keywords for search, and others may involve more ambiguity and subjectivity and therefore be more difficult to articulate.

The driving question of this study is how users think about the images they seek online. For a given image search, a user may mentally “see” the image they want to find and will then simply approach the problem as deciphering how to describe that mental image in order to find it in an online search environment. In other situations, however, the user may not be aware of what kind of image would satisfy the information need,

and so the approach is more exploratory until a higher degree of clarity is reached or the user serendipitously finds an image which meets the need.

The proposed set of image search scenarios used in the context of this study is translated from Yoon and O'Connor's query taxonomy.

Q1. "I know what I am looking for, and images satisfying this query can be described by a unique set of one or several nouns."

Q2. "I know what I am looking for, and there are a variety of image types which could satisfy this query, each of which could be described by a unique set of one or several nouns."

Q3. "I do not know exactly what I am looking for, but I will know when I see an image whether or not it satisfies my need."

Note that the last image search scenario refers to the abstract image query, emphasizing the requirement that a user subjectively *see something* into an image in order to have successfully found a match for their information need.

This study intends to evaluate the usefulness of this modified Yoon-O'Connor model for understanding how users think about the images they are looking for and how they conduct searches. Of particular interest are differences in how users think about images and the image search in each of the three different image search scenarios represented in this model.

It may be valuable to note that the second and third query types are likely most relevant to photographers, journalists, curators, and others engaged in collection development. Most image searches are likely of the most basic variety.

## Qualitative Research Design

The following section explores issues of qualitative research and makes a case for an engineering design approach to research, explores the role of variability in inductive research design, and supports the study of small sample groups of experts to discover order in the world of user behavior.

### Engineering Design Approach

Copeland (1997) offers an extensive exploration of the current state of user behavior study in information science and suggests that the field has no singular established paradigm from which to position research approaches. Research into information seeking behavior is currently mostly frameworks and implementations of those frameworks. In the dominant paradigm of qualitative social science research, implementations tend to primarily take the form of surveys, which provide a limited amount of insight. As a corollary to his first leisurely theorem, Gilbert (1978) explains that “quantitative expressions of behavior, except for special purposes, are often misleading indices of performance” (p. 23). Harris (1993) discusses as an alternative the concept of the “extended argument,” suggesting that it supports a “dialectical line of inquiry” (Copeland, 1997, p. 4). This may enable “the analyst to be far more sensitive to social potentialities than the more conventional positivist approaches” (Harris, 1986, p. 525), which still dominate the field of information science. Blair (1990) similarly expresses the need for identifying “genetic algorithm” which allows for the diversity of natural language and consequently diversity of human experience, thus allowing for an expanded framework from which information science research may be conducted.

Copeland quotes Dupre (1993) as claiming that “theories and models derived

from the “prestige of science” [and the scientific method] reflect a kind of assumed unity that has no genuine consequences for engineering design epistemology” (p. 43). Blair (1990) makes the case that researchers adhering to particular models and theories may be blinded to other possibilities, allowing the frameworks to “predetermine what researchers think they see” (p. 282). Whitehead (1985) describes the danger of deductive thinking, explaining that “paradox only arises because we have mistaken our abstractions for concrete realities” (p. 69). Copeland explains:

Models based on a strong ontology of being tend to conceal alternative models or styles of thinking. An engineering design model based on postmodern thinking privileges a weak ontology of “becoming” which emphasizes dissonance, disparity, plurality, change, and even ambiguity, paradox, and the “not-yet-know.” (p. 59)

Chia (1995) suggests that this approach allows a researcher to describe “the emergent relational interactions and patternings” (pp. 581-582). The argument for an inductive approach based on a willingness to risk asking “the wrong questions” is characteristic of the recommended framework and Copeland suggests that “researchers have to take risks asking questions” (p. 78). Copeland further claims that in inductive qualitative research, “the researcher does not impose an a priori organizing structure or make assumptions about interrelationships among data prior to making the observations” (p. 62). He explains:

According to Chia (1995), a model based on Nagel's (1979) notion of a scientific theory being based on an abstract calculus and operational definitions represents a modernist thought style. It relies on a strong ontology of "being," a distal state that privileges thinking in terms of discrete phenomenal states, static attributes and sequential events. (p.57)

Figure 16 shows a visual comparison of modernist and postmodernist approaches.

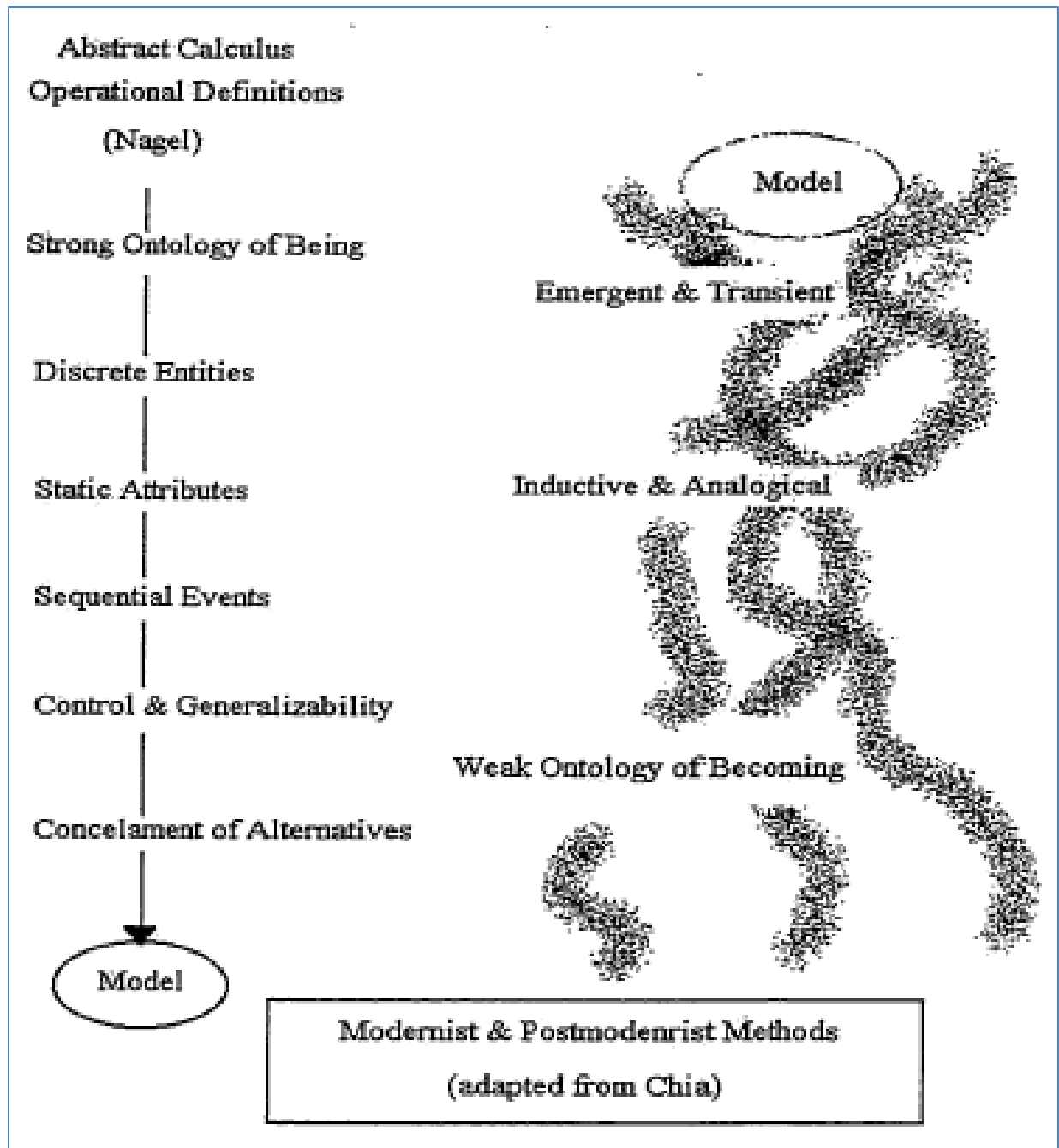


Figure 16. A comparison of modernist and postmodernist assumptions (Copeland, 1997, p. 58).

Krippendorff (1980) claims that given the state of inductive research as exploratory, content analysis is sometimes unending:

Although a good content analysis will answer some questions, it is also expected



to pose new ones, leading to revisions of the procedures for future applications, stimulating new research into the bases for drawing inferences, not to mention suggesting new hypotheses about the phenomena of interest. (p. 74)

This further suggests an iterative approach, with the researcher constantly reassessing research strategies and emerging theories during the active process of research.

Guba and Lincoln (1983) claim that data analysis "must progress by approximate answers, at best, since its knowledge of what the problem really is will at best be approximate" (p. 242). Copeland (1997) suggests that "qualitative categories" which emerge as a result of inductive content analysis could be understood as "emergent bricolage" (p. 78). He goes on:

Turkle (1995) further suggests this type of data analysis is a "tinkering" process in which the researcher, as "bricoleur," approaches problem-solving "by entering into a relationship with [his/her] work materials that has more the flavor of a conversation than a monologue" (p. 51). It is a process "marked by a desire to play ... to move [around and develop] ... elements of a collage" (p. 52). (p. 79)

This type of inquisitive playfulness, based in an emerging grounded theory is at the heart of Copeland's explanation of Engineering Design as a foundational metaphor for research in the field of information science (see Figure 17). It is in this spirit that this dissertation has been designed and conducted.

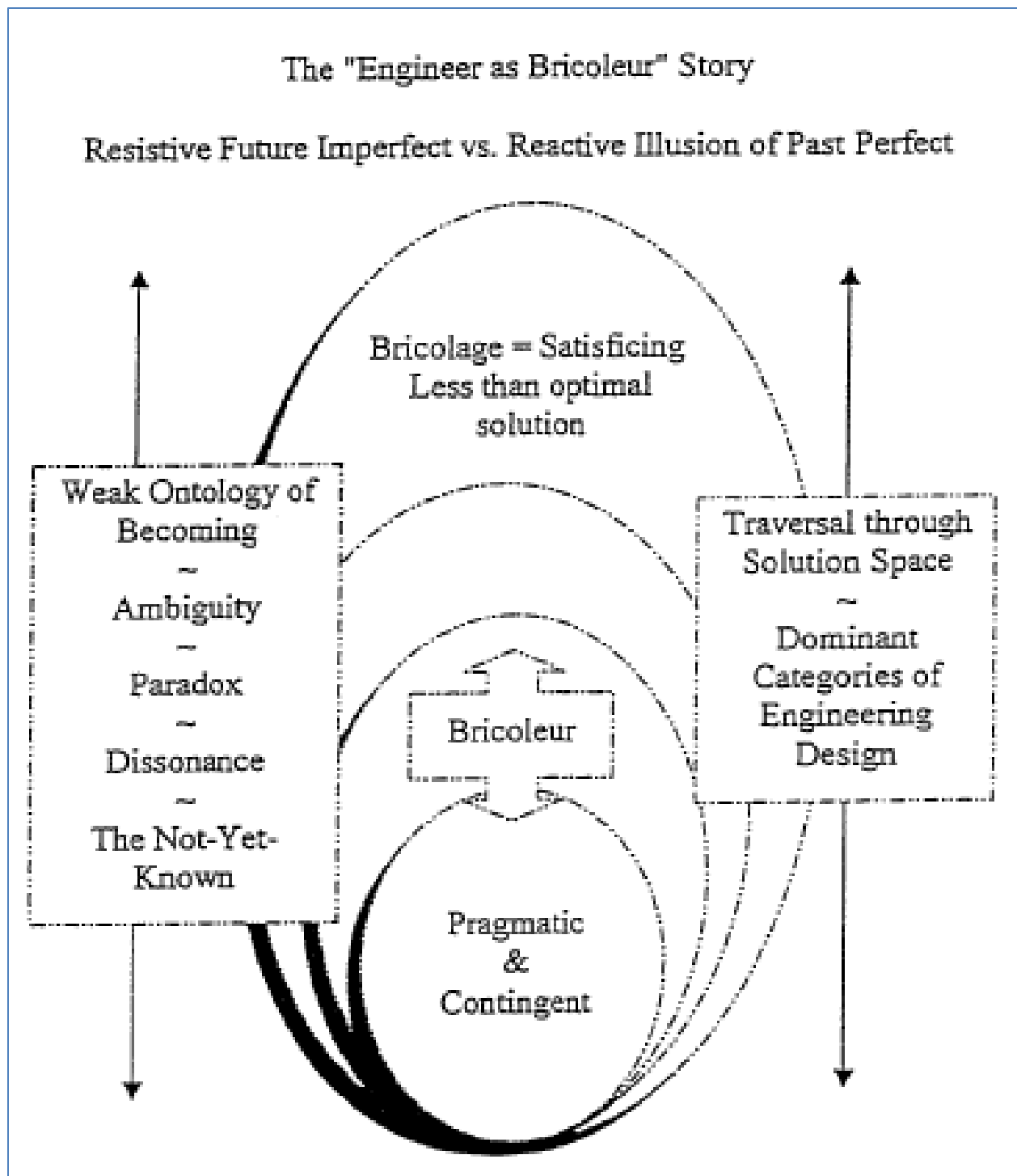


Figure 17. A model of engineering design in its current instantiation (Copeland, 1997, p. 206).

## Investigating Experts / Exceptional Cases

Gilbert (1978) introduced a measure of the potential for improved performance (PIP) as the ratio of exemplary to typical performance (p. 30). He considers that in order to study a particular observable task and human behavior related to that task, it is necessary to specifically identify subjects who are exemplary at performing that task and comparing them to others who also perform the task. Anderson (2006) describes this as “the key to improving performances lies within the tails of the statistical distribution – the exceptional performances and the spectacular failures” (p. 49). Anderson further asserts that Gilbert’s take on improving human performance is “similar to Copeland’s (1997) call for an engineering approach to knowledge problems” (p. 74). This is also compatible with suggestions by Sidman (1960) to track down variability, or in other words, look at the tails of a normal distribution.

This argument may be considered a strong case for seeking out experts to study for any given research question. In deciding which cases to choose in an inductive qualitative study, however, the researcher must determine which subjects to study. Hoffman, Shadbolt, Burton, and Klein (1995) describe an expert as:

The distinguished or brilliant journeyman, highly regarded by peers, whose judgments are uncommonly accurate and reliable, whose performance shows consummate skill and economy of effort, and who can deal effectively with rare or “tough” cases. Also, an expert is one who has special skills or knowledge derived from extensive experience with sub-domains. (p. 132)

## Functional Ontology Construction

If one accepts that inductive qualitative research is the path to pursue and that studying experts is an ideal starting point, then the question of how to frame that study is worthy of exploration. Anderson (2006) asserts:

The FOC [Functional Ontology Construction] approach suggested in this work is an attempt to provide a strategy for examining knowledge problems for individual cases. This gives us the tools to examine the exceptional successes and spectacular failures on the tails of the normal distribution. From this we can engineer better systems and performances from the users of those systems. (p. 74)

He describes that “the main thrust of [his] theory is that people live in a world of information” (Anderson, personal communication, December 23, 2011) and thus are functioning within an information-rich context. He uses methods and language rooted in a radical behaviorist perspective, which values the measurement of observable behaviors, and theories described earlier in this chapter, to describe relationships between individual users and their information-rich environments.

#### Shift in the Locus of Representation

O'Connor asserts that a shift in the locus of representation is needed in order to adequately address user needs (personal communication, December 21, 2011). Rather than examining image retrieval from the perspective of the information professional or retrieval system designer, it would behoove the research to study the problems of image retrieval from the perspective of the individual user.

The individual is very much in focus in Anderson's FOC model, as the model provides a framework from which to examine “the relationships between the individual, the aspects of the physical environment that have function to the individual, the functional ontology, and the consequences of those relationships” (Anderson, 2006, p. 9). At the same time, the same model can be used to zoom out, so to speak, and to look at the larger system of user behavior over time and even within different contexts. This ability to shift dynamically between different users and different image search experiences expands the utility of the model.

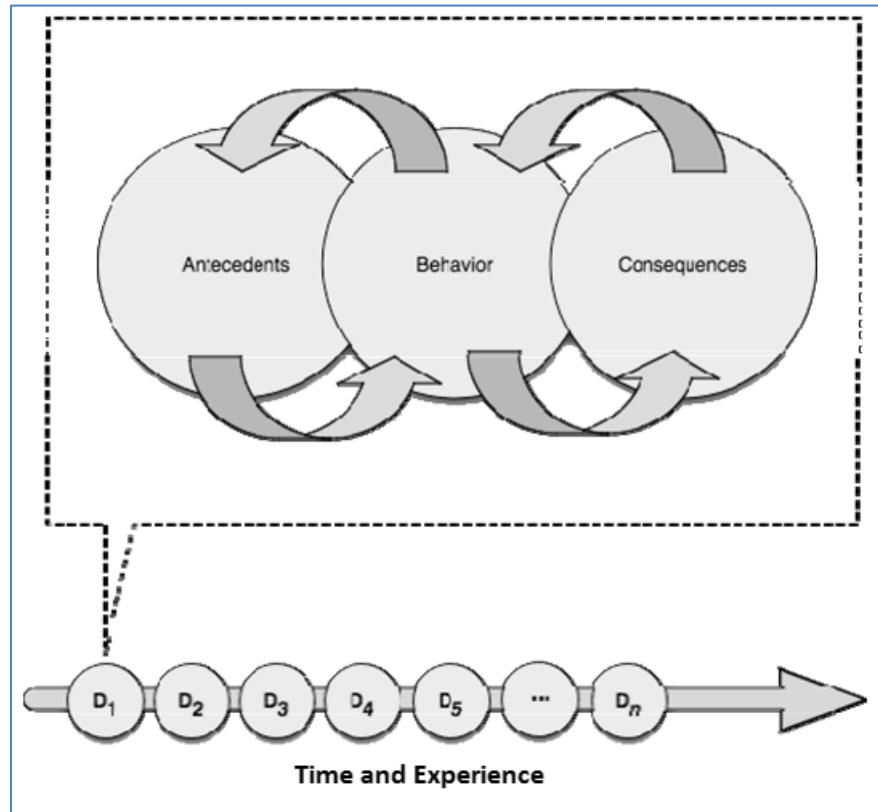
Furthermore, depending on the intended purpose a user has in mind for the image being sought, the user may benefit from a different type of representation. For example, imagine that a student has been tasked to find an example of a digitized photograph from the 1980s. Then at some later point, the same student may be seeking images depicting birthday celebrations. Theoretically the same image could satisfy each of these needs – such as a digitized photograph of a child’s birthday cake, originally taken in 1983 – but the experience of the two image searches may be very different. Ideally the digitized photograph of the cake would have a corresponding representation such that it may be identified as a possible match for either of the searches.

It may be argued that the intended use of an image should determine the methods by which a representation is created. This would require that the creators of the representations, including indexers and designers, should be aware of and acknowledge each and any possible use case for the image. Considering that this scenario is very likely unrealistic, the challenge remains of how to approach representation and image search, from the perspective of the user, such that the user is well served.

#### Functional Ontology Construction Model

Anderson (2006) discusses the foundations of his FOC model by explaining Skinner’s three-term contingency as a relation in three parts: “antecedent conditions that set the occasion for a behavior’s occurrence, the behavior of interest, and the events that follow the behavior and have behavioral function” (p. 22). He describes an early iteration of his FOC model as being based on the “bumps in the road of life” model (see Figure 8) by O’Connor, Copeland, and Kearns (2003) as seen from a behavior

analytic perspective (see Figure 18).



*Figure 18.* First permutation of the FOC approach (Anderson, 2006, p. 79).

Figure 19 shows a more complex model of the functional ontology construction model, which includes the O'Connor, Copeland, and Kearns (2003) concept of bumps in the road of life, as well as the “behavioral space” as it exists within each bump.

Anderson describes the newer iteration of his model:

Behavior occurs in time. We can conceptualize in terms of antecedent space and a consequent space. The boundary between the antecedent and consequent spaces is the point where an instance of behavior occurs. (pp. 29-30)

He goes on to explain that “a single instance of behavior occurs within a continuous stream of behavior that makes up the life span of the individual. Operant behavior is selected or extinguished by the consequences of individual instances of behavior.”

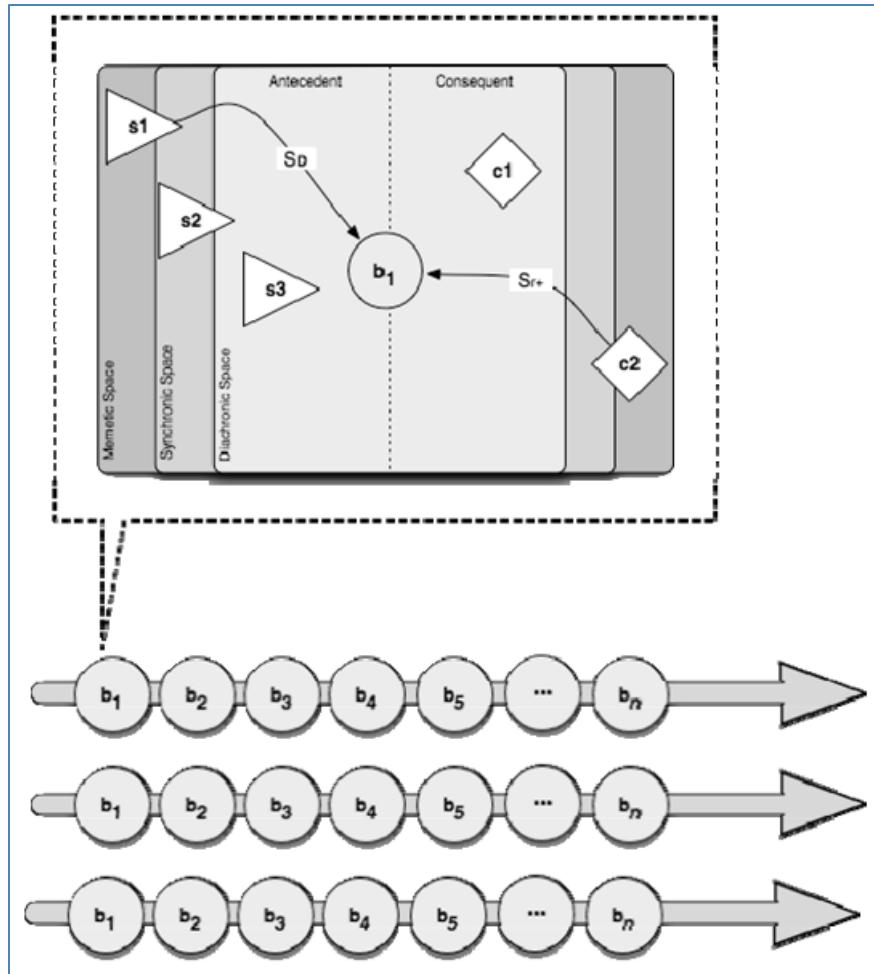


Figure 19. Later version of FOC model (Anderson, 2006, p. 81).

This explanation of behavior as the boundary between antecedent and consequence spaces is central to the FOC approach. Using this definition, any instance of behavior may be framed in terms of the behavior analysis ABC model. Likewise, the view of a life as a stream of individual behavior instances acknowledges and integrates the continuity and connectedness that individual instances of behavior have to one another in the context of an individual's lifetime. In particular, an individual's image search behaviors may be studied in terms of how these behaviors have developed over a lifetime of discovery, reinforcement, punishment, and extinction. These insights may be especially relevant when referring to and interpreting the behavior of experts.

Additionally, the FOC model includes three distinct spaces within which a signal with potential behavioral function may exist. These are the memetic space, the synchronic space, and the diachronic space. Diachronic attributes of a document are those which “do not change in respect to time or context” (O’Connor, 1996, as cited in Anderson, 2006, p. 1). Synchronic attributes are context-dependent, such that their value may change depending on specific circumstances. Memetic attributes are arguably the most complex of the three types. They refer within the FOC model to the “outward and visible (audible, etc.) manifestations of the memes within the brain” (Dawkins, 1982, as cited by Anderson, 2006, p. 27). These memetic attributes are signals which carry meaning for a particular person, or a particular culture, and may therefore be considered as culture-dependent, as compared to the context-dependent synchronic attributes, and the non-changing diachronic attributes. Signals within any of these three spaces may “acquire behavioral function for a particular person” (Anderson, 2006, p. 30), thus taking on a role such as a discriminative stimulus, an establishing operation, a reinforcer, or a punisher.

Applying the FOC model to image search, it could be said that when a user exhibits the behavior of image seeking, they change their environment such that the “before image seeking” (now the antecedent) environment is different from the “after image seeking” environment (now the consequence). Depending on how the user experiences the consequence in relation to the antecedent, the image seeking behavior which was applied in that situation is either selected or extinguished. Over a user’s lifetime, many such bumps will be encountered, and the likelihood that a user will make use of a given behavior may be a result of the entire collection of bumps.



It is interesting to note that behavior may be operant only for antecedent conditions that a person has previously encountered. Thus, when a user encounters an image need scenario beyond some threshold of similarity to any they have previously encountered, new behaviors may arise as unrelated to operant behaviors already developed. In other words, every instance of behavior is potentially distinct. Anderson suggests that the FOC approach “is an attempt to provide a strategy for examining knowledge problems for individual cases” (p. 74).

### Definition of Terminology

#### Browsing

Browsing is a method of image search in which a user enters an unknown space in order to trigger unexpected consequences and explore potentially relevant information from new angles.

#### Image Retrieval

Image retrieval is information retrieval which includes images as information types. Images may be indexed based on primitive features, various levels of connotative or denotative meaning, and associated metadata.

#### Information Need

An information need is a user’s gap in knowledge, the filling of which aids in the user reaching a specified goal. Note that a user may not be aware of such gaps in knowledge, or of the specified goals associated with these gaps, and that corresponding information needs may still exist.

#### Information Seeking Behavior

Information seeking behavior refers to all the behaviors which a user may

undertake in order to find resolution for an information need. A user need not be aware of an information need to exhibit information seeking behavior.

### Query Formulation

Query formulation is the process of articulating a query which approximates the information need and will interface with a resource, such as a human reference librarian or an automated retrieval system. This process may transcend many iterations of search, as a user approaches the resolution of the true information need.

### Representation

A representation is a creation consisting of any or multiple media which can stand in as a surrogate for an original.

### Satisficing

Satisficing is the decision a user makes to settle for a less than optimal solution, within a context of limitation of time or circumstance.

## CHAPTER 4

### METHODOLOGY

The models and assertions in the previous chapters evoke a model of photographs as documents fundamentally different from word documents; there are no analogs to letters, words, and sentences, so attempts to extract key features from photos that might be like keywords from an article are, at best, very limited. Because the meaning of any document is dependent on the “user in the loop” and because there is relatively little of predictive value to be derived from the colors, luminance, and edges in a photograph, examining the user component may be of value in modeling image retrieval. This examination has at its heart evocative discussions with experienced and expert users of photographs, instead of analysis of the reactions of many randomly selected people to some experimental construct. Therefore, semi-structured interviews were chosen to enable this exploration.

#### Interviews

Interviews were conducted with a convenience sample of people in a variety of professions, all of whom more or less frequently conduct online image searches. The interviews were semi-structured, in-depth interviews using a conversational format. Schamber (2000) asserts that “the flexibility of the methods makes them particularly suitable to exploratory work” (p. 744). The interviewer worked from a list of compiled questions, choosing which questions to ask in which order and adapting to the flow of the interview and the particular interests of a specific interviewee. Each interview can be seen as the focus of a research cycle, as after each interview, the researcher transcribed the interview recording, reviewed it, and identified emerging issues and

themes before revising the interview approach accordingly for subsequent interviews. An interpretive content analysis was conducted with the interview transcriptions.

The purpose of the interviews and the content analysis was to generate insights and concepts, rather than to make any generalizations. It is intended that results of this study will help to shape further research on the topic, building a framework of questions which may be further explored in order to better understand and support users in problems of image search.

## Sampling

### Population of Interest

The population of interest consists of people who are deeply concerned users of online images, and specifically photography. In particular, we are interested in users from the worlds of journalism, news correspondence, blogging, visual art, photography, online shopping, genealogy, academia, architecture, and web design.

### Fields and Occupations of Interest

Fields of interest include information science, media studies, communication, psychology, biology / anatomy, chemistry, physics, mathematics, architecture, performance arts, visual arts, and language. Occupation types of particular interest include students, professors, editors, copywriters, document writers, magazine publishers, small business owners, librarians and archivists, bloggers and social commentators, scientists, fashion designers, teachers, architects, inventors, reporters, archeologists, realtors, event coordinators, musicians and artists, filmmakers, graphic designers, storyboards, and writers.

## Identifying Participants

For the purposes of this interview, the ideal participants are insightful, articulate, and experienced in image use and search. They were interviewed about image searches conducted for business or leisure, and the profile of the participant includes more complexity than simply occupational information. Other factors of interest include age, gender, level of education, and familiarity with technology. The researcher has chosen to focus on depth of study versus breadth, and the interview sample consists of key participants, all of whom have extensive experience with digital images and online image search. The previous chapter includes arguments supporting the use of experts in studies of this type.

Four primary participants were chosen to be interviewed. All four are heavy image users. In addition to conducting simple keyword searches, they also have more complex needs for images and extensive experience with image search. Their educational and professional backgrounds are varied. It was discovered during the process of the interviews that all four interviewees are also avid photographers, either by hobby or profession. Brief profiles of each interviewee follow:

- 1) NS– 32 year old male, commercial film and video editor, filmmaker, graphic and website designer, photographer, Bachelor of Arts in interdisciplinary studies
- 2) JB– 31 year old female, archivist, photographer, Master of Arts in intermedia studies, Master of Fine Art degree in intermedia studies, Bachelor of Fine Arts in photography

- 3) SBS– 26 year old male, teacher, graphic designer, photographer, 2 years towards Bachelor Degree in chemistry
- 4) RB– 47 year old female, art reference librarian, painter, photographer, Master of Fine Arts in painting and drawing, Master of library and information science, Bachelor of Fine Arts in art history

These participants all meet the criteria of heavy image use, whether in personal or professional capacities, or both. Preceding formal interviews, the researcher requested a brief summary of experience and credentials. It was only during the course of the interviews, however, that it became clear that all four participants identify themselves as photographers.

Additionally, two participants from the Library of Congress agreed to be interviewed. They shared their insights in terms of their experience as expert image users as well as conceivers and administrators of the Library of Congress Prints and Photographs Division interaction with Flickr Commons™. They have also explicitly agreed to be included in this research by name.

- 5) Helena Zinkham, Chief, Library of Congress Prints and Photographs Division
- 6) Michelle Springer, project manager, Library of Congress Office of Strategic Initiatives, Web Services

Both Library participants are trained librarians, although their current roles and responsibilities focus on different activities. Both Zinkham and Springer have been involved in the Flickr Commons™ project from its conception. The Flickr Commons™ project is discussed further in the introduction and in the discussion chapters.

## Instrumentation

The main instrument used in this study was an interview script, which includes a collection of questions, which are options to be asked within an interview conversation. Each of the objectives, as well as the sample questions, is coded here in behavior analysis terms of whether it is concerned with an Antecedent (A), a Behavior (B), or a Consequence (C). Understanding the questions of the study in terms of the ABCs will aid in applying Anderson's FOC model to the results. Note that some questions may be coded more than once. Specific implications and analysis of this coding will be discussed in the following chapters.

### Interview Question Sequence

- Participant reviews informed consent notice and is provided with an overview of the research, as well as an explanation of interview format.
- The participant is asked simple demographic questions.
- The interview continues to the body of questions.

### Primary Objectives to Address within Interviews

1. To identify query types the participant uses. (B)
2. To identify how participants intend to use images they are seeking. (C)
3. To identify how participants decide when an information need has been met. (C)
4. To identify which factors influence the participant's experience of image search.  
(A), (C)

### Sample Questions to be Asked

Each interview objective corresponds to a number of questions which can be asked in the interview. Included here is a sampling of these questions, grouped by objective:

Identify experience with image search

1. When and how often do you conduct your own image searches? (A)

Identify context of image search

2. What are your typical motivations to do images searches? (A)
3. In which roles do you search? (Professional, Personal, etc.?) (A)
4. Do you attempt to avoid conducting image searches? Why? (B)

Identify how participants intend to use images they are seeking

5. Give an example of a typical image search you might conduct. (A), (B), (C)
6. Why do you do image searches? (A), (C)
7. Do you ever create your own images (when search fails)? (B), (C)
8. Do you ever modify images (which you have found)? (B)

Identify strategies for image search

9. Give an example of the type of typical search process you may follow. (B), (C)
10. Why do you follow this process? (B), (C)
11. How do you begin your image search? (A), (B)
12. Where do you search for images? (A), (B)
13. Is browsing for images a part of your search? (B)
14. Describe examples of image searches which include textual information. (B)
15. Give an example of when, during an image search, you may recognize that your strategy is not working and change strategies? (A), (B), (C)
16. What do you do to narrow down or clarify your image search? (B), (C)

Identify query types used and how



17. Explain your experience with this type of search: “I know what I am looking for, and images satisfying this query can be described by a unique set of one or several nouns.” (B)
18. Explain your experience with this type of search: “I know what I am looking for, and there are a variety of image types which could satisfy this query, each of which could be described by a unique set of one or several nouns.” (B)
19. Explain your experience with this type of search: “I do not know exactly what I am looking for, but I will know when I see an image whether or not it satisfies my need.” (B)

Identify internal approach to image search for each query type

20. Describe the moment you recognize an information need. (A)
21. When do you internally visualize the image you would like to find? (A)
22. How do you formulate a query for an image search? (B), (C)

Identify how participants decide an image information need has been met

23. How do you choose the image you want? (A), (B), (C)
24. How do you know that a particular image meets your image need? (C)

Identify which factors influence the participant’s experience of image search

25. Explain how satisfied you are with image search in general. (C)
26. Do you ever feel you are making due with a less than optimal search result? (B)
27. Describe how satisfied you generally are with your image search results. (C)
28. Describe how satisfied you are with image search resources available. (C)
29. What about your method do you think works particularly well? (B), (C)
30. What about your method does not work well? (B), (C)

31. Tell me about any specific challenges you face in image search. (A), (B), (C)

Identify desires for improved retrieval systems

32. What types of improvements would you like to see in image retrieval systems?

(Inventions/technology, processes, descriptions) (A), (B), (C)

### Data Collection and Analysis

Due to the nature of the review process following each interview, the series of interviews evolved with each iteration, as well as during each interview. After each interview, the researcher recorded observations and explored insights that may have arisen during the interview, modifying the interview script for the subsequent interview. Likewise, the interviewer approached each interview with the flexibility to adapt to the particular interests and concerns of the individual interviewee.

### Examples of Questions Which Emerged During Interviews

As expected, non-scripted questions emerged during the process of interviewing. Some questions were incorporated for subsequent interviews, while some were simply interesting to make note of. Examples of these questions follow, along with coding as to which of the ABCs they may refer. Due to the context in which these questions may be asked, three of these example questions are double coded.

- How do you decide which images to use? (B), (C)
- How did you learn to search? (A)
- How do you search your own digital collections? (A), (B)
- How do you organize your own digital collections? (A), (B)
- When do you give up (on an image search)? (C)

## Content Analysis

Schamber (2000) describes content analysis as “a well-established set of techniques for making inferences from text about sources, content, or receivers of information” (p. 735). She goes on to explain:

The analytic process requires the use of a coding scheme, which consists of categories and operational definitions for specific variables (e.g., images of a certain societal group). Content-bearing units are identified in the texts and coded for appropriate categories. Categories can be derived inductively from the texts being analyzed, adapted from previous studies, or adopted unchanged from previous studies. Inductive content analysis is particularly appropriate for research that takes a grounded theory approach, or which derives theory from data rather than verifies existing theory. The development of new schemes entails decisions about units of analysis, category construction, and coding procedures. (p. 735)

Interviews in this study are analyzed according to this method of content analysis.

Krippendorff (1980) declares that content analysis can be unending and will generally create new questions rather than provide final conclusions. Accordingly, the first step of the content analysis began during the interviews themselves, while the researcher worked from an interview survey, allowing the flow of questioning to be flexible and accommodate the profile and interests of the interviewee. After each interview, the researcher transcribed the interview, closely reviewed the transcription, and modified the interview script for subsequent interviews. Throughout this process, the researcher noted any possible coding terms as they emerge. After all interviews were conducted and transcribed, the researcher took a first pass at developing a coding scheme and then began coding the transcriptions, adding new terms as necessary and modifying the scheme as appropriate. Concepts emerged as organizing principles for the coding terms in some cases, and in others, the researcher explicitly organized terms into concepts. For example, the term “doing things with images” became a concept as

well, whereas terms such as “search by color,” “search by image,” and “search for similar images” were explicitly categorized into the concept “search by image attributes.” Concepts were then organized into categories, which became a high level representation of what may have been revealed through the interview process.

Word processing software was used for transcriptions and coding. The next step was to extract excerpts from the transcripts and organize them by the terms applied to them. By examining excerpts corresponding to coding terms, the researcher gains insight by understanding the coding terms in their own context. The content analysis is conducted in order to yield emergent categories which can be used as the bricolage Copeland (1997) refers to as building blocks for an engineering design of information seeking behavior.

## CHAPTER 5

### RESULTS

Upon completion of the interviews described in the previous chapter, certain patterns seemed to emerge, aspects of answers to our research questions were suggested, and new questions arose. Findings are explored in this chapter.

#### Interview Summaries

Each of the four initial interviews and the additional Library of Congress interview is described here in brief. Full interview transcriptions are included in Appendix B.

##### Interview 1

The interview with NS, a 32 year old male, included reference to various aspects of his image usage, including that related to personal, as well as professional roles in commercial film and video editing, filmmaking, graphic design, public relations and marketing work. He credits his liberal arts education for his approach to documentary filmmaking, for example, and he considers himself relatively technology savvy. Personal applications include discovering and exploring vacation destinations, accommodations, and restaurants, for example by examining available images “to get a sense of what an experience would be like without actually having to invest either money or time in going there” using travel planning websites or Yelp®. In other words, he is using image search “to aid in decision making.” Another example consists of searching for pictures or further information about potential roommates or collaborators through resources such as the professional networking website, LinkedIn®, and the social networking website, Facebook®, in order to “give you more of a complete picture of what they’re about before meeting them.”

Specific examples of image information needs he described include:

- Images to illustrate a current events story
- Following trails or connections within a social network (voyeurism)
- Materials for creating a funny image to show a friend
- Sharing images with friends to add context to a conversation
- Images that someone else needs
- Designing invitations or posters
- Search for new desktop backgrounds by resolution only
- Understanding current events
- Context for celebrity news
- Sharing an experience with a friend

He cited using image search engines such as Google Image Search™, Facebook®, LinkedIn®, iStock® photos, and Getty Images®.

He describes a typical search process as follows: construct a query, use advanced search features to filter for high-resolution images, scan and click on next page as necessary, until finished. If there is unanticipated ambiguity, then he will modify the search term, either choosing a term he believes may be more effective, or “shooting in the dark” out of desperation at possible search terms. He believes that this desperation is most likely when an image need is very specialized or very ambiguous. He also states that he usually knows “based on the first round of results, how hard the task ... is going to be.”

He also describes searching on tangents, similar to his example of voyeuristically navigating through images on a social network. He identifies the “totally irrelevant result

that just is interesting for some reason, because you weren't thinking about it two seconds earlier, and it just shows up there, and something about it piques your interest."

When searching for someone else, he described his process as starting with a goal to "extract as much information as possible from them" and then "show them ten different things that you think meets the criterion." He may ask, "What do you like that is similar to what you want?" and "What did you like about it?" or "What didn't you like about it?"

As a designer, he considers it his job to "interpret someone who's often inherently not good at expressing either what they need or want, and having an ability to transfer that into a visual aesthetic." He described an analogy of music search and searching by genre, tempo, or feel of an image as examples can describe the search for mood-driven images. He also used an example of comparing 100 pictures in a grid versus 100 small paragraphs to illustrate the differing value of images and text. He offered the suggestion of improving retrieval by giving the option of returning different search results with each search, even with the same search terms, in the manner of Yoon (2008).

Challenges with image search he identified include:

- Legal copyright issues
- Getting too many non-relevant results for a particular type of search
- Low-resolution where high-resolution is needed
- High costs of stock images
- Inability to search based on 'mood' of images

- Many repetitive results; “Great images that are obscured because they’re on the hundredth page [of results],”

## Interview 2

The second interview subject, JB, a 31 year old female, is a photographer by education and profession, as well as a professional archivist at an art library. She has two Masters Degrees which relate directly to her work as a photographer but no formal education in archiving. She does not believe that photographs taken with iPhone® can be considered art. She describes herself as “not a native technology user. ... but I found it very easy to adapt to technology.” She talks about looking for clues on websites or search engines that help her decide how likely the resource is to help her meet her information need. She actively thinks about the role of technology in her life and how she is “technically, or mentally, or emotionally connected to it.” She appreciates that technology helps her stay in touch with people, but she is not comfortable with the prevalence of technology and resulting overstimulation. Thus, she avoids certain news and video websites. As an avid photographer, she always has at least three cameras with her and has recently added an iPhone® to her collection of available tools. She says that she uses technology primarily for “seeing images and putting images out there.”

She feels she has good communication skills and good intuition. She finds that she is good at being able to understand what someone is trying to say and summarizing it, a skill to which she partially attributes her success with searching. This point echoes the comment by NS that good designers must have just those abilities.



She maintains both a physical collection of printed photographs – both her own and found images – and digital collections, which include an estimated 25,000 images on Flickr® (uploaded over the past 6 years), at least two external hard drives in addition to her computer. These digital collections include scanned negatives from her film cameras, digital scans of slides, and digital photographs. The fact that she can easily share digital photographs has replaced the previous need to print them.

She uses very specific tags to index and retrieve her own images, and in her offline collection, folders to organize images. They include location-based information and are organized hierarchically. Over time, her tagging strategy has gotten to be more detailed, but it still depends on her self-described good memory for dates and tendency to “associate dates with emotional experiences.” As a professional archivist, she is aware of the utility of metadata and would like to incorporate more into her collections.

Specific examples of image information needs she described include:

- Images for flyer design
- Checking for online images of items in the library’s collection
- Pictures of animals that look like her cat
- Pictures of food
- Pictures of birthday cakes
- Wood-block print by a specific artist
- Particular pattern of antique china
- Photographs from a certain time frame of a certain subject
- Photographs shot on film, rather than digitally
- Pictures of past events

- Collecting images to remember
- Collecting photographs associated with recipes
- Collecting wedding images
- Faces with similar facial structure
- Gifts, clothing, or vintage shoes

She cited searching for images in locations such as Google Image Search™, YouTube, Instagram®, Pinterest®, Tumblr®, eBay®, and Etsy®. She conducts both self-directed searches, as well as searches for others.

A search process for her may include trying different variations of some selection of keywords, and she has found that there seems to be some kind of hierarchy that works better than others. She uses Boolean searching. She sometimes searches by image rather than text, because although the image is not her end goal, she finds it to be a faster way to find what she needs. Sometimes she will satisfice by ending her search with an image which was not initially what she had wanted but which contained the fundamental message. JB finds that her search process is often more effective than those of others. This may be due to knowing where to search and her choice of search engine. Of more difficult searches, she says, “I usually know what it is and find it – I don’t know if there are a lot of times where I look for something that’s just sort of a vague idea of what I want.”

She explains that her image searches have changed over time, in that they tend now to be more specific or vaguer than they had previously been. This point also echoes observations expressed by NS. On the relationship of images and text, she says that she is not able to express her visual work in words until about six months later. She

would love to be able to search by typing in explanations in natural language of what she would like to find.

Challenges she has encountered with image search include:

- Overstimulation
- Lack of source information in online images
- Inability to trace how online visitors are finding her images

### Interview 3

SBS is a 26 year old male and a teacher, as well as a graphic artist. Through his background in pedagogy, he recognizes different learning styles and found that many people, like him, are visual learners, learning through the use of visual images, rather than through words, or “technical language.” When teaching others, he gets creative and makes use of visuals and images to more effectively communicate concepts or instructions. He sometimes modifies images to make them three dimensional, so that students can continue to “see” images through their fingers, even with closed eyes. He almost always incorporates images in one way or another.

He believes that his interest in communication and development of related skills started very young in his attempts to help people avoid misunderstandings. He credits to this interest his discovery of images as a tool for communication and his interest in using and understanding images. Another advantage he sees of using images to teach is the encouragement of a focus on the enjoyment of learning. This attitude is well captured by Marshall McLuhan’s statement that: “Whoever makes a distinction between education and entertainment does not know a thing about either” (as cited in Prensky, 2002, p. 7).

He also spoke about image searches that he conducts in order to do advertising for himself and his organization, as well as to teach himself about photography. In his self-directed learning, he finds and then studies photographs he likes and then tries to reproduce them with various tools.

Specific examples of image information needs he described include:

- New screensavers for his computer
- Landscapes to use as backgrounds for advertisements
- Image of bamboo in a specific shape
- Image of the sun with spikes around it
- Images for his boss according to specific criteria

He cited searching for images in locations such as DeviantART®, Wallbase.cc, and Customize.org. He tends to avoid Google Image Search™ and does not like Flickr®. In fact part of his search strategy is to choose first where to search. He goes to different search engines depending on his specific search.

His search process often begins by choosing categories, narrowing down search results to “photography,” “wallpaper,” “logos,” “drawings,” or “three dimensional art.” These are especially useful, as he is often interested in finding rather artistic, as opposed to medical or directly photographic images. Rather than narrowing his search right away with keywords, he explains that he first browses through wider collections, wanting “to be immersed in that search until I find whatever I like, because I want to see more.” Later he uses keywords at the last possible moment, stating that after narrowing the search he finds “almost the same things, or things that are not appealing.” For advertising purposes, he sometimes searches by color scheme.

When conducting searches for others, he first makes his decisions about where to search and which categories to use, if any. The person he is searching for chooses the keywords, which are then input at the appropriate time. Through experience working with a person, he develops a better understanding of what kind of images are more likely to satisfy an information need.

He has a digital collection of his own photographs, and he organizes them by intended audience, type and date, duplicating images as necessary in case they fit into more than one category. This design mirrors the way he searches for online images by using categories. In both environments, his preferred method of searching is browsing through increasingly narrowed sets of images, without keywords.

Challenges of image search he encountered include:

- Images being too small to be used
- Too many search results
- Legal copyright issues

If he encountered a copyright problem, then he may ask for permission directly from the image creator to use the image, looks for another similar image, or creates the image himself, if possible.

He is excited by developments in technology that allow more people to take more photos in more places, because he likes “to see the world as other people perceive it through images.” He describes the use of words in describing images, as potentially misleading, stating that writers can capitalize on the reader’s own mental image collections and use their “own image database [of memories and experiences] to paint a picture, which is going to be way more beautiful than just one single picture.” He

explains that with images, one has the opportunity to experience an image directly, without that experience being “tainted by that person’s idea of what it should be.” He believes that a conversation about images should start with images and then words, and he would like to see online forums where interested parties could share their images with each other and engage in serious dialogue with each other about their work. Ideally, such a forum would highlight the image by presenting it over “60-70% of the screen real estate, and then comments will come later.” He says, “I don’t want your opinion. I want your opinion, and I want to answer you back.”

#### Interview 4

RB is a 47 year old female and holds two Masters Degrees – a Masters of Fine Art and a Masters of library and information science. She has worked as an art reference librarian for six years, teaches an iconography class to art students, and is an avid painter and photographer. She uses image search in various professional capacities as well as for some personal pursuits. Part of her professional use of image search is in helping students find images appropriate to their needs, as well as other self-directed tasks. When searching for someone else at the reference desk, the patron can see the same screen as she is searching and participate in a type of group search.

Her experience with images includes manipulating images that she has taken by doing things like cropping, increasing the color saturation, and changing brightness and contrast measures. Sometimes she adds text to images or interpolates them to imitate a higher resolution. Her background in library and information science and work experience in libraries results in her awareness of issues such as natural versus controlled language usage, and she uses such “librarian tips” in her searches.

Specific examples of image information needs she described include:

- Images as a starting point for learning more about an art style or topic
- Images which students need for papers or presentations
- Images which students need for their art research
- Paintings and works by certain artists
- Creating maps
- Spicing up newsletters; “Librarians always want to overdo the text.”
- Creating brochures
- Examples to use with students in iconography class
- Images of irises as inspiration for paintings
- Learning more about contemporary work in the visionary art movement

She cited searching for images in locations such as Google Image Search™ and ARTstor, which includes the feature of allowing users to pan around in the image and view it from different angles, which is helpful in the study of architecture, or sculpture. She cites an example of a virtual exhibit of the Alhambra which shows the museum as well as the collection, so that the user experience is nearer to the experience of being present. When searching for images that students need, she appreciates advanced search options, such as the ability to search by geographical location, format, date, culture, color scheme, and other fields.

For images used for students, she looks for images with simple, direct subject matter from an iconography perspective, and it is important to her that the digital images she uses are as close as possible to the original paintings.

In a personal capacity, she uses image search to find inspiration for her paintings, to learn more about an interest or a certain artist. Her own image collections consist of images she has scanned or saved from others, and photographs that she has taken. These collections are organized in various Microsoft PowerPoint™ presentation documents by type of object or type of place depicted. These photos are used primarily for inspiration for paintings or construction projects, like building garden structures, which she considers wanting to pursue professionally someday.

She expressed a belief that “people usually respond to an image first by its color, and then there’s a color and a mood, so their emotion is usually the first thing that appeals to it.” This echoes what SBS shared about the emotional connection to images and their subsequent value in communication.

Challenges of image search he encountered include:

- Need high-quality images
- Need high resolution images
- Difficult to find images of art by contemporary artists
- Some databases require subject knowledge to use
- Being asked to help finding images to whose subject matter she is averse
- High cost of some images
- Copyright issues; ARTstor® images can only be used in offline materials

When she encounters copyright challenges, she sometimes makes her own images, using photography and photo editing software.



## Interview 5 -- Library of Congress, Helena Zinkham and Michelle Springer

Helena Zinkham, Chief of the Prints and Photographs Division at the Library of Congress, and Michelle Springer, Project Manager in the Library of Congress Office of Strategic Initiatives, graciously agreed to be interviewed for this study.

This interview was unlike the previous four, especially in terms of their focus in the world of online image search. Both Zinkham and Springer have been heavily involved in learning to understand user behavior and serve their image needs. Both been involved in the Flickr Commons™ project since its inception in January, 2008. As explained in detail in a Library of Congress Report by Springer et al. (2008), the library's decision to begin uploading images from their collection led to Flickr management adding a "No known copyright restrictions" option for photos such as these and then to launch the Flickr Commons™ project, which now over fifty cultural heritage institutions around the world have joined.

Zinkham and Springer shared lessons learned from their experience with Flickr users, including the confirmation that people prefer "direct access to images" and the ability to browse visually. They have enjoyed Flickr's automated browsing tools, improving upon old methods of having users sift through boxes of photos or showcasing "the most popular or heavily requested pictures." They also confirmed that "access by subject, more than creator, is critical." In the Flickr world, that means that tags referring to the subject of an image are highly valued.

They explained that in their interaction with Flickr, they did not solicit any particular type of participation from users but simply "invited them to tag" and "wanted to see what was meaningful to the people looking across the pictures." In terms of the

types of tags created by users, they confirmed that a high percentage were duplicating information the library provided for the image in metadata, such as locations. Some tags have no clear meaning and are assumed to be meaningful only to the tagger, while many tags were reactions to photos and keywords describing image details including format and type. Users also added tags which were translations of existing tags into other languages. They have seen that “people who comment don’t necessarily tag and vice versa.” Comments include “fuller surnames, the identification of people, discussions about a particular type of aircraft,” etc., and may often include “verification with links back to the New York Times, or links back to other sources that support what they are asserting about the image,” or even a link to the photographer’s or subject’s obituary.

Overall, this interaction has been considered useful to the point that the library adds valuable information from tags, and especially comments, into their own catalog records. About once a year they also then reload the updated data from their catalog records back to Flickr, also “citing the Flickr Commons™ community as the source of materials so that that data is also then linked to the PPOC [Prints and Photographs Online Catalog] record.”

Tags have also contributed to the library’s interactive presence, as photos from their collection are added to Flickr’s special interest groups, for example about “a certain type of bridge or boat” and “things that [they] wouldn’t have the resources to index” at the library. Likewise, tags and comments make images more findable by virtue of their being indexed by search engines, through which users may be directed to the library’s Flickr collections. Popular photos, as designated by high interaction in the form of tags

and comments, also become more findable within Flickr. The library then provides links from its Flickr images back to the library website for users interested in high-resolution versions or the rest of the library image collection.

Of their collection, Zinkham says:

Our collections here at the Library of Congress that we can put out on Flickr is very historical, and it's not heavily curated or vetted. In other words, we're not putting out the best; we're putting out what we have.

In this sense, the input from Flickr is highly valuable in describing the largely uncured collections. Putting these collections online, especially with the enhancing tags and comments, helps specialists find treasures within the collection.

Zinkham states that "Flickr has greatly broadened the audience," although it is not clear how exactly to track this expansion or its reasons. It may be a combination of the increased findability due to tags and comments, or the engagement with an existing social network, or articles and blog posts being written about the collections. Zinkham shared that they do not have "the metrics, tools, or even the mental agility" to accurately analyze trends and how the traffic has flowed between Flickr images, Library catalog records, and various sources that may refer to the images, though this would be interesting in terms of better understanding the use of their collections. Zinkham likens the desire to track this movement to citation tracking and says, "We love to learn who's published our images on the web or in books," but also points out that because "blogs themselves can be very ephemeral," they don't tend to record blog posts about their images. Springer shared that she has "some canned searches on Google and some others that indicate to me when somebody posts." She will then share that information

with other members of their internal team, “so we can be aware of it.” Zinkham commented that an automated mechanism which supported this kind of web citation tracking could be useful.

There are still people who visit the library’s physical collection, although the number of online visitors is far higher. Those who need the physical images are interested in a physical property of the image, such as seeing “the way the grains of silver are setting on the paper,” “the way that it was signed or matted originally in the context of fellow pictures,” or “to see what’s written on the back.”

The two interviewees also discussed their own image searching. Zinkham described searches which include meeting image requests from the office of the Librarian of Congress, and organizing new image collections or potential acquisitions. A specific example was for images of the War of 1812, separated according to whether the image is from the era of the war or “commemorative, after-the-fact images.” For this task, she browsed collections she felt would be promising, and then searched by name for admirals involved in the war or specific battles, as she knew that subject access to such images would be limited in the library collection. A more personal example was of looking for images related to babies for a baby shower. In this case she searched by keywords like “baby, children, infants, mothers and children,” but also keywords like “playgrounds, places you knew that children would be.” She summarized her approach as “trying lots of different terms... or tags.”

Springer described her image searching as following classic librarian training, “finding out what we would call the pearl gathering,” or collecting terms used in images that are similar to the desired image, searching with those terms as keywords, and then

browsing images. She says, “I’ll start broad and then limit it.” She also gave an example of a vague search: “We’d like something that shows people volunteering.” In this case, the tactic was to try some keywords and browse visually to see if anything looked right and conveyed the right feeling.

In the special case of the Library of Congress, they say that people who come looking for images tend to be “pretty grateful to have anything.” They are usually asked for “a name, a topic, a person, or a place.” These experiences are different than the types of requests an image stock agency, for example, may receive.

Experience with Flickr has guided the library in redesigning their online catalog, incorporating viewing options for results, such as slideshow view, or a thumbnail grid showing up to 100 thumbnails at a time for easy browsing. During the time since the project began, the library’s own Prints and Photographs catalog was redesigned, so that “every image has its own static URL” and the images are now more findable as well. They have also added share technology tools, allowing users to easily share images via email or social networking profiles. They would like to further incorporate tools such as a lightbox, or bookbag, where users can save images that they want to look at again later, or create galleries of others’ images to share.

The increase in speed of transactions offered by online catalogs and digitized photos was acknowledged as a great benefit. An instance of desired future tools include image query searching that allows building with shape vectors, such as for designers who may imagine building the image they are looking for piece by piece into a visual query. Facial recognition and shape or object recognition were also identified as desired capabilities. Three-dimensional technologies, including 3D visualization tools, are also

an area of interest for future incorporation. They discussed the fact that user experiences are device-dependent, and the “sweep of the finger” browsing with an iPad is simply not possible when using a computer terminal in a reading room or at home. Currently, the library digitizes and uploads 30,000 to 50,000 new pictures a year, pursuant to availability of funding and other resources.

The library also fosters relationships with existing communities and experts, such as the Society of Baseball Historians or a garden historian. These relationships are mutually beneficial, as one party enjoys access to the library collections, whereas the library may sometimes “reach out to the editors of the civil war magazines” and “they can tell one kind of gun from another, if we need to know that.” Zinkham states, “We can do a basic level of description, but having to cover the whole universe, we can’t always tell one kind of plant from another.” Springer makes the point that Flickr users sometimes link to communities of interest, such as “an airplane aficionado website where it’s very detailed, obviously, where communities are residing, so that it gives us clues, where if we do need to reach out, we know where to go.” They may also write to the webmasters of reliable websites to ask for information. Springer summarizes the benefits of interaction with Flickr and other communities:

By heightening the interest and request for groups, and putting [these images] in a place like Flickr, where people are really focused on photographs, so if the community of interest there is specific to a particular subject, you often touch those communities, even though you aren’t trying to, because you have such a large, broad base of community just interested in images.

## Results of Content Analysis

Through the process of content analysis with the first four interview transcriptions of this study, a set of 55 coding terms, 23 concepts, and 6 categories emerged. Note: Findings from the Library of Congress interview are discussed in the following chapter.

Table 3

### *Emergent Categories, Concepts, and Unique Coding Terms*

Categories	Concepts	Unique terms
Challenges	challenges	avoiding image search
		changing strategies
		language barrier
		natural language
		resolution
	frustrations	cost issues
		deception / misleading
		frustration
		inability to trace source
		copyright issues
		too many images
	overall satisfaction	improvement for systems
		satisfaction
Experience	background	evolved over time
		experience
		context
		increasing access to images
	knowledge	knowing where to search
		knowledge of self
		understanding of learning
		understanding of technology
	personal collections	building digital collections
		organization of collections
	role for searching	roles for searching
	writing vs. images	images need words too
		writing vs. images

*(table continues)*

Table 3 (continued)

Categories	Concepts	Unique terms
Goal of Search	communication	communication
		Interaction
	doing things with images	doing things with images
	hidden image search	hidden image search
	learning and teaching	learning
		teaching with images
	other reasons	reason for search
Knowing Search is Over	creating own images	creating own images
	giving up	giving up on search
	knowing you've found it	knowing you've found it
	satisficing	satisficing
Search Process	place for search	place for search
		searching own collection
	search process	keywords
		metadata
		search process
	types of search	browsing
		categories
Thinking about Images	criteria for search	criteria for search
		diagrams
		emotion
		envisioning
	query type	context
		libraries
		prompting search
		query type
	search by image attributes	search by color
		search by image (for image)
		similar image

Figure 20 is a visualization of emergent categories, and Figure 21 is a visualization of emergent concepts within their respective categories.



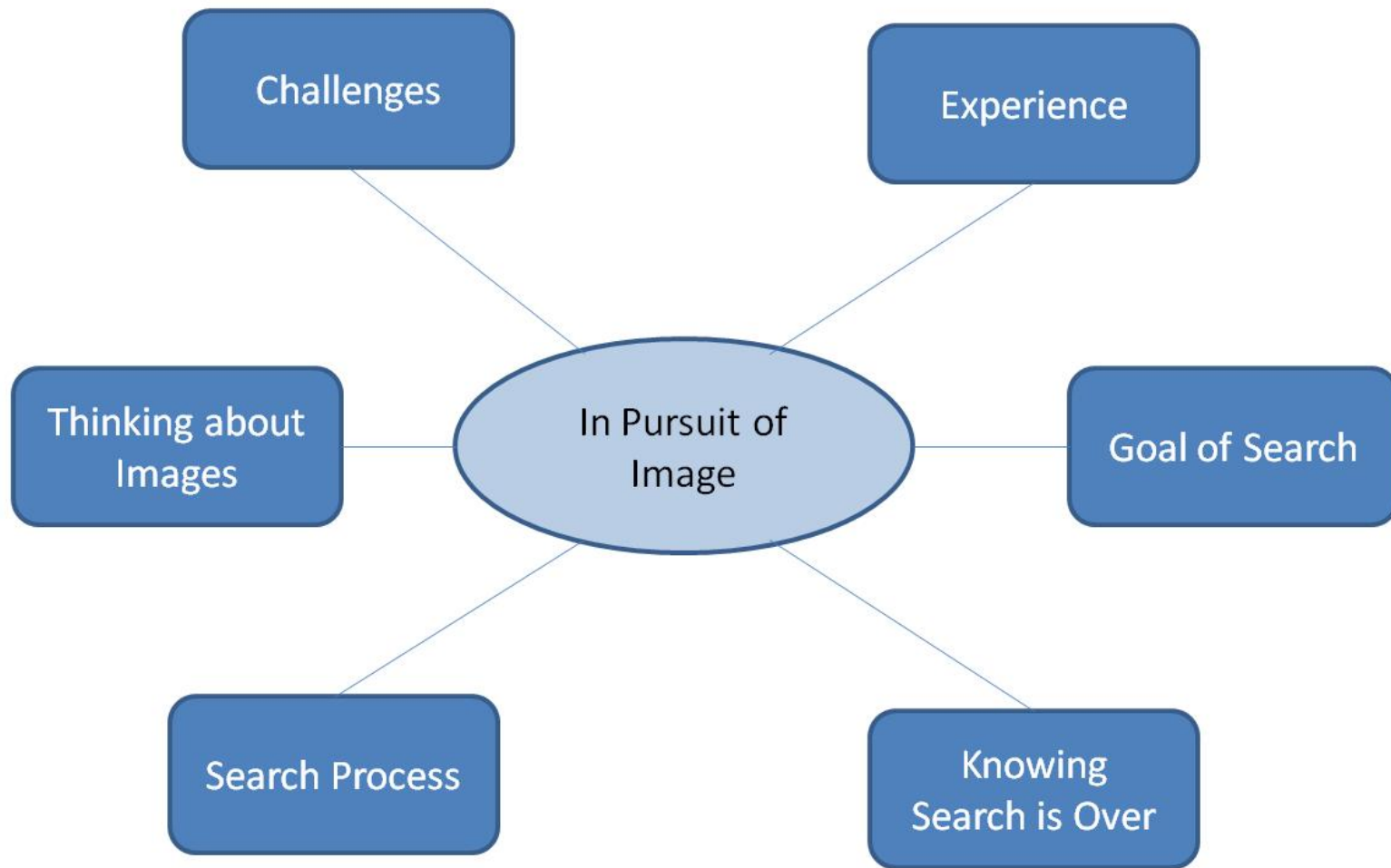


Figure 20. Emergent categories.

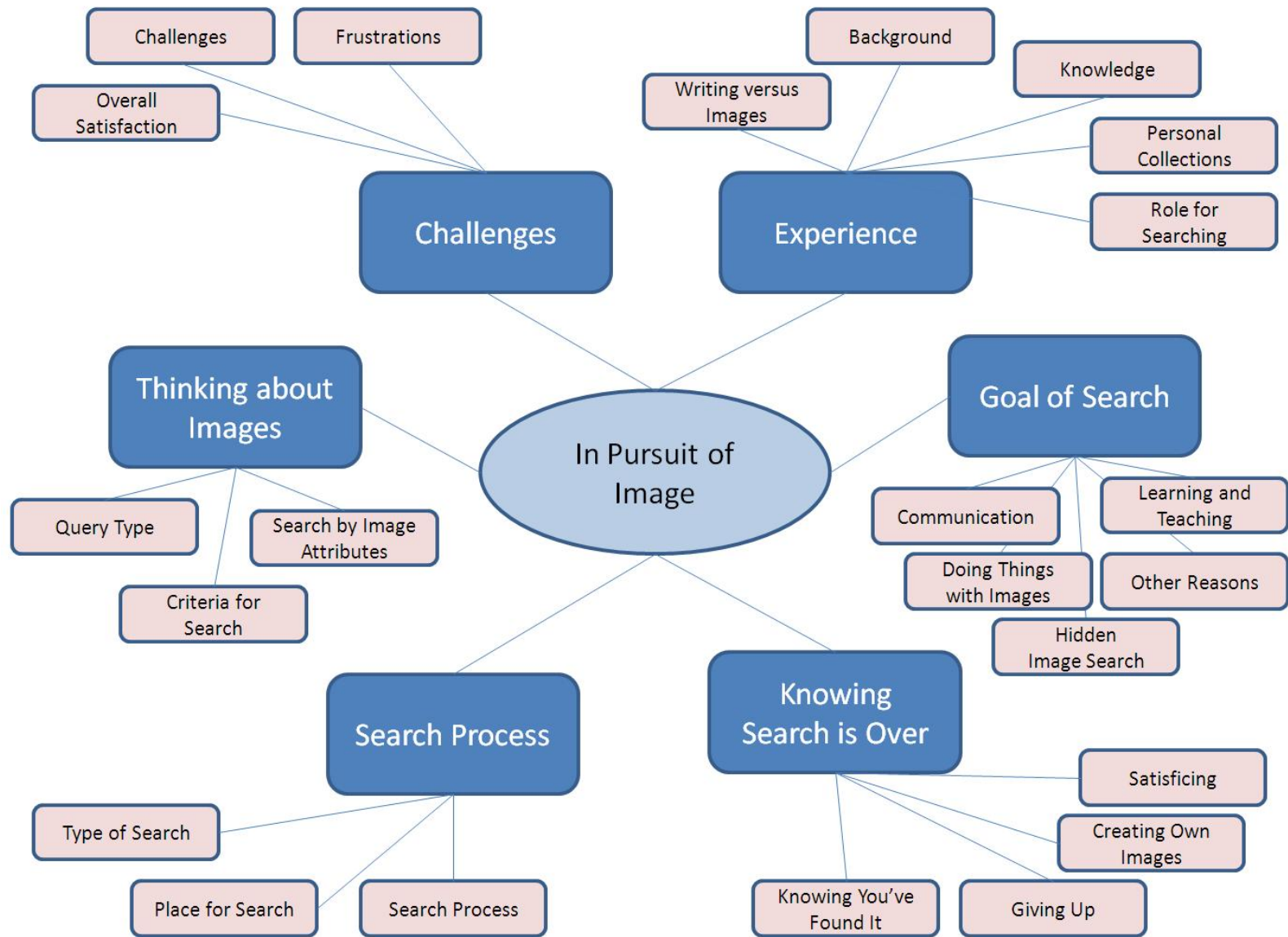


Figure 21. Emergent categories and concepts.

## Functional Analysis of Results

Anderson (2006) explains the concepts of ontology with which his functional ontology construction model is concerned:

Ontology within the context of this work is simply that which exists within the environment of an individual. The functional ontology is comprised of those elements of the individual's environment that have behavioral function. Ontology as traditionally used in information science emerges as a consequence of the collective instances of individual behavior. (p. 29)

In other words, the model aids in discovering and describing an ontology for image search behavior based on a functional ontology of the user experience of image search. The interviews conducted as a part of the research for this dissertation were intended to identify those elements of an individual's environment that have some type of behavioral function in the context of image search. Applying the functional ontology construction model to the data collected in this study and the resulting content analysis may support the development of a framework for the study of image seeking behavior.

As a step towards applying the functional ontology construction model in this study, Table 4 is a replication of the table of emergent results, with the additional dimension of including unique terms organized by coding of Antecedent (A), Behavior (B), and Consequence (C). In applying coding labels to the emergent results of the content analysis, it became clear that the unique terms were the results to which the coding could be most effectively applied, as they are the most atomic units of analysis. At times, terms within the same concept were coded differently, and as a result, terms within the same category were assigned different codes.

To provide an additional angle, the results of this coding process are presented

in Table 5, organized by emergent categories, but not concepts, into Antecedents, Behaviors, and Consequences. This distribution of emergent terms by category, organized by their coding may aid in a better understanding of how to interpret and address these issues. It may also be seen as a critique of the concepts established in the content analysis to contain the unique terms and be contained within categories.

In an effort to analyze each category in terms of its antecedent, behavior, and consequence terms, a discussion follows for each of the six emergent categories.

### Challenges

The challenges category includes emergent concepts of “challenges,” “frustrations,” and “overall satisfaction.” The latter two are composed exclusively of terms which were coded as consequences. Both concepts refer in this analysis to frustrations with the image search process and satisfaction following an image search process, each of which could have impact in the antecedent portion of the behavioral space, but which primarily appears after image searching behavior. The first, however, is the only of the 23 emergent concepts that included terms coded in all of the ABCs and may thus warrant a closer look.

This “challenge” category includes very different types of concepts. For example, the concept “challenge” functions in a sense as a catch-all for terms related to challenges which do not fit into the “frustration” and “overall satisfaction” concepts. The concepts of “language barrier” and “natural language” issues are coded as antecedents; “avoiding image search” and “changing strategies” are coded as behavior; and the issue of “resolution” is coded as a consequence. The fact that concepts within the same category are coded differently within the ABC structure may suggest that the

misplacement of some of these terms into these particular concepts and categories. It may be that “language barrier” and “natural language” issues fit more appropriately into the “experience” category, and the “avoiding image search” and “changing strategies” issues fit more appropriately into the “search process” category.

### Experience

All the terms in the experience category are coded as antecedents. This coding is logical, as the category of experience was created based on comments related to the various types of experience that a user had prior to a search and thus brought to the search situation.

### Goal of Search

The terms in this category were all coded as consequences except for one, hidden image search. This particular term refers to instances described in the interviews of a user exhibiting search behavior but not recognizing or identifying that they were conducting a search. Six of the seven terms in this category are coded as consequences. Although the goals of search may indeed inform circumstances that lead to a search (antecedents), it was decided that coding these terms as consequences is more appropriate, based on the fact that the goal of search is something that can be actualized only once the searching behavior has been adequately successful.

That “hidden image search” is the one exception in the category, being coded as antecedent, suggests that there may be some inconsistencies in the content analysis which generated these terms and distributions, or in this coding process.

### Knowing Search is Over

All terms in this category are coded as consequences. Each represents a

possible consequence of image searching behavior, each in a different context. In one behavior instance, the searching behavior may result in a person deciding to create their own image to meet the need, rather than continue searching. Alternately, the searching behavior may result in the user recognizing that the right image has been found, the user giving up on the search altogether, or the user deciding to satisfice and use an image which does not fully satisfy the initial information need. While these actions may also be considered behaviors, they are not image searching behaviors and thus do not qualify to be coded as behaviors in this context.

#### Search Process

All terms in this category are coded as behaviors. They all represent details of image seeking behavior, from the decision of where to search, deciding to search one's own collection, using keywords, searching metadata, specific behaviors of search process, browsing behavior and searching by categories.

#### Thinking about Images

The terms in this category are coded as antecedents and behaviors. Terms within the "criteria for search" and "query type" concepts are coded as antecedents and all refer to characteristics of the image need which prompts the searching behavior in a particular behavior instance. Terms within the "search by image attributes" are coded as behaviors, and refer to the type of searching which is done – search by color, search for images using images as queries, and search by similar images.

The fact that the third concept group is coded as behavior may suggest that the concept and those terms may be better placed in the category "search process" where all included terms are also coded as behavior.

Table 4

*Emergent Results with ABC coding*

Categories	Concepts	Unique terms		
		Antecedent	Behavior	Consequence
Challenges	challenges	language barrier	avoiding image search	resolution
		natural language	changing strategies	
	frustrations			cost issues
				deception / misleading
				frustration
				inability to trace source
				copyright issues
				too many images
	overall satisfaction			improvement for systems
				satisfaction
Experience	background	evolved over time		
		experience		
		context		
		increasing access to images		
	Knowledge	knowing where to search		
		knowledge of self		
		understanding of learning		
		understanding of technology		

*(table continues)*

Table 4 (continued).

Categories	Concepts	Unique terms		
		Antecedent	Behavior	Consequence
Experience (cont.)	personal collections	building digital collections		
		organization of collections		
	role for searching	roles for searching		
	writing vs. images	images need words too		
		writing vs. images		
Goal of Search	communication			communication
				interaction
	doing things with images			doing things with images
	hidden image search	hidden image search		
	learning and teaching			learning
				teaching with images
	other reasons			reason for search
Knowing Search is Over	creating own images			creating own images
	giving up			giving up on search
	knowing you've found it			knowing you've found it
	satisficing			satisficing
Search Process	place for search		place for search	
			searching own collection	
	search process		keywords	
			metadata	
			search process	
	types of search		browsing	
			categories	

(table continues)



Table 4 (continued).

Categories	Concepts	Unique terms		
		Antecedent	Behavior	Consequence
Thinking about Images	criteria for search	criteria for search		
		diagrams		
		emotion		
		envisioning		
	query type	context		
		libraries		
		prompting search		
		query type		
	search by image attributes		search by color	
			search by image (for image)	
			similar image	

Table 5

*ABCs of Emergent Unique Terms by Category*

Emergent Category	Antecedent	Behavior	Consequence
Challenges	language barrier natural language	avoiding image search changing strategies	resolution cost issues deception / misleading frustration inability to trace source copyright issues too many images improvement for systems satisfaction
Experience	evolved over time experience context increasing access to images knowing where to search knowledge of self understanding of learning understanding of technology building digital collections organization of collections roles for searching images need words too writing vs. images		

*(table continues)*

Table 5 (continued).

Emergent Category	Antecedent	Behavior	Consequence
Goal of Search	hidden image search		communication interaction doing things with images learning teaching with images reason for search
Knowing Search is Over			creating own images giving up on search knowing you've found it satisficing
Search Process		place for search searching own collection keywords metadata search process browsing categories	
Thinking about Images	criteria for search diagrams emotion envisioning context libraries prompting search query type	search by color search by image (for image) similar image	

## CHAPTER 6

### DISCUSSION

The question of image search is a complex one. In order to develop a more grounded approach to further exploration of this question, the study described in the previous chapters has been undertaken.

#### Summary of Findings

A variety of creative uses expressed by interviewees inspired a coding term: “doing things with images.” This term is also used as a reverent bow to the work of O’Connor, Kearns, and Anderson in their 2008 book, *Doing Things with Information*. Therein, they state that “doing things with all the media available today is exciting, empowering, bewildering, and multifaceted” (p. ix). This outlook captures the spirit in which this dissertation was both conceived and conducted. The joy of image search and image use was apparent to the researcher during the course of each interview – in the mode, as well as the content of expression shared by this study’s participants.

Against this background, this study’s findings are presented as yet another step forward in a joint exploration of image search. These findings should provide guidance to image users and help to inform future research in this area.

#### Emergent Categories from Content Analysis

The content analysis of conducted interviews reveals some intriguing findings. As outlined in Table 3, the six emergent categories are, in order of how they may arise during the process of discovering an image need and conducting a search: experience, thinking about images, goal of search, search process, knowing search is over, and challenges. Each of these categories represents a main arena of future research

necessary to explore for further insight into the topic of image search. This framework is to be interpreted as a suggestion for how to approach search and concepts contained within each category may be flexible as to deciding in which category they best belong. An explanation of the content of each category, as well as examples, follows:

### Experience

This refers to the profile of an individual user and includes, for example, a user's background and experience with search, the roles in which they search, their knowledge of where to search and understanding of technology, their knowledge of self and of learning concepts, their interaction with personal digital image collections, and their opinions of words vs. images. All four interviewees consider it very important knowledge to know where to search for a particular image. The third interviewee highlighted the importance of knowing how to search, giving an example of a less experienced searcher: "He didn't know where to look. He didn't know what websites to search and which words to use."

### Thinking about Images

This refers to how a user thinks about and searches for images, including the kind of criteria used for image search, what prompts users to search for images, and the types of image queries used.

### Goal of Search

This category includes reasons why users conduct image searches. Examples of motivations for image search include the goal of communication or interaction with others, the goals of learning and teaching, and the creative possibilities of "doing things with images," as discussed above.

## Search Process

This refers to the search process itself, including places where users search for images online, browsing or category-based searches conducted, and strategies, such as using keywords or knowing about metadata. Whether a user is looking for a specific image format, such as a photograph, a drawing, or a logo, would also fall under this category. Two interviewees discussed needing diagrams or instructions in image form.

## Knowing Search is Over

This category describes how users know that a search is over, whether successfully or otherwise. A user might recognize that they have found the right image, or they may satisfice by deciding to use an image although it is less than optimal. Users may give up on the search, and they may decide to create their own image instead of continuing to look. Three interviewees expressed that making an image was often a viable alternative to finding the perfect image.

## Challenges

This category includes (1) conceptual challenges, such as avoiding image search, changing strategies, language barriers, natural language issues, and resolution issues; (2) frustrations, such as cost issues, copyright issues, inability to trace the source of online images, too many image search results, poor retrieval system design, and the possibility that images are misleading; and, (3) overall satisfaction, which includes comments related to how satisfied users are with image search and how they would suggest image retrieval systems should improve.

Regarding desired improvements to retrieval systems, the fourth interviewee described an example of an image database at her University which specifically caters

to student's needs, allowing users to search by design terms students are often asked to make use of. The third interviewee expressed wanting to have more intellectual access to the creators of images they may find: "I want people to focus on the image. It's like a discussion. I don't want to only talk about it; I want to have a discussion about it. Or, I don't want your opinion, I want your opinion, and I want to answer you back."

### Functional Ontology Construction in Image Search

The examples in this section illustrate the use of Anderson's (2006) FOC model within the context of online image search. The material of these examples is taken from interviews conducted for this study.

"To aid in decision making"

NS (Interviewee 1) explained a type of image search that he conducts regularly:

Maybe I'm using Yelp® to get a sense of what a restaurant looks like, or what their food is like. So sort of to get a sense of what an experience would be like without actually having to invest either money or time in going there. (Interviewee 1)

This particular behavior instance can be described in terms of:

Antecedent – User knows of a particular restaurant

Behavior – User searches Yelp for their profile of the restaurant and thus images of the restaurant and its food

Consequence – User gains "a sense of what an experience would be like without actually having to invest either money or time in going there"

Applying FOC logic to this behavior instance suggests that the signals present in the antecedent conditions may acquire behavioral function as an establishing operation (EO) for the behavior, making it more likely that when this user encounters restaurants, he will go to Yelp for the profile of the restaurant and pictures. Likewise, the behavior

may acquire behavioral function as an operant behavior if it continues being followed by the consequence of getting the desired sense of the restaurant experience, and that consequence may become a reinforcer for the operant behavior. This analysis may explain why NS uses the described behavior and may be used to predict whether and when he will exhibit the same behavior in future search instances.

“Shopping for antique china”

JB (Interviewee 2) described a typical search she conducts:

Looking for antique china that I collect. I usually do an initial search, which is this one pattern I really like, which is Gold Crown china. But then if that doesn't work right away, then I'll say “Gold Crown china / Homer Laughlin,” which is the company that created it. And sometimes that pulls up Fiestaware, because they also make Fiestaware, but I don't want Fiestaware. And then I'll write in, “Homer Laughlin china [minus] Fiestaware” and see what other patterns come up, and see if the Gold Crown will come up. (Interviewee 2)

Several behavior instances have been explained here:

Antecedent #1 – User knows of a specific type of china she wants

Behavior #1 – User searches for the china by the name of the pattern

Consequence #1 – Search results do not yield satisfying results

*Antecedent #2 – equivalent to Consequence #1*

Behavior #2 – User searches by the name of the pattern of china and the company which makes the china

Consequence #2 – Search results yield china patterns from the desired company but not with the desired pattern

*Antecedent #3 – equivalent to Consequence #2*

Behavior #3 – User searches by the name of the pattern of china and the company while using the [minus] function to explicitly excluding the name of the



pattern she does not want

Consequence #3 – Finding the pattern of china she wants and where it is sold

In this example, although JB described a several-step search process which culminates with a successful behavior at the end, she presented the search as a three-step process. What might have been expected is that, having learned from experience that consequences #1 and #2 do not lead to the desired result that she stated, she would now skip directly to behavior #3, which may be most likely to result in a desired consequence. Why does she not immediately use the searching strategy that she knows works, in favor of starting with other strategies which she knows may not work? Why is it that consequence #3 has not acted as a stronger reinforcer of behavior #3, such that given the antecedent scenario, JB would exhibit behavior #3? One reason may be that behavior #3 is not \*triggered\*\*\* by antecedent #1 or #2, but only by #3, where neither behavior #1 or #2 has resulted in the desired consequence. It may also be that there are other aspects of consequences #1 and #2 which are reinforcing behaviors #1 and #2, even as they do not lead to the ultimate desired consequence #3. It may be, for example, that by taking these additional and seemingly extraneous steps, JB acquires additional contextual information about a topic of interest (antique china) and this learning is of value to her and in fact acting as a reinforcer for behaviors #1 and #2. As discussed in Chapter 2, Chiesa (1994) explains that “the task of science is to account for variation, to seek out the order in variability rather than to silence it” (p. 82). In this case, that line of thinking would suggest a more detailed analysis of this behavior sequence, perhaps beginning with an examination of what types of additional consequences may be functioning as reinforcers for JB’s search behavior.

## “Finding an image for a boss”

SBS (Interviewee 3) describes an image search conducted for someone else:

Sometimes [the boss] tells you, say like, “sun” or “surya,” and we go through the images – like sometimes he sees it and he wants it, or sometimes he’s like, “Ok, I don’t know, because these images are not appealing to me, so keep on going, flip to the pages. When I find it, you’ll know.”

I am doing the search, and he is just looking at the images. So I conduct whether I want to look for it in Google® or in DeviantART® or in customize or whatever. He dictates the keywords only. And I decide whether to conduct a general search or more like searching inside a category. Of course there is human interaction in between. Which means that I would ask, “What are you looking for?” And he would say, “Whenever I see it, I will tell you.” And when he kind of gets – through the images, when he gets an idea of what he wants, then he will describe more or less what he wants. So that narrows it down for me also. I transform whatever he says into keywords. (Interviewee 3)

This particular behavior instance can be described in terms of:

Antecedent #1 – Boss asks for an image of the sun

Behavior #1 – User chooses where to conduct the search (i.e., Google® or DeviantART®), chooses whether to conduct general search or category search, and asks for clarification of what the boss wants

Consequence #1 – Boss looks at results from search, search does not yield satisfying results; boss describes more precisely what he wants the image of the sun to look like

*Antecedent #2 – equivalent to Consequence #1*

Behavior #2 – User conducts a new search, “transform[ing] whatever [the boss] says into keywords”

Consequence #2 – Boss finds an image he approves of and search is over

This example includes a different role of searching – that of searching for another person. It also describes one step in the iterative process of query formulation. In

particular, as behavior #1 does not yield desired results, the boss makes the effort to more accurately articulate aspects of his desired consequence. Consider that the ABCs are being described here for the user, and not the boss. Thus, the behaviors are those of the user, whereas the behaviors of the boss function as antecedents and consequences. This process could easily include many iterations, depending on the series of consequences in a given search scenario.

“Images to inspire drawing and painting”

RB (Interviewee 4) described one of her image searches:

I was wanting to find an iris the other day to paint, or to draw and paint, because I also make paintings. So I was able to pull up everyone’s photos of irises, and have it on my screen and draw an ibis from it. (Interviewee 4)

This particular behavior instance can be described in terms of:

Antecedent – User wants to draw or paint an ibis and wants to find a photograph to work off of

Behavior – User conducts a search for photographs of ibises

Consequence – User acquires appropriate images and can paint the ibis

The purpose of use for RB is an example of one of the many behaviors coded in the content analysis as “doing things with information.” Previously in this dissertation, discussion of use cases has suggested that as many possible uses that a system designer may imagine, there will always be an additional use case for which the system did not account. The process itself as described in this search is simple, in the sense that the user describes the antecedent conditions as a need, she conducts a search, and she acquires appropriate images that resolve her need. The behavior as explained here does not include information about what type of search RB conducted, or where

she searched for these images, or how she decided upon which image or images she would use. A deeper investigation into search processes such as these is warranted.

What does it mean?

The simplicity of these analyses is due to the fact that this investigation has been preliminary by design. Further exploration is required in order to develop rigorous models of image searching behavior. The efficacy of the FOC model as a useful approach in this realm has been established.

### Library of Congress Lessons Learned

The Library of Congress interview helped shed light on how the Prints and Photographs Division has engaged with its users and worked towards better supporting them in their image search. They found some confirmation of what they had already known “anecdotally” such as that users want to be able to visually browse image collections, and that subject access is the most common search.

The library is interested in knowing more about how people learn about their images, the kind of interaction generated, as well as how this interaction develops – the life of an image, so to speak. Zinkham discussed the potential utility of a kind of automated citation tracking mechanism. This would potentially support not only the library in learning about the use of its images, but also individual users, as they explore the images and learn more. In terms of interaction, the library records have been enhanced by incorporating feedback from the Flickr community. This process is not unmoderated and does require the library to spend resources, but the result is better records and increased exposure to and findability of the library’s image collection.

Their evidence suggests that users do not exhibit uniform tagging and

commenting behavior. This was also found by Lee and Neal (2010). The Library gave users no instructions for how to tag. It may be interesting to explore how users behave when they are given specific instructions. Meanwhile there is also much possibility for further research into how these tags, comments, and annotations are being used in the Flickr community. Redesign of the Prints and Photographs online catalog is partially a result of their experience with Flickr, as they have incorporated visual browsing tools which support user search processes, and static URLs for photos which enable search engines to crawl the website and index the images, making the images more findable also to a larger population of users. Furthermore, the addition of tags and comments into the image records supports users in finding and accessing their images, both on Flickr and on their own website. Their discussion of image query searching, facial and shape or object recognition facilities, and the use of various devices for image search is indicative of a user-centric approach and embrace of technology which is increasingly capable and effective.

Finally, the library discussed their partnerships with experts and communities of practice as a key strategy for describing and indexing their collection. In exploring their Flickr experiment and its effects and implications, they are learning lessons about how users are interacting with technology, online images, and each other. These lessons will continue to help shape how the presence and services of the Library of Congress Prints and Photographs Division develops over time. Note: In considering tagging behavior specific to the Flickr community, it is important to recognize that this behavior is adapted to specific characteristics and constraints of the Flickr infrastructure and is not necessarily generalizable.

In discussing their own image search experience, both Zinkham and Springer echoed statements made by other interviewees. In particular, they search in both personal and professional roles, they begin with a keyword search and then browse visually, as well as “pearl gathering” as a strategy for choosing best keywords. As trained librarians, they know some of the insider tricks, like which types of keywords and synonyms to use or which collections may be more promising for browsing. Springer specifically stated: “I’ll start broad and then limit it,” narrowing down into the specific item of interest, for example in the case of a vague image search where one has only an idea of what might work to meet the image need. This process of narrowing down could apply to either the process of discovering more precisely through trial and error what the desired image may be, or just learning as a result of the process which keywords or which strategies may most effectively lead to the image a user already knew they desired. In other words, it is the clarification of an image need versus strategy development.

### Revisiting the Research Questions

What kind of answers can be derived from the content analysis to address the research questions which prompted this study? For each of the primary and secondary research questions, related excerpts from the interview transcriptions are provided.

#### 1. How do we think about images in the context of online image search?

The category related to thinking about images includes concepts of search criteria, search by image attributes, and query type. Some examples of participants’ statements which provide insight to this question include:

“If I want to find a picture of a dog from the eighties that looks cute that I want to send to a friend, then I’m going to look for something that actually looks like it is

from the eighties, not from a digital point and shoot. I don't know if it was [name] or even [name] who talked about the aura of the image. And I think even online there is an aura to the image. It's not physical in the same way, but that's important to me." (Interviewee 2)

"I choose images that are going to be overly simple and not overly complicated for that particular assignment. Because these are all sophomore level students. You want something very direct." (Interviewee 4)

"So I need information diagrams, too, that show how something is built. How a passive solar home is built, how a greenhouse is built." (Interviewee 4)

"Some words, for being words, they have a mental image also. And when somebody is able to use those mental images and combine them in a way that flows, they don't contradict each other. There he is using your own image database to paint a picture, which is going to be way more beautiful than just one single picture. You know what I mean? It's like bits of information, images." (Interviewee 3)

"People usually respond to an image first by its color, and then there's a color and a mood, so their emotion is usually the first thing that appeals to it. I know sometimes when I know somebody in art or something, people will keep gravitating towards a certain color scheme, and it's really some color that appeals to them personally. So that may be their first way into it, and then they start looking at the imagery and all of that, the actual objects." (Interviewee 4)

"I knew what some sort of aristocratic seal looked like in some kind of vague sense, or crest looked like. But I had no idea of specifically what I wanted it to look like. And then I just typed it in and saw a bunch of different ones, and then picked the one that I liked the most." (Interviewee 1)

"If I'm looking for a specific kind of painting by an artist, I can visualize that." (Interviewee 2)

"I don't know why it seems like shopping and animals are the easiest things for me to visualize that I know exactly what they look like, and I want to find them." (Interviewee 2)

"I think most of the time, when I want to explain myself, or when I need to do some advertising or whatever, I always think of images." (Interviewee 3)

"I was happy when Google® finally added the color thing, where you could search by color. That made a lot more sense." (Interviewee 2)

"When I'm looking for a desktop background, like wallpaper for my desktop, often I'll just search by resolution and nothing else, or maybe some word that's more

on the vague side, because I want to find something that's not familiar, that I'll want to look at for a long period of time." (Interviewee 1)

"Classic library science kind of stuff, or human nature – you've got to try one word and then try another. So, you know, baby, children, infants, mothers and children, consulting the thesaurus to a certain extent but also looking for keywords – playgrounds, places you knew that children would be. So, trying lots of different terms." (Zinkham, Library of Congress interview)

"When I find something that represents what I'm looking for, then I can expand outward by looking at the tags and the subjects for that. But I don't know what other users do. I'll start broad and then limit it." (Springer, Library of Congress interview)

### 1.1 How do people intend to use images they are looking for?

It seems to be the case that how users intend to use an image relates to how they think about images in the context of an image search. The main goals for search identified in this study include: images for communication, learning and teaching with images, and using images in creative work.

"I need for someone else's marketing purposes to find a specific image of something." (Interviewee 1)

"I'm using Yelp® to get a sense of what a restaurant looks like, or what their food is like. So sort of to get a sense of what an experience would be like without actually having to invest either money or time in going there. To aid in decision making." (Interviewee 1)

"To make something that's kind of funny to show to a specific person as a joke." (Interviewee 1)

"Like if I want to share some experience I had with someone else, or maybe to get them excited about something that I tried and was excited about. You know, finding an image of it to send a link to them about." (Interviewee 1)

"To me, images are all about communication, and I think they are for a lot of people." (Interviewee 2)

"Every time someone has a birthday, I try to Google® their name and birthday cake and see if I can find a picture of a birthday cake with their name on it." (Interviewee 2)

"Some friends of mine in Chicago were like, 'Oh, if you're getting an iPhone®, you have to get Instagram®, because we all put pictures on it all the time. And



you don't have to put them on Facebook®, just put them on Instagram®, and then we can see what you're doing, and you can see what we're doing.' And so I did – I did use it. And the filters that they give you are kind of weird. And it feels weird to do something like that, but the way that I see it, the way that I choose to use this, is that to me it is simply a mode of communication. It has very little to do with how the image looks." (Interviewee 2)

"I am in love with black and white photography, and I need to understand how the shadows and the light and the new techniques that are around, how they work. " (Interviewee 3)

"I want to feel what the people is trying to say with the image – and even if it's something like, they are teaching me something, I want to feel the experience to the image, because if I do that, then I know that experience is not going to be tainted by that person's idea of what it should be." (Interviewee 3)

"For example, for my teaching experience, or what I've been doing, is finding that people will understand whatever you are saying, but they cannot visualize what you are saying." (Interviewee 3)

"I use images to develop, sometimes for the library, or mostly for our department now, and also I am on the assigned work groups, and we make library maps and stuff, so we can put them all over the library." (Interviewee 4)

"I have an interest in visionary art, so I'm trying to find out what everyone is currently creating that fits that category out there. So there's just a big jumble of websites out there right now. And the art as a movement is sort of trying to get off the ground and trying to formulate itself as an art movement – a kind of underground sort of art movement. Still it's interesting to me, and that way I can find all the most current stuff that they're creating, what they're thinking." (Interviewee 4)

"I'm usually thinking, 'Well, what did this courtyard look like?' And I think I need to go back and look at that image, and it's just jogging the memory, I guess." (Interviewee 4)

"We were having a baby shower for a staff member. The guy who was organizing it set us the task to bring pictures related to babies." (Zinkham, Library of Congress interview)

"Searching for an image to be on the title of the report was just like, well, we'd like something that shows people volunteering, or something very vague." (Springer, Library of Congress interview)

## 1.2 How does a person know when they have found an image they want?

One of the categories which emerged from this study was about knowing when a search is over. The concepts within this category include the user knowing they've found the right image, satisficing, giving up, and creating original images due to not having found the right image. These are not mutually exclusive outcomes, as evidenced by the case of interviewee's number one and three, who each explained that upon giving up on an image search, he will then create his own image in order to satisfy the information need. Another example of overlap is that a user may know she has found an image she can use, but it may still qualify as satisficing if the image is not exactly what she would have liked to find, as three interviewees attested.

"I think you look at a bunch of different stuff, and you see what does the best job, and you decide that that did the best job of all these images, that's the best I'm going to do." (Interviewee 1)

In terms of a user knowing when she has found what they are looking for, whether perfect or otherwise, it seems to be a matter of simply recognizing upon sight that an information need had been met. This recognition does not seem to depend on having a well-articulated query.

"I'll ... wait until there's a landscape that I want, something that's nice to the eye. And then I'll go and pick it up." (Interviewee 3)

"It's like food. Some people like salty food, or sweets, or whatever. I like a specific color scheme or specific – I am looking for something specific, and I always know what it is. There's a combination of colors and images and lines and circles that I know I like. That's how I know." (Interviewee 3)

"I certainly didn't have any idea of people standing in line trying to convey terms, and [upon finding an appropriate image] thinking, yes, that image conveys." (Springer, Library of Congress interview)

### 1.3 Which factors influence a person's experience of image search?

Participants expressed several frustrations with image searching, including too

many image results, copyright issues, cost issues, low resolution, the inability to trace the source of an image, image format other than desired, and poor retrieval system functioning. Excerpts of specific frustrations expressed include:

“Maybe there’s a couple hundred images here on the first page. It looks like there’s maybe a few hundred images on the first page. But I mean, I’m never really going to look at more than a few pages.” (Interviewee 1)

“I think usually, depending on what it is that you’re looking for, or sort of a wrinkle of that would be the rights issues. Because sometimes they’ll be an abundance of really good results that you know that you have no ability to use, for legal reasons.” (Interviewee 1)

“Often you can find something that you can have the rights to if you wanted to, but it’s cost prohibitive. The Getty® images cost sometimes thousands of dollars.” (Interviewee 1)

“For professional use, there are some sites that are really good at some areas and not great at others. And there are some that are just really expensive for everything.” (Interviewee 1)

“If you’re looking for something very specific, it can be a dissatisfying experience, because the likelihood that somebody took the kind of picture that you’re looking for that type of image is not going to be that high, and if it is, then it might not be at the right resolution.” (Interviewee 1)

“So there’s an inability to trace back where you’re coming from, or the amount of images that are out there. It becomes kinds of existentially upsetting to me, and that’s usually why I have to try to stop my searching.” (Interviewee 2)

“I am not satisfied at all, because people tend to post thousands of images, and whenever you’re searching for something, all these things just pop up. ... If I’m looking for a photograph of a sunset, I don’t want to see a logo. So if I type, ‘sunset / photograph,’ screw the logo, I don’t want the logo.” (Interviewee 3)

“Like we have a bunch of Citrix databases that are going away, because they haven’t changed to be easier for the user to use, and they have some technology problems, too.” (Interviewee 4)

“Flickr ... helped to show the way others have been doing it, but they showed the benefit of perhaps a few words to get you started, but then really you’re doing the searching by looking at the pictures directly... any picture library has known that you needed to provide visual browsing tools.” (Zinkham, Library of Congress interview)

“There’s a fair amount of translation into different languages. People are helping each other out by putting the same word down in three or four different languages.” (Zinkham, Library of Congress interview)

“There are of course people, for example, photo historians, where they’re seeing the actual print made by Ansel Adams. It makes a difference to see it in person simply because the size of it is a clearer factor than homogenized on a computer screen. They can see the way the grains of silver are setting on the paper. They can appreciate the way that it was signed or matted originally in the context of fellow pictures. They gain insight.” (Zinkham, Library of Congress interview)

“We do see a large interest of, they always want to find, where’s the link to the high-resolution version?” (Springer, Library of Congress interview)

“[In redesigning the online catalog], rapid visual browsing was critical and even though our statistics had been saying it, once you work in Flickr, see a hundred tiny thumbnails, “Oh, we get it!”” (Zinkham, Library of Congress interview)

“I’ve been looking through a deck of slides, and I’ve picked out the ones that I think are my strongest candidates, and so those are the ones that you set out on top of a light box, so that you could look at them more carefully.” (Zinkham, Library of Congress interview)

“And I was thinking about how when I look at images on my iPad, with the sweep of my finger, I can see a whole bunch of images swing by, even in a grid pattern, so I can pitch and zoom and do a lot of other things like that. That depends on the device on which you’re looking at.” (Springer, Library of Congress interview)

“[Tags and comments] can provide verification with links back to the New York Times, or links back to other sources that support what they are asserting about the image.” (Springer, Library of Congress interview)

### Efficacy of Image Query Types as Framework

This study was intended to determine the efficacy of the image query types described in our modified Yoon-O’Connor model as a framework for studying image search. In the final analysis, the coding of these interviews did not have high enough specificity to discover differences amongst image query types. In fact, the interviews themselves did not include much discussion of the query types.

Over the course of the interviews, prepared questions about query types were not addressed as explicitly as planned. As a conversational interview format was used, the interviews followed the interests of the participants. The manner in which image query types were addressed is that each participant had experience with the third type of image query, in which a user “knows when they see an image.” Overall, this study has been more preliminary in nature and has served more to articulate general areas for further research in understanding image search from a user perspective.

The resulting lack of evidence for the model as a framework is most likely due to a limitation of this study and its design and should not be interpreted to imply a lack of efficacy. The model of image query types merits further research specifically focused on its efficacy as a framework.

### The Perception Flow

Each of the emergent categories discovered in the process of this study may be considered a key to image representation: the experience that a user brings to an image search, the way she thinks about images, her goal for that particular search, the process she undertakes, how she decides to end the search, and which challenges she encounters along the way. On the path towards ideal image representations, each of these themes must be addressed. Each provides clues as to how a user may react to and find value in a given image. In other words, if we are able to harness the power of the intangible features of the perception-conception gap described by Greisdorf and O'Connor (2008), then the image representations we provide for users may more directly address their unique contexts and thus result in more effective image retrieval.

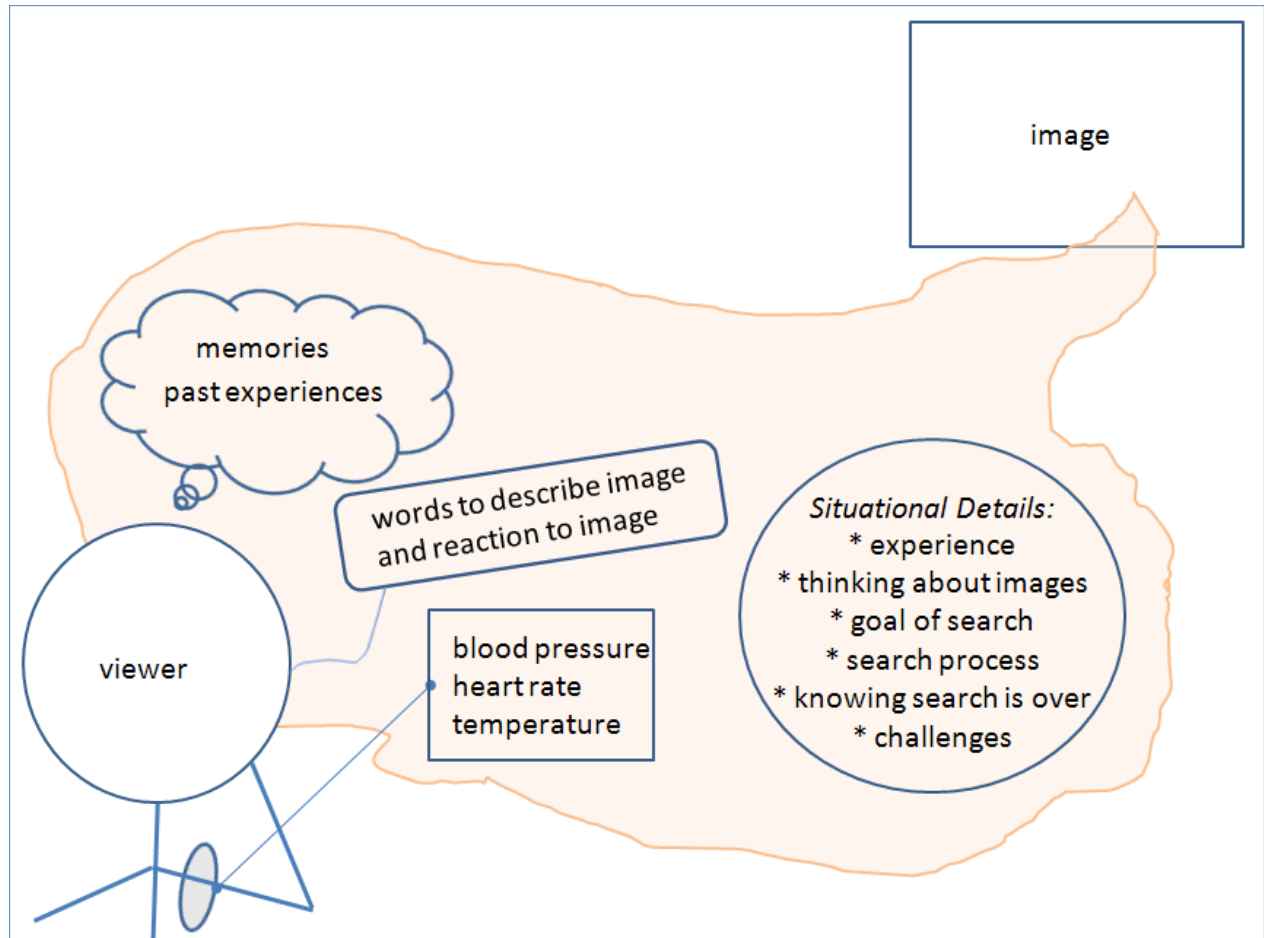


Figure 22. Modified perception flow model.

Revisiting the O'Connor Perception Flow model, it is possible to incorporate the emergent themes of image search to provide a more detailed framework for study (see Figure 22). This model may be used for future research into development of image representations which account for those issues relevant to users in image search.

#### Emerging Model: Shifting the Locus of Representation

This dissertation involved the use of research models and paradigms which helped ground and direct the study. In particular, Anderson's functional ontology construction model (Anderson, 2006; O'Connor, Kearns, and Anderson, 2008), and O'Connor's theories of image use and image search (Greisdorf & O'Connor, 2008;

O'Connor, 1996; O'Connor, Copeland, & Kearns, 2003; O'Connor, Kearns, & Anderson, 2008; O'Connor & Wyatt, 2004), have formed the heart of the pursuit. The developing theory is presented in this section.

In a typical image search context, a user must articulate their information need and formulate a query, interface with a retrieval system of some sort in the hopes that the system will provide them with images that will bring them nearer to a resolution of their image need. Descriptions for and representations of images are typically created by someone other than the user for whom the images will eventually fill image needs. One person connected to this research expressed the frustration of searching for an image and needing to put herself “into the shoes” of the person who might have described the image she is looking for. This explanation inspired a visual of a user building a bridge over to the system designer (for simplification) simply in order to communicate a query in the language of the designer. Even building this bridge and putting forth this effort does not guarantee any satisfying results from the retrieval system or a satisfying resolution to an image need.

Chapter 3 includes a brief discussion about the need for a shift in the locus of representation. Essentially, this need is one to move from a focus on the perspective of the system designer to a user-focused orientation in terms of image presentation. In order to solidly pursue an agenda of user-oriented representation practices, system designers must address the fact that the representation that makes sense to a user depends in large part on their intention for how they will use the image, or purpose of use. Part of what this research has found is that users have many different purposes of use for the images that they seek. It is unlikely that it will ever be possible to create a

comprehensive list of all of the possible use cases for a given image, let alone an entire collection of images.

Does it then serve the user to determine a limited set of use cases within which context image representations may be created? Probably. The key may be to create both the image representations and the infrastructure which contains them in such a way as the system is able to respond dynamically upon encountering new use cases. This is a promising area which requires much more exploration.

Figure 23 is a rough model of a space from within which engineering design models can be developed through a shift in the locus of representation (O'Connor, personal communication, December 21, 2011). This illustration shows that Anderson's (2006) foundational model of functional ontology construction can be used as a framework for exploring O'Connor's research on image seeking behavior and image use, as has been implemented in this study. Also present is a user-oriented emphasis on shifting the locus of representation increasingly towards the user and into a practical space where researchers and system designers may interact more proactively with their intended users. Findings from the research in this study, as well as from related and future studies, may be incorporated into the knowledge base of this model as well.

In the spirit of supporting user image search, possibilities for future research follow.



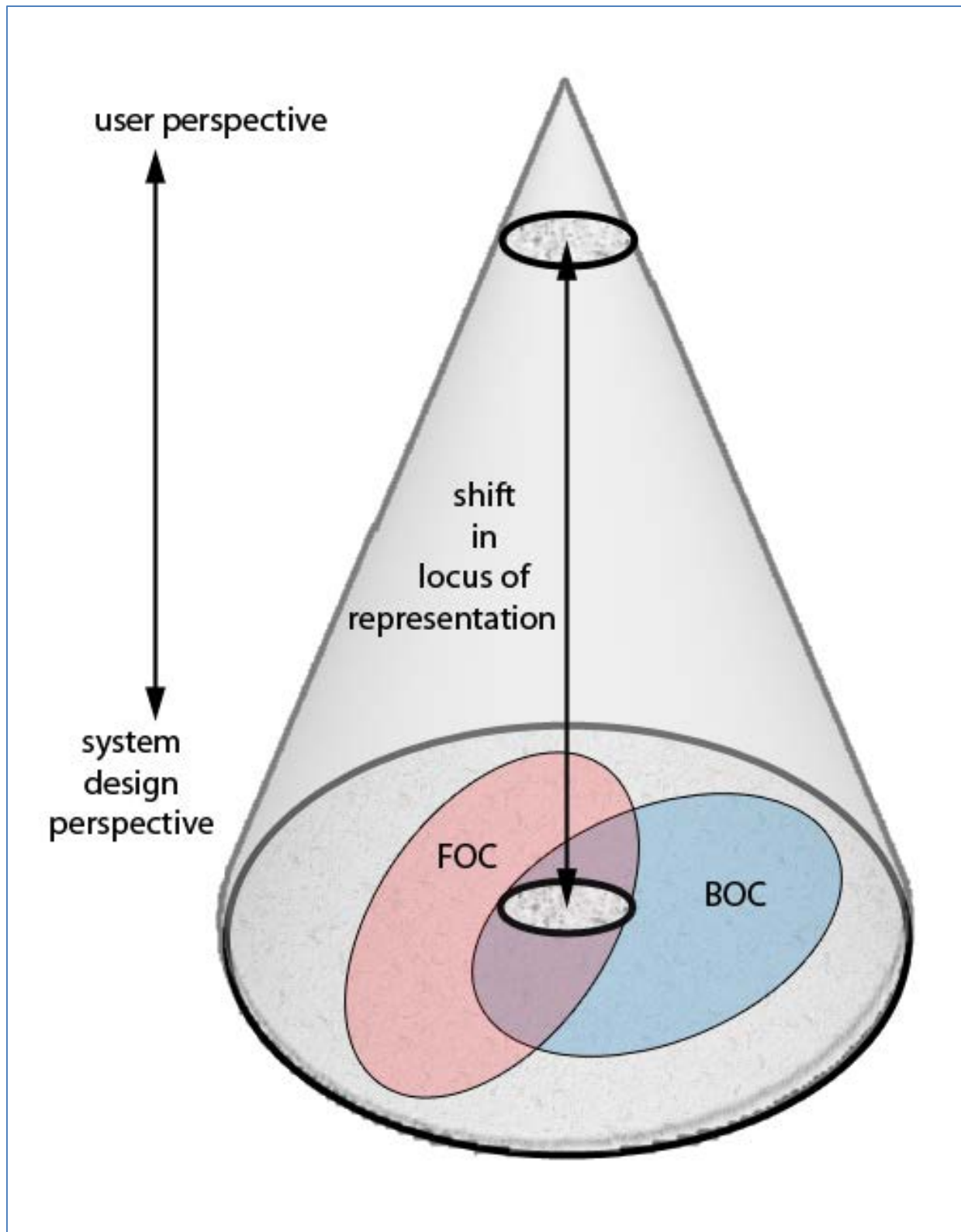


Figure 23. Shifting the locus of representation.

## Recommendations for Future Research

Stewart Brand (1999) muses about the concept of a “Long Now Library,” wherein long-term research projects may be securely archived and then accessed, so that new best practices can be applied to old data (p. 142). In this spirit of research utopia, arenas for future research are presented here.

O'Connor and Wyatt (2004) introduce the concept of “photo conversation as paddling upstream in the river of memory” (p. 53). They write of challenges encountered while paddling and suggest “two types of journeys upstream through memory” (p. 64). One includes taking new photographs in places where meaning and memories of the past have existed, and the other involves perusing photo albums, discussing and further exploring images discovered and memories evoked. In further studies, adventurous researchers are encouraged to approach the questions posed by this dissertation in this style, by accompanying research subjects on their own upstream paddling excursions.

### Towards Understanding Image Seeking

As this study has been intended as an initial step towards building a framework for better understanding image seeking, it follows that further research will be necessary for actual development of this framework. For example, the six themes of image search which emerged during this study need to be tested as a viable framework. In particular, further studies may help further define these themes, or may suggest a different, more useful categorization. O'Connor's Perception Arrow model may be tested a visualization tool towards understanding image seeking behavior. Additionally, further exploration is needed on the validity of the modified three question types as a framework for future study. The scope for future research reaches beyond the planned framework as well,

including investigation into other aspects of image search and retrieval design. The following section outlines several possibilities for future research.

The study described here included four participants representing a variety of professional and educational backgrounds, as well as various ranges of verbal and visual ability. In order to gain more insight about the different users of image search, it would be interesting and informative to interview larger samples of similar backgrounds.

It would also be prudent to interview users of a different background or educational profile. For example, all four interviewees identify themselves as photographers, either professionally, or by training, or both. It may be that heavy image users, such as those sought out in this study for their expertise, are also often image creators. Thus it is perhaps not surprising that this sample of four all created images as photographers. In fact, this level of expertise has been desired for this stage of research. In future research, it may be interesting to find a new set of subjects in order to understand what types of differences may exist within those who do interact heavily with images and image search but do not photograph or create images themselves, How will their processes of image search differ? Similarly, all four interviewees have at least some university education, and two have multiple graduate degrees, including a fine arts degree in both cases. The design of this study required participants to be able to articulate their experiences, and this intention, likely combined with an assumption that more education would correlate to higher verbal ability, may have led to a skew towards participants with more education. Further research should include participants from different educational backgrounds. The ages covered in this sample range from 26 to 47. Future research should examine potential differences in varying age groups.

## Matrix of Question Types

Kearns (in O'Connor et al., 2003, p. 120) describes a matrix of question types based on taxonomies of question types by Maron and Levien (1967) and O'Connor (1993), which explore question space from the system perspective and seeker perspective, respectively (see Table 6). The matrix serves to “describe the nature of question based on this idea that question is the beginning of thought” (p. 119). Thus, columns represent “degrees of depth required based on the complexity of the knowledge gap” (p. 119), and rows represent “various question states or circumstances that one could discover beckoning attention” (p. 120). She suggests that mapping question states or circumstances can help to “express the essential need and what can be done to satisfy it” (p. 121).

Table 6

### *Matrix of Question Types*

	Look up	Deductive	Inductive	Conversational
Articulated				
Vague Awareness				
Monitoring				
Browsing				
Encountering				

The research questions underlying this study included the aim of distinguishing amongst the three different types of queries derived from the typology articulated by Kearns. As the results did not address the query types to the extent anticipated, future research is necessary into these distinctions. It may yield interesting results to map

questions which emerged in this study into a matrix such as this. Discovering the distribution of question types which different users tend towards may illuminate unexpected correlations and provide clues as to how to better serve those users and question types. For example, if a certain population of users tends to ask only articulated look up questions and monitoring type conversational questions then effort can be focused to design a system for those users which is tailored specifically to meeting those particular needs.

#### Community of Practice / Community of Interest

In the process of this research, the phenomena of collaborative image searching presented itself as particularly worthy of investigation. The Library of Congress participants shared stories of beneficial partnerships between the library and several communities of interest. Zinkham discussed the library's collection of Civil War photography which they have uploaded to Flickr and an example of civil war magazine editors who "can tell one kind of gun from another, if we need to know that."

Relationships of these types can provide each party with access to information of interest from the other party – images, in the case of the editor, and details about the images, in the case of the library.

The exploration of interactions amongst communities of practice may provide an ideal microcosm within which to study interactions within these communities as they relate to image use and image search. In particular, it may be useful to identify locations, such as online forums, which support and encourage this type of community interaction and partnering.

In addition to benefiting existing members of such a community or relationship

with a third party, such as the library, an individual looking for images or information related to the Civil War may encounter either the Flickr collection or one of these magazine editors and then potentially tap into the benefits of such a partnership. Especially in the context of an online forum, new users may organically discover such communities and partnerships and be aided by or even join forces with them.

### Collaborative Searching

Another arena of future research involves the exploration of collaborative search. Flickr® is an example of an image sharing site which also functions as a social networking site (Marlow, Naaman, boyd, & Davis, 2006). In this environment, the possibility of sharing image search tasks with other users is plausible and even reasonable as a next step after unsatisfying searches. Consider the example of one user contacting another whose profile reveals their location as San Francisco, California. The first user would like to put together a montage of images representing beautiful locations of the world, yet is not satisfied with their own images on this subject. Public images in the second user's photostream appeal to the first user's style and sensibilities, and perhaps these two users have already interacted in a number of other ways enabled by the site. The first user may ask the second to take a picture of the Golden Gate Bridge. Researchers could explore image sharing communities and learn about what kind of collaborative searches are already thriving, including details about how they emerged, who is involved with them, in which roles they may participate, what type of structure they follow, and so on. Even social networking sites which are not explicitly image-focused provide access to networks of people who may be willing to help a user on an image quest, whether by creating the image, finding the image, or

offering suggestions.

It is common for colleagues working together in an advertising agency or a video editing group to collaborate in this way, asking others for help and tapping into their networks of contacts for assistance. Consider that people who are working together or are closely connected to one another may be more likely to have similar contexts or mindsets, at least as related to the work they are doing together, or their common interests. This similarity may ease the process of tuning into each other's mindsets and mental processes in order to collaborate together. It would be interesting to explore how this kind of collaboration may emerge and take place amongst people who already know each other in online forums, such as Flickr®, as an aspect of collaborative search. Gaining insight into these collaborative processes made visible may bring to light aspects of the image search process which are otherwise invisible.

“Doing things with images,” one of the emergent categories from the present study, includes varieties of motivations and uses for images. In order to support users who have diverse intentions for their image search process, collaborative searching may be a viable source to tap which is already accessible in at least rudimentary forms. Using a social networking, or forum-like approach to images, as does Flickr, could allow users the opportunity to work collaboratively within like-minded communities, independent of potential differences in time and space.

Another aspect of collaborative searching is related to the collapse of a boundary between searching for images and the production of images. As discussed in the introduction to this work, users who were once merely consumers are now, armed with the tools of latest technologies and social media networks, increasingly becoming

producers as well as consumers. Patrick Wilson (1983) wrote extensively about the concept that an individual's cognitive authority is composed of both that which the individual has learned through their own first-hand experience, as well as second-hand knowledge, which is gleaned from others. He suggests it wise to be critical of the sources of our second-hand knowledge. In the case of collaborative searching as we have explored it here, asking a colleague to create or find an image in the process of image search is to assign some degree of cognitive authority to that colleague, and yet it is not quite first or second-hand knowledge, as per Wilson's explanation. Is collaborative searching a type of "one and a half" hand knowledge? The searcher is at least somewhat engaged, in that they have chosen someone to ask for help from, and they have presumably articulated parameters somewhat equivalent to a search query. How is asking someone to find an image different than finding the image alone? What if both people are using the same search tools? What about when a person is specifically asking that another person create an image to their specifications?

Part of the inspiration for this line of future research came about in the context of traveling abroad and recognizing that people who had not traveled to the same place or in the same way had difficulty grasping certain truths of travel. Thus developed the idea of an experiment about finding photographs to aid friends and family in understanding aspects of travel stories and impressions and found images to be extremely helpful and possibly even necessary in order to communicate satisfactorily. Clearly, the experience of a person hearing stories and viewing pictures is quite different from the experience of the traveler who has actually been immersed in a different reality. Furthermore, consider the case wherein the traveler took photographs herself, as compared to the case where



she did not take the photographs herself and is using someone else's photographs instead. What is different in these examples? What can examining these cases help us to understand about the process of image search and the cognitive experience of different aspects of image search?

### Creating Own Images

In the case that it is not possible to personally take a photograph and thus create the desired image, a user may request of someone else that they take a photograph. Several examples of users creating their own images emerged in the interviews, sometimes within the context of improvising following an unsuccessful image search, and other times as the original goal, incorporating the found image into a new piece of work. A user may choose to plan a photo session, arrange a particular scene to photograph, and then take a variety of photos which may meet requirements, either personally or with help from a willing associate. Similarly, it may be realistic at times to utilize photo editing software to combine and otherwise modify existing images and create a scene without using a camera at all. Further explorations of how users incorporate the creation of their own images into their image searches may lead to the development of tools and systems which could better support these pursuits.

### The Original Image Version

Interviewees in this study identified image resolution as a challenge in their image searches and discussed their strategies for finding images that fit their high-resolution needs. Kennedy (2009) discusses exploring iterations of an image found in various places or instances online. Constructing a type of family tree for the image may help identify the original image and be useful in summation for use in image retrieval

algorithms. Future research could be conducted using an experiment which provides users with proposed family trees as an image browsing option. Researchers could explore these family trees of images in terms of how and when they may be helpful for the end user in searching for optimal images. Interviewee Helena Zinkham of the Library of Congress emphasized the importance of providing visual browsing tools to users so that they may immerse themselves in the images. The possibility of visualizing an image's "history at a glance" may provide users with insight which aids their search, and future research into this question could prove valuable. It may be that if users had access to a collection of image instances, then they could more easily choose the image which best fits their needs.

#### Hidden Search

The study uncovered the hidden image search, or image searches which users conduct without explicitly realizing that they are searching for images.

Well, I don't know that it's necessarily a search if it just ends up being something that happens organically. (Interviewee 1)

This is a phenomenon worthy of further exploration. Specifically, researchers may pose questions such as, when are image searches ubiquitous versus explicit, and how do users conduct image searches differently in each situation? It would be of interest to better understand the circumstances in which hidden searches occur and design experiments to understand how user needs could be met in such situations.

Researchers may discover how well-served users are to be made aware of the fact of their searching.

#### Children Seeking Images

During the course of research for this dissertation, the researcher began to

consider how answers from children may differ with regard to their image seeking. Children would be extremely interesting subjects of study in this area, as they are in the process of developing their verbal constructs and skills, and as current generations of children enjoy unique new relationships with technology have not previously been possible. Future research may address the image seeking behaviors of children as well, as children have unique behaviors and we recognize that results of this study will not necessarily apply to or represent children.

### Image Sharing Institutions

As discussed in Chapter 1, as well as in the Library of Congress interview, Flickr Commons™ is an initiative which began in January 2008, sparked by the decision by the traditionally conservative Library of Congress to start sharing their images online in order to give their collections more exposure and experiment with new technology and user paradigms. In addition to digitizing and uploading their images, the Library of Congress also started soliciting feedback from viewers. At the time of this writing, Flickr Commons™ includes 55 participating institutions worldwide. Appendix D contains a table including the institutions and pertinent aspects of their participation with the project.

The institution with the most items in their Flickr Commons™ collection is the San Diego Air & Space Museum Archives, with over 103,000 items at the time of this writing. In second and third places are the Library of Congress, with 14,000 items and then the U.S. National Archives with nearly 8,000 items. Without the top outlier, the average number of items in a set is about 1,400 items total, or just under 1,800 for US institutions and 1,100 for non-US institutions.

Flickr® provides the functionality of designating collections, galleries and sets within a single user's "photostream," or display, of uploaded images. Only 44% of participating institutions identified "collections" within their contributions, and only 5 of the 55 utilized the "galleries" feature of Flickr®. Almost all institutions, however, created "sets" of images, and on average 30 sets. Interestingly, in these respects there are no apparent differences between U.S. and non-U.S. institutions.

Research and interviews have been conducted and published on the use of Flickr Commons™ collections, by the Library of Congress and by academic researchers (Bray et al., 2011; Conway, 2010; Springer et al., 2008). Future research could explore this project from the perspective of users and institutions. Researchers could examine current levels of participation, and could contact the institutions directly to learn more about how the Flickr Commons™ experience has affected their processes and procedures, both online and offline.

#### Looking Backwards to See Ahead

Advancements in technology have made it possible to analyze old ideas in new ways, affecting aspects of our daily life from the development of modern day motor vehicles to sophisticated computer programming software. In the field of photography, digital imagery, and image search, researchers may gain insight into their own questions by revisiting questions that earlier photograph enthusiasts have posed. With access to new technology, we may be able to repose these questions in ways that aid our research with regard to serving users.

Emanuel Goldberg, who lived from 1881-1970, described himself as "a chemist by learning, physicist by calling, and a mechanic by birth" (Buckland, 2006, p. 249), and

could further be described as interdisciplinary by nature. He is considered a pioneer of information science, as well as a key figure in the development of thinking about photography and people's reactions to them. Goldberg helped to invent cameras, created the first desktop search engine, and was the first person to conduct serious investigation with real human beings into notions previously reserved for engineering studies. Examples of these include densitometry, shades of gray, amount of light, translucency of film, and so on. He observed that people are interested in images which include ranges of dark to white tones. There is a wide range of information related to image creation and image use which can and should be further explored, in order to ultimately understand image search. Future research could explore Goldberg's work in the context of philosophical discoveries and technological advancements since his time. These explorations could include experiments with how various measurements described by Goldberg may affect users. It may also be interesting to compare user reactions to physical photographs versus digitalized photographic images which appear on a computer screen.

Oliver Wendell Holmes, who lived from 1841-1935, describes his initial experiences with the most modern technologies of the day in "The Stereoscope and the Stereograph," stating: "The first effect of looking at a good photograph through the stereoscope is a surprise such as no painting ever produced. The mind feels its way into the very depths of the picture" (Holmes, 1859). He goes on to explain that:

A perfect photograph is absolutely inexhaustible. In a picture you can find nothing which the artist has not seen before you; but in a perfect photograph there will be as many beauties lurking, unobserved, as there are flowers that blush unseen in forests and meadows.

This speaks directly to the discussion of image representation challenges. If a photograph is inexhaustible, then so are its possible representations.

Holmes proposes “the creation of a comprehensive and systematic stereographic library, where all men can find the special forms they particularly desire to see as artists, or as scholars, or as mechanics, or in any other capacity.” It would be interesting to explore the content and merit of assertions by Holmes and his contemporaries as to how the new capabilities of photography affect the lives of such artists, scholars, and mechanics, for example, or change their perspectives. Understanding the utility of images to these users may assist in the development of appropriate search resources tailored to these populations. This may offer valuable insight into best practices during current transitions into future technologies.

Sir John Herschel, who lived from 1792-1871, was another person of many interdisciplinary interests, and is credited with the improvement of various processes in the beginning of photography’s history (Schaaf, 1997). Herschel’s explorations were driven by a desire to understand “what the actions of light upon substances could reveal about the universe” (p. 46) and “how the material universe reacted to light” (p. 47). Exploring questions posed by Herschel may help guide conversations about the use of photographs in an era of digital photography. At least one interviewee in this study expressed a fascination with the way that the character of light is different in digital images, as compared to printed images. Understanding which types of users may be interested in these discrepancies may aid better search tools, or even modes of indexing light differences in digital images.

## Nonlinear Model of Information-Seeking Behavior

During the process of this research, it became clear that most users follow very nonlinear paths towards meeting their information needs. Allen Foster (2008) describes a nonlinear model of information-seeking behavior that was initially developed based on observations of interdisciplinary academic researchers and is now being adapted to increase generalizability (see Figure 24, personal communication, July 22, 2011).

The center of the model consists of clusters of behaviors organized into three core processes of Opening, Orientation, and Coordination. Opening includes behaviors such as breadth exploration, eclecticism, networking, keyword searching, browsing, monitoring, chaining, and serendipity. Orientation includes behaviors of reviewing, picture building, identifying keywords, source identification and source selection, and problem definition. Consolidation includes behaviors of refining, sifting, incorporation, verifying, finishing, and knowing enough. The interaction of these core processes is non-linear, so that a user may switch back and forth amongst the three processes fluidly during any given search. It is interesting to note that “Opening” in this model is not the automatically the first step, as may be assumed from other models, but rather a “moving from a state of orientation to actually seeking, exploring and revealing information” (p. 233). Rather, the Orientation process here is most likely to be the starting point for information seeking. Each of these processes includes a measure of Extent and Intensity, in order to capture more information on both length and depth of the activity for a given step in the search process. The intention is to “map the variability of behavior within the seeking process” (Foster, Urquhart, & Turner, 2008) and thus represent that different people performing the same behaviors will perform them differently (Foster, 2011).

The three processes exist within an Intrinsic Context, which represents aspects of an individual's knowledge and cognition, or more specifically, feelings and thoughts, coherence, knowledge and understanding, as well as a user's cognitive approach for a given search. The final layer of the model, the Extrinsic Context, represents various external influences on a user.

While the three query types discussed earlier in this study were not as prominent in the results as expected, this researcher believes they may still prove valuable in future research into the topic. It may be useful to consider and test a model where each of the three query types are represented and described in terms of Foster's core processes. In this combined model, the core processes are considered for each of Q1, Q2, and Q3, and all three query types are contained within an individual user's intrinsic, and subsequently, extrinsic contexts. Incorporating of Foster's model may provide additional structure and insight into the details of the image seeking process (see Figure 25).



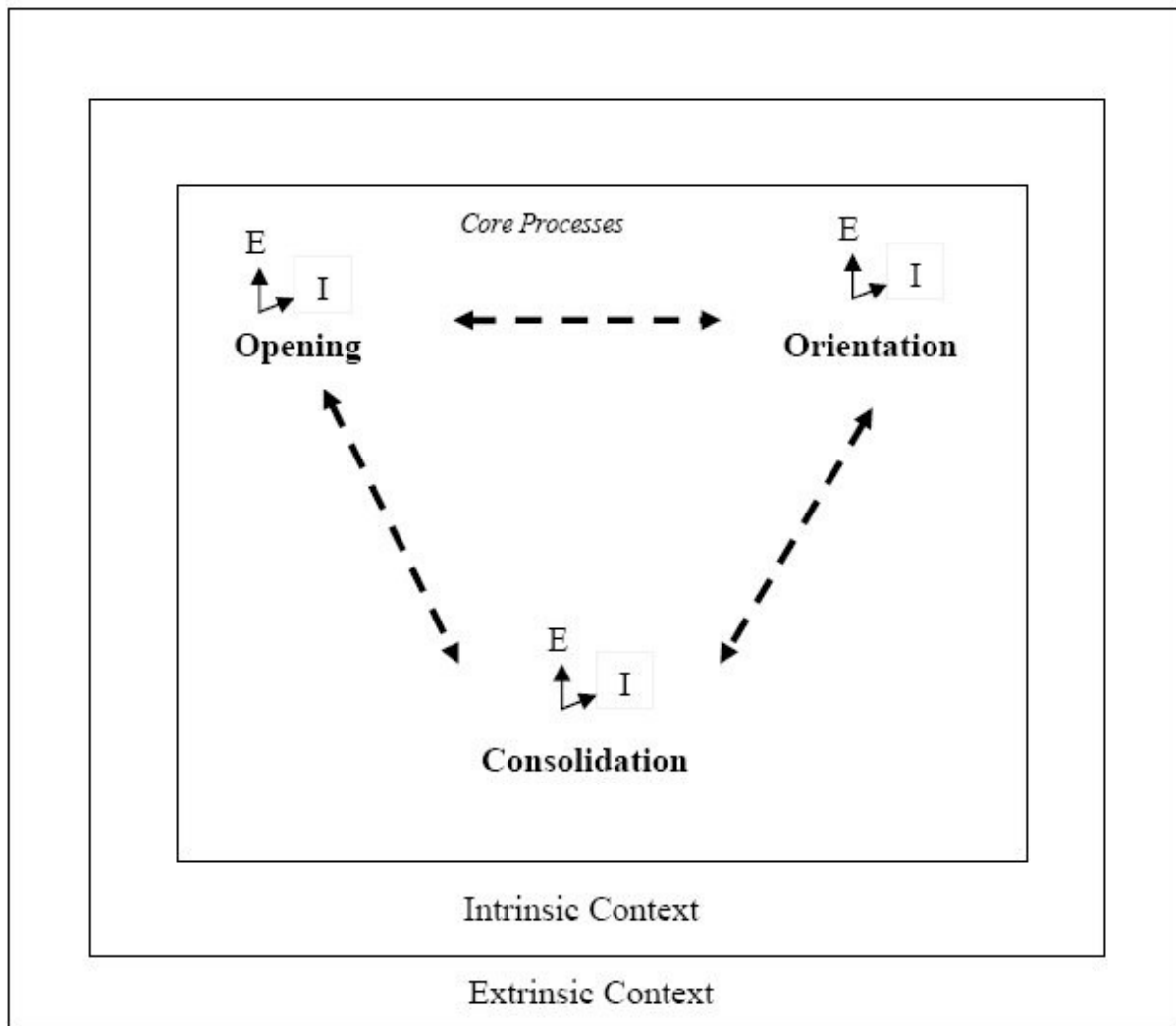


Figure 24. Foster's non-linear model of information-seeking behavior (Foster et al., 2008).

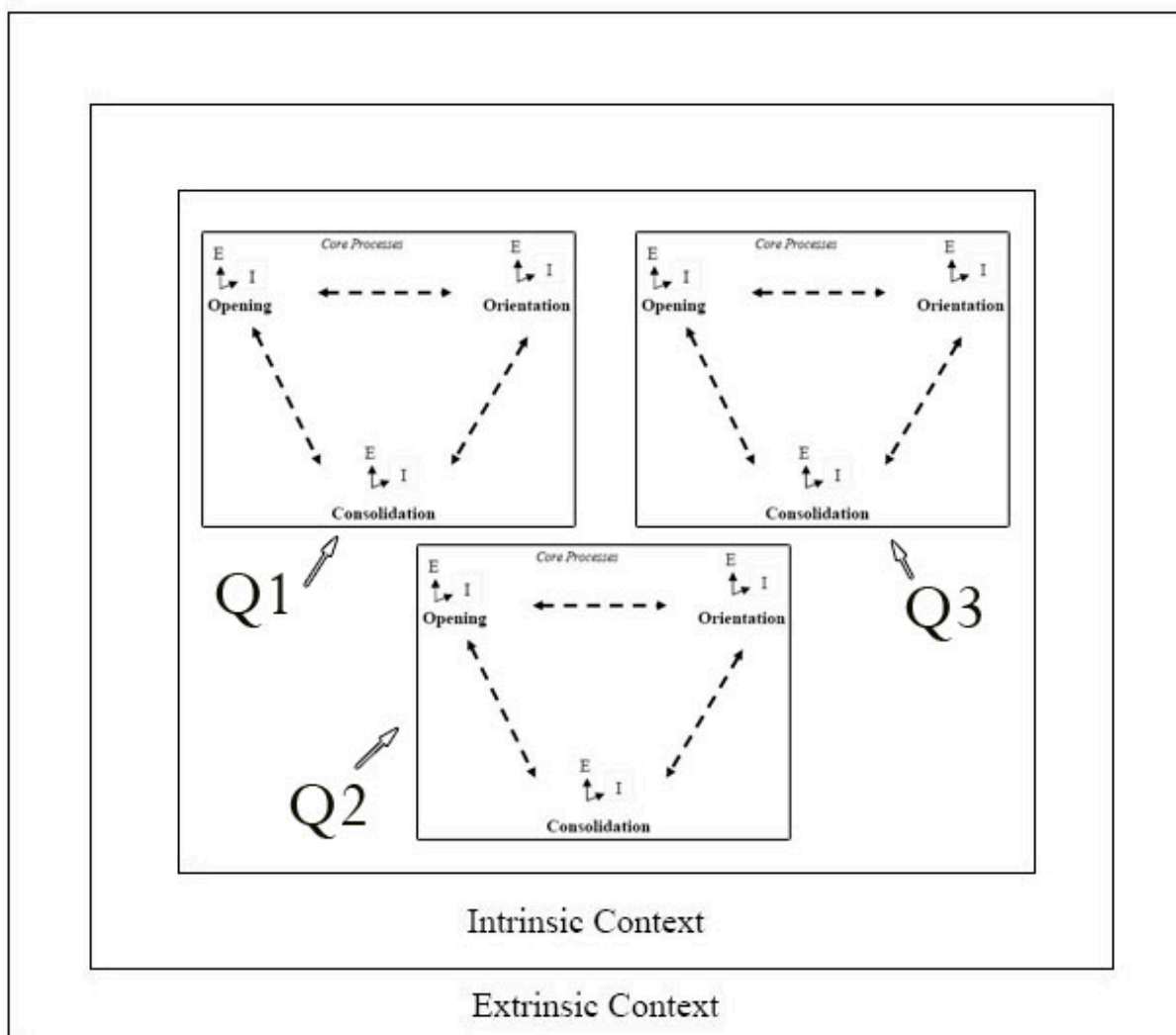


Figure 25. Composite non-linear model including three question types.

## **Conclusion**

This work began with a discussion of the effect of photographs on societal change and the corresponding necessity of providing excellent search tools to serve new populations of image searchers and their ever changing image needs.

This dissertation has been completed with the intention of offering further insight into the fundamental landscape of image retrieval and image seeking behavior. In particular, this study has aimed to identify specific questions and frameworks which may be utilized for further exploration of this landscape and has explored an inductive approach to the study of image seeking behavior. The image search scenarios, based on image query types by Yoon and O'Connor (2010), as well as Anderson's (2006) functional ontology construction model were demonstrated to be viable research frameworks which also warrant further investigation. The discussion of results and exploration of various ideas for future research is presented with the hope that exploration into the world of image search will continue with passion. The end goal is that through a more complete understanding of the user experience of image retrieval, the subsequent design of more effective systems for image retrieval becomes a reality.

Patrick Wilson (1996) explains in "The Future of Research in Our Field" that while a lack of emphasis on the engineering aspects of information science may have been "understandable when in an era of static technology" (p. 323), it will increasingly become necessary that we not only use technology, but that we also design the technology which we intend to use. He asserts: "As the need for more sophisticated information systems becomes clear, however, information science as system design will increasingly claim a distinct place in the academic world" (p. 323). Today, as technology

advances at a speed far from static, information scientists may embrace an engineering research and development approach which is steeped in the human sciences.

Mark Rorvig emphasized that system designers must always prioritize the user as more important than the system itself. He advocated that users should be involved throughout the process of system design and explained that it may be necessary at times to experimentally tweak the system in order to figure out what works best for its intended users, much in the spirit of engineering design. Rorvig reminded students and colleagues to play with system design: “As information scientists, we should not be afraid of getting our hands dirty” (M. Rorvig, personal communication, circa November 2001).

We close with an apt quote from Wilson (1968) which we will be wise to remember through any endeavor:

A little clarification in one place is likely only to expose further obscurities and difficulties in neighboring places, and there is some truth in the claim that we cannot clarify anything unless we clarify everything. Since we cannot manage that, we must be content with relative clarity and a bit of precarious understanding. (p.2)

APPENDIX A  
INSTITUTIONAL REVIEW BOARD LETTER



OFFICE OF THE VICE PRESIDENT FOR RESEARCH AND ECONOMIC DEVELOPMENT  
October 20, 2011 Research Services

Brian O'Connor  
Department of Library and Information Science  
University of North Texas

Re: Human Subjects Application No. 11426

Dear Dr. O'Connor:

As permitted by federal law and regulations governing the use of human subjects in research projects (45 CFR 46), the UNT Institutional Review Board has reviewed your proposed project titled "In Pursuit of Image." The risks inherent in this research are minimal, and the potential benefits to the subject outweigh those risks. The submitted protocol is hereby approved for the use of human subjects in this study. **Federal Policy 45 CFR 46.109(e) stipulates that IRB approval is for one year only, October 20, 2011 to October 19, 2012.**

Enclosed is the consent document with stamped IRB approval. Please copy and **use this form only** for your study subjects.

It is your responsibility according to U.S. Department of Health and Human Services regulations to submit annual and terminal progress reports to the IRB for this project. The IRB must also review this project prior to any modifications.

Please contact Shelia Bourns, Research Compliance Analyst, or Boyd Herndon, Director of Research Compliance, at extension 3940, if you wish to make changes or need additional information.

Sincerely,

Patricia L. Kaminski, Ph.D.  
Associate Professor  
Department of Psychology  
Chair, Institutional Review Board

PK:sb

## University of North Texas Institutional Review Board

### Informed Consent Notice

Before agreeing to participate in this research study, it is important that you understand the following explanation of the purpose, benefits and risks of the study and how it will be conducted.

**Title of Study:** In pursuit of image: How we think about images we seek

**Student Investigator:** Sara Oyarce, University of North Texas (UNT) Department of Library & Information Science. **Supervising Investigator:** Dr. Brian O'Connor

**Purpose of the Study:** You are being asked to participate in a research study which is intended to gain insight into how users think about images that they seek, particularly through the use of online image search retrieval systems.

**Study Procedures:** You are being asked to take part in a 1-2 hour telephone interview regarding your use of images and approach to image search. The audio of this interview will be recorded.

**Foreseeable Risks:** No foreseeable risks are involved in this study.

**Benefits to the Subjects or Others:** We expect the project to benefit you by providing you with more insight into your own use of images and approach to image search. We hope to contribute to the research community by informing design of more effective image retrieval systems.

**Compensation for Participants:** None

**Procedures for Maintaining Confidentiality of Research Records:** The confidentiality of your individual information will be maintained in any publications or presentations regarding this study.

**Questions about the Study:** If you have any questions about the study, you may contact Sara Oyarce at (940) 206-1172 or via email at [soyarce@unt.edu](mailto:soyarce@unt.edu) or my advisor, Dr. Brian O'Connor at (940) 206-1172 or via email at [boconnor@unt.edu](mailto:boconnor@unt.edu).

**Review for the Protection of Participants:** This research study has been reviewed and approved by the UNT Institutional Review Board (IRB). The UNT IRB can be contacted at (940) 565-3940 with any questions regarding the rights of research subjects.

**Research Participants' Rights:**

Your participation in the survey confirms that you have read all of the above and that you agree to all of the following:

- Sara Oyarce has explained the study to you and you have had an opportunity to ask any questions about the study. You have been informed of the possible benefits and the potential risks of the study.
- You understand that you do not have to take part in this study, and your refusal to participate or your decision to withdraw will involve no penalty or loss of rights or benefits. The study personnel may choose to stop your participation at any time.
- You understand why the study is being conducted and how it will be performed.
- You understand your rights as a research participant and you voluntarily consent to participate in this study.

APPROVED BY THE UNT IRB  
FROM 10/20/11 TO 10/19/12  
SB



APPENDIX B  
INTERVIEW TRANSCRIPTS

Interview transcripts are included here in the order in which interviews were conducted. Detailed interviewee profiles and an analysis of the interviews can be found in the description of methodology in Chapter 4.

## Interview 1

SO: I'm going to start with demographic questions.

How old are you?

NS: 32 years old.

SO: And you are a male?

NS: Yes.

SO: What is your first language?

NS: English.

SO: Are you fluent in other languages?

NS: I am not fluent in another language.

SO: What is your highest level of education?

NS: I have a Bachelor of Arts.

SO: How would you describe your occupation?

NS: I do commercial film and video work and am a filmmaker.

SO: How many years have you worked in this occupation?

NS: About a year and a half.

SO: And is your education directly related to your current work?

NS: Not directly, no. I mean, sort of.

SO: What do you mean by that?

NS: Well, as someone who is involved in documentary filmmaking, there are certainly similarities in a lot of the social science stuff that I studied, and how I approach various documentary subjects that I might consider making a film about.

SO: Tell me a little bit about how often you conduct your own image searches.

When do you conduct image searches, and about how often?

NS: It's hard with any degree of certainty to say how much. I would estimate that it's something that happens between, in one form or another, several times a day, maybe 1-5 times a day. That's just a total guess.

SO: Would you say that most days you conduct image searches?

NS: I feel like the answer to that is probably yes. But when I think of just the concept of image searching, the first thing that comes to mind is that I have the need to find a picture of something, and I will use Google Image Search™ and find it. But I realize there are more subtle ways that I don't as readily identify with image searching, like trying to find a picture of someone on LinkedIn® or Facebook®, which probably happens close to every day. But it's not something that I immediately think of as image searching, even though it is.

SO: What are your typical motivations to do image searches? What are some examples of motivations for image searches?

NS: I think there's going to be several different reasons why I would start to look for an image. The most straightforward one would be if, as I said earlier, I needed to find a picture of something, whether it was for – before I was doing film stuff, but I still do a little of this for some clients who I have had for awhile. If I'm doing any sort of design or PR/Marketing stuff, which is what I used to do, then there's often situations where I need for someone else's marketing purposes to find a specific image of something. It might be Google Image Search™; it might be iStock photos, or some other stock image site.

I'm just trying to think. The other, more frequent example, is if I were wanting – for

example, right now, I'm considering a bunch of different places I might go on vacation to for winter break, and I've used image search both to look at the destinations themselves, like to check out what the beaches look like, or if I can get a sense of what the culture of the place was, like how commercial it was, through, often Google Image Search™. I'm not sure if it counts as image search if you're using some sort of trip advisor site, or hotels.com, specifically to look for images of those hotels, but I do that. So that would be probably the two most frequent things.

Or, another example would be if I – maybe I'm using Yelp® to get a sense of what a restaurant looks like, or what their food is like. So sort of to get a sense of what an experience would be like without actually having to invest either money or time in going there. To aid in decision making, I guess.

SO: You have mentioned also looking for pictures of people. Is that a good motivation?

NS: Yeah. The other sort of – another application, which often is tied in with – it might not be an everyday thing – it might be if you're looking for a new roommate, or you have a business contact, and you just want to do your due diligence – is using either Facebook® or LinkedIn® or something like that, just to see what they look like, to make some sort of judgment about if they're worth dealing with, or what their character might be like, or just to give you more of a complete picture of what they're about before meeting them.

SO: You mentioned that you've used image search in your work for design and PR /

Marketing. You mentioned that that was related to work that you've done in the past. Is that also related to work you do now?

NS: Yes and no. I think for documentary work, there's definitely – for example, I was recently doing some pro-bono work for the San Francisco Fire Department, and it was about earthquake preparation in San Francisco, and one of the people who were – we were interviewing this woman who is a Chilean earthquake survivor, and we needed to find a lot of images of the earthquake in Chile last year. So there might be – yeah, there's going to be occurrences when you're making documentaries where you need to find images, and ideally images that you can either use through fair-use or gain the rights to.

SO: So part of what you do is to ensure that the images you use can be used legally?

NS: Yeah, I mean, I think that just sort of comes with the making of films, whether it's with pictures or any other sort of intellectual property, or just people's appearances. You just sort of get vigilant about being able to have the rights to use what it is that you're filming or finding.

SO: In which roles do you search? You've mentioned some professional things; you've mentioned some personal things. Are there other roles that you recognize you may take on in search?

NS: I feel like I've probably mentioned most of the different ways that I would use search on a day to day basis.

SO: Some of the roles that are potential roles for seeking here include what you're doing professionally – that's definitely relevant in your case – and then personal – looking for images for yourself and looking for images for others.

NS: For the most part, if I'm searching for images through Google Image Search™ or iStock®, it's going to be professional application. I mean, there might be some sort of instance where I'm just messing around in Photoshop®, and I just want to make something that's kind of funny to show to a specific person as a joke, or I might want to search for some things and then Photoshop® them together. But other than that, I don't think – the only other personal stuff would be like e-stalking people.

And it's different -- ok, let's talk about that. It's different than judging someone, you know, like before you meet them. I mean, people also kind of skulk through the friends of their friends on Facebook® and look at pictures of different people.

SO: Then there's the distinction between image search that's e-stalking and image search that's finding out more about somebody you want to know about.

NS: Or just for the sake of – well, that's sort of a nice way of putting it – I'll be prejudice now. But yeah, there's sort of the voyeuristic aspect of it. I mean, sometimes you are explicitly searching; often it just sort of ends up happening. When you're on someone's



sort of social media page, and then you notice that one of your friends is in a picture with someone else, and then there's this quick trail where you end up just, maybe looking through all of one of their friends-that-you-met-at-a-party-once's pictures. And then you might end up on someone-else you've-never-met's pictures. But you're not really actively searching – it's more just something that happens at that point.

SO: It sounds like in some cases, you recognize that you need something, and you conduct a search. And in some cases, you find yourself conducting a search, although you didn't recognize that you had a need initially.

NS: Well, I don't know that it's necessarily a search if it just ends up being something that happens organically. You're actively choosing to click on the next picture, but it's not like at any point you decided – well, are you really searching for something if it's already in front of you, and you're just kind of extending that kind of voyeuristic thing that just organically happened?

SO: Well, in the field of information science, there's something called information seeking behavior, and this whole study that I'm doing is under that umbrella, so to speak. So searching for information is a part of that, and browsing for information is an important type of information search. So actually what you're describing is a great example of browsing for information, which many theorize to be one of the most common and also most successful ways to search for things, be they pictures or other types of information. So, yes, that is considered search, and that's a good distinction.

So let's think specifically about searches where you start with an intention. So you recognize that there's an image that you need, for example. Is there ever a time when you would want to avoid conducting a certain type of image search?

NS: What sort of situation – what would be involved in this? I mean, why would you explicitly not want to search for something if you needed to find it?

SO: Let's say that, in a professional capacity, you recognize that you may need images of some objects that you may or may not be familiar with, and sometimes people are uncomfortable with searching for information, for whatever reason, and so they try to avoid conducting those searches. Maybe they find another way to –

NS: I feel like the only thing I can think of offhand is – say, I was looking for something that I knew there was going to be a lot of results for. And I didn't want to go through – I didn't want to do all the legwork of having to go through fifty pages of something that wasn't really that interesting, that I knew a client or somebody needed, and I didn't want to go through just like so many results and maybe order a bunch of things that weren't really that visually interesting or that different [from one another] to me. That's all I can really think of. The only other thing that might be sort of close would just be – and this is not something where I would necessarily want to avoid doing it – I would just be frustrated with the process itself – would be if it was – I think I just encountered this yesterday – where I was searching for something where the word itself had sort of ambiguous results, and I knew that there was – upon seeing the Google® search

results, there were a couple of things that were --- I was looking for a specific type of cheese, to show one of my friends who I was chatting about cheese that we liked. And this one particular cheese, the only picture they had of it was – it's this Italian cheese, which only has one importer in the United States. And the only picture I can find of it is like 100 pixels by 100 pixels. And then there were thousands of other results of pictures that are unrelated but were like similar – they were similar in that they were all from the region of Italy that this cheese is named after. So it was just a frustrating search, because the only thing that I could find was something that was really low resolution, and all the other results were unrelated to what I wanted to look for.

SO: That's a great example. And actually, that sounds like that's also an example of you using a more typical image search for a personal reason for others.

NS: Yeah, I think I might have mentioned that already, but it's often used on a day-to-day basis for illustrative purposes. Like if I want to share some experience I had with someone else, or maybe to get them excited about something that I tried and was excited about. You know, finding an image of it to send a link to them about.

SO: Can you give me an example of a typical process you might follow in searching for an image? Let's say, for example, the cheese that you just talked about.

NS: My standard searching MO [modus operandi] would be constructing some sort of query that would be similar to the way that I would search for it if I were just doing a web

search. And then the next step would be – probably for most of the things that I end up using image search for – it's important that it's not a thumbnail – that it's fairly high resolution. So often it's going to be going to advanced search features. Actually, with Google Image Search™, you can do that without advanced. But on the left-hand side, clicking on the larger or extra-large image. I don't know, I mean, it's pretty straightforward. You either find it, or you don't. And you click on the next page if you don't find it.

SO: Do you ever modify the search terms that you're using based on the results that you get for your first search?

NS: Yes, if there's an ambiguity to the results that I didn't anticipate. I think if there's some other term that might more effectually find what I'm looking for, then I'll try to find it. Or, sometimes it's just out of desperation, where you don't get what you're looking for, and you just keep shooting at this thing in the dark until you ideally hit it at some point.

SO: Could you talk more about shooting in the dark? What is that experience like, if you're looking for an image and you feel like you're shooting in the dark?

NS: I think it's similar to if you were searching and you're experiencing the same thing. Usually it's a scenario where either what you're looking for is very specialized or very ambiguous, and you just try to think like the search engine, and you come up with some

kind of search query that is going to help you find what you're looking for, as opposed to the way you would actually do it – the way the search engine you would think would do it.

SO: It sounds like you're saying that it's a process of learning how to communicate with the search engine?

NS: Yeah. Understanding that it's an algorithm, that there are certain ways that information is sorted. And even though, if you would ask a human being for a picture of something, you know specifically, you would get it. That there might be some kind of ambiguity in one of the words that makes it much more difficult for the search engine to find what you're looking for.

SO: It sounds like you have an understanding of what the search engine is doing and how it actually works. Do you think that has an effect on how you search?

NS: I think just in the sense that it makes you – I don't think that I have any more of a profound understanding than most people who have used – like, maybe somebody from my parent's generation – but, I feel like anyone who's reasonably internet savvy, you sort of realize that it works a certain way, and you – I don't think it's something that maybe it's conscious that you sort of learn how to do this. It's just something that I think you develop after having to do it a bunch of times.

SO: Can you tell me about where you conduct your image searches? You've talked about Google Image Search™. What else is there?

NS: Specifically for situations where I need to find a specific image? Or do you mean just all applications?

SO: Any application of image search.

NS: I think I've mentioned most of them at this point. It would probably be Google Image Search™, Facebook®, Yelp®, probably some travel sites, LinkedIn®, maybe. I think it's often limited to those. It's all I can think of offhand. I might be wrong about that.

SO: You mentioned iStock® also. Is that one that you use exclusively for professional work?

NS: Not exclusively, no, but I would say that a large percentage of the time – because you have to buy stuff from iStock® – most of the time, if something warrants me paying money for an image, it's going to be for paid work. I mean, there are exceptions for that. But for the most part, it's for some client or something.

SO: Is that the only example of a search engine, or an online search location, where you would actually pay for images?

NS: That I use with any sort of frequency?

SO: Or that you're aware of?

NS: There's a ton of other stock image sites. Like, Getty® would be the biggest one. But Getty® is often cost prohibitive for anyone who's not working for a newspaper or something like that. I mean, there's a bunch of other smaller-scale stock image sites, too.

SO: We touched on this a bit before. Can you tell me about how browsing for images plays into your searches?

NS: Are we just talking in Facebook®? Well, let me think before I answer. I think sometimes you just go on tangents when you're searching for something explicitly, and maybe there's a totally irrelevant result that just is interesting for some reason, because you weren't thinking about it two seconds earlier, and it just shows up there, and something about it piques your interest. And then you might just go on some sort of – do a series of a bunch of clicks on weird, random tangents, based on that thing that you inadvertently found during your search, which makes you search for other things, which were not related to what you were searching for initially, but are related to that tangent.

SO: When you're looking for – when professionally you need a certain image of something, do you tend to browse through your search results to find what you're

looking for?

NS: Explain to me the distinction between browsing through my results and just examining the results as I normally would? What other option do I have other than browsing through my results?

SO: When you do an image search, and you get a certain set of results, let's say, many search engines separate them by page or sets, so you can look through them one at a time. Browsing would be more if you refine your search based on what you see in the first set of results. And then you might refine your search differently based on the second set of results.

NS: So for our purposes right now, browsing is just a series of refinements in your search?

SO: Consider, in the way that you talked about tangents, it's a little like going on a tangent, because imagine you've done your first image search, and you see that that's not getting exactly the results that you want, but you might notice a few different routes you might take to get to the results that you want. Does that play into your searches, that experience?

NS: I think it depends on the results of the initial searches, but it's certainly something that I would do if I'm not able to find what I'm looking for through the first query. I think



usually, depending on what it is that you're looking for, or sort of a wrinkle of that would be the rights issues. Because sometimes they'll be an abundance of really good results that you know that you have no ability to use, for legal reasons. But I think usually it is pretty clear how difficult of a task you have ahead of you in finding an image based on the first series of results. Either it's something that you're going to find pretty easily, or you know that – because there are two images that look like what it is that you're looking for, but maybe they're the wrong resolution, and everything else that you're looking for is related – that's it's really difficult, even if you refine your search a lot, to find what it is that you're looking for, delivered in a fashion that's usable. So I think you usually know based on the first search whether you're going to be able to find something. And there are cases where maybe if you changed your search query, then maybe you'd be able to find something a little bit better, but often you sort of know, based on the first round of results, how hard the task ahead of you is going to be.

SO: Are there examples of images searches you might do that don't necessarily have obvious text or keywords that you can apply to them?

NS: In a very general sense, or if I were explicitly looking for a certain type of image that doesn't have clear, like keywords associated with it?

SO: Let's say you want to find a particular image, and you have an idea of what kind of image that is, but it's not clear what kind of keywords you would use in a search engine.

NS: That's a hard situation to conceptualize, just because, how often is it that there isn't words you can use, associated with what it is we are looking for?

SO: That's a good question. Consider that there are always words that you can use, and it's our task based on the current image retrieval systems we have at our disposal that we must put our image searches into words. Sometimes it's more difficult to put them into words.

NS: Are you talking about something that's maybe mood-driven, or? I mean, you could search for something literally based on the name of what that object is, but there are also going to be categories that something could fall under, and I mean, maybe a good parallel would be music search, where I often need to find – maybe I'm doing a video for a company, I might have to find some sort of piece of music that – the name of the music is not important for them, because that's just something totally abstract that somebody throws on to the song, because they have to name it. Whereas there are certain characteristics that the music has, which is – it could be the tempo, the feel of it, the genre that it's in. Whereas in image search, there's really no way that I can think of right now that allows you to search for a happy picture, or a picture that's very dark. There's nothing you can do that's mood- or category-related. But it's all based on, at least on my understanding, the naming conventions, or what the picture literally is of, or the content that's on the same page as the picture.

SO: Have you used Flickr® for image search ever?

NS: Not really at all.

SO: So Flickr® is an example of an image world that uses tagging. Often times, because they're user-generated tags, images will be tagged with things like happy or sad, and to some extent, this is a new way of looking for images. I really like the parallel you drew to music search. That's a great parallel, because in music search, there are these different ways of looking for music, and that's exactly the kind of thing that I'm interested in how we could create that for image search.

I'm going to read you a sentence about a type of image search, and I'd like to hear your thoughts about this type of image search.

A user might say, "I do not know exactly what I am looking for, but I will know when I see an image whether or not it satisfies my need." Do you have experience with this type of search?

NS: To some extent, yes. In situations where I was doing marketing and design stuff, there's certainly a situation where someone might not know what it is they are looking for. They might have an idea of the sort of thing that would satisfy what it is that they had in mind. But they might not know what that looks like. And then you have to show them like ten different things that you think meets the criterion, but you're not sure, and then they decide, "Ok, this one works."

SO: In that kind of process, you are looking for images that meet someone else's

needs. So you search for images and show them some selection, and they give you some feedback on how those images may or may not meet their needs, or give you more information on what they're really looking for, correct? Does that process ever involve you trying to get more information from them before you conduct that initial image search?

NS: Yeah. Typically it would be a situation where you had some sort of meeting with them, and you got a sense of what they're like, how they're positioning themselves, or what their particular marketing objectives were, and you would have a context to work with. And you try to extract as much information as possible from them. But I think that's the thing about design in general – you are someone who's being paid to kind of interpret someone who's often inherently not good at expressing either what they need or want, and having an ability to transfer that into a visual aesthetic. So you try and get as much as you can from them. One really helpful tactic is just saying to them, "What else do you like that is similar to what you want?" You might not be able to tell me what you want, but maybe you'll be able to say, "I saw this other website that had this image on it that I thought was really effective." And then you can ask, "Well, what did you like about it, or what didn't you like about this?" That's often the way that you end up getting to what it is that they want.

SO: How often is that kind of conversation, like you mentioned earlier, about mood or categories? Does that conversation with a client involve things like, "I want it to feel this way," or, "I want it to be...?"

NS: Yeah, I think some of those more abstract classifications get brought up in those situations when people don't know what they're looking for as much.

SO: Can you imagine the utility of a search engine for images that allows you to choose, like in a music search, something like the mood or the genre of sorts, of the image you're looking for?

NS: Can I imagine it, yeah. I think the thing that would make it difficult would just be that at some point, there would have to be a human-generated input that would classify these things. Because my understanding is that that's the thing that's holding back the ability to refine how effective image searching is right now, because most of it is just text-based. You could probably write software that could tell by the color palette, or the amount of light or darkness, or just being able to recognize a face or something like that, what an image is of. But ultimately, there's going to be lots of results that a human being is going to look at and have to classify in some way.

SO: We were just talking about a commercial need. If a client wants something and you're trying to find it for them. Are there examples of searches that you do for yourself where you're not exactly sure what kind of image you're looking for but you would recognize it?

NS: I think it would be pretty rare. There are examples where I don't know exactly what

I'm looking for, but I know the category of what I'm looking for. But it's usually, that category is pretty defined to begin with; it's not something that's vague. I'm just thinking of how – there's a pick-up soccer game that I organize. And generally, whenever I do something that's like an invitation or like a poster or something like that, I invest a little bit of time to just make it look clever or cool or fun or funny or something, and I needed something very regal looking, because it was part of the joke. And I knew that I wanted some kind of royal crest, some aristocratic seal. I didn't know exactly what that would look like – I knew that I knew what some sort of aristocratic seal looked like in some kind of vague sense, or crest looked like. But I had no idea of specifically what I wanted it to look like. And then I just typed it in and saw a bunch of different ones, and then picked the one that I liked the most. I'm not sure if that's what you're asking.

SO: That is a good example of what I'm asking. So you have an idea of what it is, but you don't know exactly what.

NS: But I think those are often situations that are in some ways tied to a creative process. I don't know that if I wasn't making something – or, the other example would be – actually, that's sort of an interesting example. When I'm looking for a desktop background, like wallpaper for my desktop, often I'll just search by resolution and nothing else, or maybe some word that's more on the vague side, because I want to find something that's not familiar, that I'll want to look at for a long period of time. So that's probably the vaguest search I would do for myself. But I think everything else is somehow tied to a creative process where – things that you're creating, they're often

derivative, and you draw inspiration from something maybe you hadn't seen before or hadn't thought about. And you'd think, "Ok, I like that aspect of that. I'm going to take that and pull it into this." So most of the instances that I can think of where I don't know what I'm looking for until I find it are tied into me making a design, either for business stuff, or as frequently, because I'm making it for myself or for personal use.

Actually, another example of that would be, say you're looking for hotels – that's something I've been doing recently. And there's sort of been this balance of, "I want to go somewhere that's relaxing and resort-y, but I don't want it to be really cheesy." So it's like I'm looking for a feel in the hotel that I want to stay at. And I don't know explicitly what that looks like, but I'm going through a bunch of pictures of different hotels – you know, the rooms, the beaches, the décor, until I find something that works for me.

SO: I know that there are travel sites, probably even the ones that you are on, that give an idea of what different hotels might be good for. Like Yelp® gives, "This restaurant is good for dates," or "This restaurant is good for families."

NS: Yeah, which is a similar application.

SO: It sounds like in this case, in your example, you want to make this decision yourself based on looking at the place.

NS: Yeah. Or the other situation, I don't think we talked about it – another application of image search for me is if there's some kind of current event that I want to get more

information about. It could range from people are protesting in some country, and you just want to get a sense of what it looks like on the ground, just so you can get a sense of what's actually happening. Or it could be some celebrity news, and you just want to see it, because that's what everyone's talking about. But you are looking for an event, in an abstract sense. You don't know explicitly what those pictures are going to look like, but you learn more about that event by seeing whatever those results or, or maybe by looking at a bunch of different pictures and sort of weaving together a picture – that's a mixed metaphor, I guess. You know what I'm saying, it helps you paint a better picture of what's going on, when you're just looking for the event itself, as opposed to – like, you're not saying, "I want to see a picture of a guy on a horse, with a club, hitting a protestor." You just say, "Egypt, revolution."

SO: That's a very good description. It reminds me of what you said earlier about using Yelp® to get pictures of restaurants, so that you can get a sense of something without investing yourself, more time or money.

NS: I think that's different, because in one situation, it's like allowing yourself to judge things in a way that's more efficient for you and won't waste your time, or you won't have to risk eating a bad meal or something like that. And the other is that you're using it more to educate yourself. And by educate yourself, I mean, seeing a picture of Britney Spears getting out of a limousine without wearing any underwear. Sometimes.

SO: Can you describe for me your experience recognizing that you have a need for a



certain kind of image? Let's use, for example, rather than the professional setting, where a client asks you for a specific thing, in a personal search that you're doing for yourself or someone else, what is the experience of recognizing, "Oh, I need to find an image of this?"

NS: I have no idea how to answer that. It's often in that moment that the need arises, and you're sitting in front of a computer, so you do it.

SO: Let's say the need arises, and you're not sitting in front of a computer. What do you do?

NS: I think if it's a less important thing, then you often just forget about it, or you use your iPhone® or your Android® phone or whatever. If it's important enough, then you do it when you get back to being in front of a computer.

SO: Do you have a sense of when a search is important enough to make that extra effort?

NS: I would imagine if we're talking about the personal realm, it's something that would be aiding in some kind of decision making that's relatively important. Most of the other times, if it's more on a whim, like if it's, "Oh, what is that celebrity, or that thing that you just happen to be talking about, look like?" or, "What does that guy that she's dating look like on Facebook®?" It usually doesn't warrant, if you don't have any sort of way to

immediately do it, or even if you did, if you had your phone, it would be kind of rude or breaking up the flow of a conversation, and it's probably not that important. Some people don't really have the ability to make that distinction.

SO: That's a very subjective decision. When do you internally visualize an image that you might like to find?

NS: I think it would be either for work purposes or some sort of personal obligation if I know that there's something that's specific that I'm looking for. Based on what we've been talking about, there are different classifications of image searches. One of them would be, I know explicitly what I'm looking for, and I want to find THAT picture. Another would be, I want to find a picture that meets these criteria. And I feel like you would be more likely to visualize what you're looking for if you already know what it looks like.

SO: How often is it that you would be trying to find exactly THAT picture?

NS: I don't know what the frequency would be. I would imagine it would be the sort of thing where I was trying to share an experience that I've had with someone else. Like, "Oh look, this is what this looked like." And again, that might not be just one picture, but it might be a picture that really well represents one aspect of this thing. Or if I just needed something for work that was a specific image of something. But I think it would more frequently be for personal use. I think.

SO: In the example of sharing an experience with someone, is it that you're envisioning or remembering a memory that you have, and trying to find an image that captures THAT in order to share with someone?

NS: Yeah. A memory of something very specific, but often because, maybe I just went to ski yesterday at a specific resort, and I'm having a conversation with someone who doesn't live in California or have any conception of what the climate is like here and that we have Tahoe so close to us, and they just think of California as palm trees and sunshine. And I want to just share with them my experience of skiing Kirkwood yesterday and how it was March, but it was still beautiful and snowing, and how it's the mountains everywhere. Or you can see the lake, or something like that, from the top of Heavenly or something. I would want to find a picture that conveyed some aspect of that experience with them.

SO: In that kind of example, how do you know when a particular image does capture that experience, will communicate that to someone?

NS: Often I don't, and you just sort of find something – unless you take the picture yourself, it's very rare that you would exactly find something that conveys the scope of this experience you had. I think you look at a bunch of different stuff, and you see what does the best job, and you decide that that did the best job of all these images, that's the best I'm going to do, and you share it with them.

SO: Is it sometimes the case that they might give you feedback on what you share, and then based on that feedback, you would share additional images?

NS: Yeah, of course.

SO: Would you consider yourself a writer at all?

NS: Yeah, sure.

SO: You're talking about sharing an experience, conveying something to another person, and that's often accomplished with the help of writing. So in what way do you feel that images are important or even necessary for conveying this kind of experience?

NS: You might be able to, with beautiful, descriptive, flowery writing, create a sense of what an experience was like. It's going to take awhile, and a picture is going to be able to convey that faster. Some people have the ability to more vividly imagine things than others. There's going to be, I think, more consistency as well with the delivery of that sensation, or memory, or whatnot. Think about – this is a ridiculous example, but – say you wanted something that would be a cue that would help someone understand your experience in Tahoe last weekend. If there's 100 pictures in a grid versus 100 little small paragraphs, describing that thing, you're going to be able to process those hundred pictures probably in probably a matter of seconds, where it would take maybe an hour to read all the paragraphs.

SO: That's a great example. So how satisfied are you by image search in general?

NS: A lot of my dissatisfaction would be – well, two things. One would be, as I said earlier, there's two kinds of searches. If you're looking for something very specific, it can be a dissatisfying experience, because the likelihood that somebody took the kind of picture that you're looking for that type of image is not going to be that high, and if it is, then it might not be at the right resolution, which it probably isn't, for whatever reason. And then there are more general images, which you're going to find a lot of, because I think what it comes down to, one of the biggest frustrations ends up being a rights issue. Yeah, there are images that you're going to be using to either gain information or saving, or investing your time or energy in something when you could just judge it preemptively. But there are also situations where there's an image you might need for something, where you don't have the rights to it, and you can't use it, so it kind of defeats the point that you can find it.

SO: What do you do in that case that, because of rights issue, you can't find and use an image that you need?

NS: You do one of two things. You either take the picture yourself, or you find the best possible alternative that probably doesn't meet your need nearly as well as what already exists. But what other choice do you have?

SO: Relatedly, how satisfied are you with the image search resources that you're aware of? That means, like the image searching websites that you use, for example.

NS: The other thing also is – going back to – this is sort of both questions, this and the last one – often you can find something that you can have the rights to if you wanted to, but it's cost prohibitive. The Getty® images cost sometimes thousands of dollars. I think I understand why they do.

How satisfied am I? I think for personal usage, for the most part, satisfied. I mean, it's like anything else – it's going to be able to do a good job for some things, and it's going to have weaknesses, limitations. But it kind of is what it is.

For professional use, there are some sites that are really good at some areas and not great at others. And there are some that are just really expensive for everything. And it could be frustrating if you don't have a really large budget and you need – you have a very specific need and no means to actually take the picture yourself. But the risk is to be expected.

I think the other thing – and this is maybe one more legitimate frustration that I have – with either search instance. This more pertains to personal usage as well. I feel like if you search for something with Google Image Search™, you're going to get the same results. If you search for – ok, right now I'm opening up a browser, and I'm going to randomly search for – actually, when you click on the Google Image Search™ homepage, there are four images that are there already. One of them is from Van Gogh painting, one of them is a weird logo, and one of them is a bridge that looks like it's somewhere in Eastern Europe. And then there's, it looks like it's either [unintelligible] or

I think it's Santorini. I'm going to search for Santorini right now. Yeah, I want to do Greece. And if I search for "Santorini Greece" one hundred times, then the same results are going to show up one hundred times. And granted, you know, if I go to a "Show more results," I'm trying to see how many pages here I can go through before the results kind of really trail off. The bottom line is, there could be great images that are just – and I guess I understand why this is – but there could be great images that are obscured because they're on the hundredth page, or the tenth page, which I'm never going to have access to, because I see all these images on the same page, which are sometimes repetitive by virtue of the fact that they're the ones that are most accessible by search, so more people find them, use them, and they become more popular. Whereas, it might be cool – it might also be annoying, because it might be hard to find the same stuff over and over again. If you need to do that. But it might be interesting to have it so that every time you'd search, you'd get different results. So you'd have more access to – well, it says there's 3,620,000 results for Santorini. I mean, at most I'll maybe see a thousand of those.

SO: You'll see a thousand, because you'll actually go through each of those pages?

NS: Maybe there's a couple hundred images here on the first page. It looks like there's maybe a few hundred images on the first page. But I mean, I'm never really going to look at more than a few pages.

SO: It sounds like you're saying, if there were some kind of different formatting or setup

for the search results...

NS: I mean, one of two things – I understand that there's an algorithm that which rates these first page results as higher priority results, because they're better, arguably, or they're better categorized or something. That's good in some way, but there's definitely downsides to it, too, because it only allows you to see a certain number of images, and the algorithm isn't perfect. It might be the best picture of a certain aspect of Santorini, but it might not explicitly be what you're looking for, and that might not be categorized in such a way that would allow you to find it.

SO: Is part of what you're saying also the idea that, if you search for images of the sun – I've tried this in the past, then I see the same image over and over, throughout the first few pages.

NS: For example, if you look for a solar eclipse, there's one picture – and it's funny. The only reason I've noticed this is because a company that I've worked for used this specific picture of a solar eclipse in their logo, but it's funny, because there's really one picture of a solar eclipse, and any time that somebody uses a picture of a solar eclipse, then nine out of ten times, it's this specific image of a solar eclipse. Just because it's sort of – it spreads, and it replicates, because it's so popular.

SO: And then that interferes with the image search results that you would get when searching for something like that.



NS: Yes, because it just permeates to, kind of, everywhere.

SO: Thank you very much for your time. That's a lot of very good information, and I appreciate it.

NS: That's more than I've ever thought about image search and probably will ever again at any point in my life.

SO: Do you feel that it was in any way helpful to you?

NS: Absolutely. I mean, maybe in ways that I don't appreciate right now that I will come to appreciate in the future.

SO: I'd be happy to hear about those in the future as well, and if you ever have any questions or comments about this interview, or about this study, feel free to get in touch with me.

## Interview 2

SO: I'm going to start with a few demographic questions.

What is your age?

JB: 31

SO: And you are a female?

JB: Yes.

SO: What is your first language?

JB: English

SO: Are you fluent in any other languages?

JB: No.

SO: What is your highest level of education?

JB: Masters

SO: How would you describe your occupation?

JB: Archivist and Photographer

SO: How many years have you worked in this occupation?

JB: One of them probably 4 years, and as a photographer I've worked on and off for over a dozen years.

SO: And is your education directly related to your current work?

JB: Yes.

SO: Could you tell me about when you conduct image searches?

JB: At work I conduct them for work purposes, for images we might need to use for a flyer, or see if there are images online of things we have in our collection – our works, our books. And then personally, I conduct image searches probably on a daily basis, at least once, looking for pictures of animals that look like my cat, or pictures of food. Every time someone has a birthday, I try to Google® their name and birthday cake and see if I can find a picture of a birthday cake with their name on it. Some sort of frivolous things and then more serious as well. I also look for YouTube videos where someone's singing a song to the name of a person. I don't know if that's part of your research, though.

SO: So you said that personally you conduct image searches probably every day. How about for work – is that also a daily thing?

JB: It would probably be every other day, or three or four times a week.

SO: You did just talk about some of your typical motivations to do image searches. It sounds like you definitely have self-directed motivations. Professionally, how much of the image searching that you do is work that you are assigned, or work that you choose to do?

JB: I would say it's half and half. Sometimes when I am searching for an image – let's say a screen print or a work-block print by a specific artist, usually no one's telling me I need to search for the image – it's part of a larger project that I then find, I find other images for. But when I am directed to search for images, it's usually pretty vague. It's not usually, "Find this image."

SO: Is it more that you get a project and you decide that image search would be a good way of completing it?

JB: Yeah. Oh, there's another thing, I don't know if this might be helpful or not. When I'm looking, I specifically look – an example would be a personal and professional – one of my methods of looking for things. Let's say I want to find who sells a particular

antique china that I collect by like listing the company, the same company that makes Fiestaware. Well, I might look up the name of the pattern that I know it is. But not everybody knows that pattern, and so sometimes I would use words that would relate to it but are not directly tied to it, and search by image, rather than by text for the specific thing I'm looking for. Image searches can bring up more related things that don't necessarily, are not as easily as direct with text. So I do that kind of searching a lot.

SO: Where do you do those kinds of searches?

JB: You mean physically?

SO: Yes. Which websites would you use or which software would you use?

JB: I usually use Google®. And I don't know that I use anything but Google®.

SO: That's relatively new, in the sense that a lot of people don't know about searching for images with images. So can you tell me about how you learned about that?

JB: I don't know how I learned about it. I think that – I mean, I'm not a native technology user. I didn't grow up using technology, but I found it very easy to adapt to technology. And so I find myself, when I'm looking at a website I'm familiar with, or a search engine, or something like that, I immediately look for certain cues that show me whether I can find what I need. I don't know if that directly enough answers the question.

SO: That's very interesting. What kind of cues might those be? Can you talk about that?

JB: Usually it's something – and I think that I definitely experienced this a lot while I was looking for jobs after grad school. Because you go to – a lot of companies or museums don't post their jobs on their websites. So you have to find where on their websites they would post it – in some cases it's "Contact Us," in some cases it's "About Us," in some cases, it's hidden, and you can't really find it. So I began looking for certain kinds of navigation bars at the top or the bottom, and I guess I can compare it to recently when Google+® ("Google Plus") came out. There wasn't any kind of instruction on how to use it, and you had to just sort of intuitively find things. I feel like that's basically how I learn anything else technological.

SO: How comfortable do you feel with technology now?

JB: Pretty comfortable. There are certain things I don't care to do for myself. Like, I don't really want to build a whole website. I don't want to take the time to learn that. But, given a framework, I can change things or change content on a website or something. But, I guess they are there to learn or not.

SO: Well, it's very interesting what you said about not being a technology native. And yet, according to what you've explained already, it sounds like you do have a lot of technology savvy.

JB: Yes.

SO: So how do you feel that not being a technology native plays into how you interact with technology today, especially online?

JB: I think a lot about how I'm physically connected to technology, or mentally, or emotionally connected to it, in a way that even just my younger sister wouldn't think about, because she grew up having the internet, having a laptop, having an iPod. And for me, it's more of an adjustment to use these things. And they're great, and they make me so happy, because I can stay in touch with people that formerly I had to write letters to. And I still wish I could write those letters, but being so busy with work and life, technology is great, and I feel really great about being able to use it. That said, I do feel uncomfortable sometimes how much technology is around me. I don't watch TV really. I occasionally will watch a show online. But I watch TV and there's ads, it's always too loud, there's too much going on, there's overstimulus, and I feel that way a lot with the internet. And I don't look at certain websites – I don't really look at a lot of news websites, or a lot of video websites. I just sort of try to limit myself, and when I go on trips, I try to not use the internet at all.

SO: It sounds like you're not the kind of person who would pull out the iPhone® to look up something that comes up in conversation. Or are you?

JB: I try – I actually just got an iPhone® for the first time. But only because it was the cheapest thing I could get, and I got a good deal for my family plan. And I like it a lot, but the only reason I really use it – I don't really use it to look things up out a conversation. My boyfriend tried to use my phone, I said, "No, you're not going to use the phone now." But really the thing I like it for is for taking pictures and being able to send them to people. And using the photo apps where you can sort of see your friends' photos, what they're taking. Really, it's about images for me. That's what I most use technology for – seeing images and putting images out there.

SO: Do you take pictures then primarily with your phone?

JB: No. actually, that's a totally new thing for me to take pictures with my phone at all. I usually have at least one camera in my purse, if not two. Usually I have a small digital camera and an analog film camera – a 35 millimeter. And those are the two cameras I shoot the most with. I also have a digital SLR that, if I go on a trip, I'll take that with me as well. So I usually have three cameras and then also the phone when I'm traveling. But the phone – it's actually been nice, because I'll leave the digital camera at home sometimes, instead of carrying an extra camera.

SO: Does that mean that you'll have only the two cameras plus your phone in that case?

JB: Yeah, lately it's been like that.



SO: Can you tell me about your personal image collections?

JB: Do you mean digitally or prints?

SO: Let's start with print collections.

JB: I have a large amount of my own photographs that I've kept since high school. In college, I was one of the last generations or years that – I wasn't forced to take a class in digital photography. I've never taken a class in digital photography, so I did only prints my whole college career. So I have a lot of prints from there, and I have boxes and boxes at my parent's houses back home. Some boxes here. But now, with the photographs at this point in my life, it's A) too expensive to have them printed, and B) I don't need to have them printed as much, because the prints, for me, was about having something physical to share with people. And now that I can have a negative scanned and put it on the internet to show it to people, I can skip that step of physicality. Although, when I shoot film, it's still important to me that I'm shooting film.

SO: Why is that?

JB: It's not only about the tactile nature, that there's a negative that's physical. For me, it's about a quality of light that is virtually impossible to duplicate in a really convincing way, at least to me. Usually a digital camera, you have to manipulate the image far

more to make it look like it came from a real camera, an analog camera. And I'm not really interested in manipulating the image really at all. I'm interested in having an image how it looks when I take it. And so with a film camera, what you see is what you get, pretty much. I mean, there's some kind of adjustments you can do in a dark room to change things, but if there's a light leak on the film, there's a light leak on the film. And I like that. I think it offers more up to chance. And I like getting less control over that part. But I still want to have them accessible digitally, so I do scan them.

SO: When you see an image online, can you tell if it was taken on film or if it was taken digitally?

JB: Pretty much. I use Flickr®. Actually, you asked me where I search images, and Google®'s not the only thing I use. I don't know why I said that. I use Flickr®; I use dozens of museum and library websites, things like that, to search for images as well. But I use Flickr® a lot for my own photos, so when I look through other people's, I can tell pretty quickly usually what looks like film and what doesn't. And nowadays, I feel like people who are younger than me, maybe ten years younger, are using film as a sort of a schtick or a gimmick, and they make it look as much like film as possible. Like, they underexpose the negative; they want it to look old or something. And it drives me crazy. I'm like, you're seriously bad at what you're doing. You're not doing a good job. I'm a little bit of a – it's not that I'm a snob about images. I'm really critical; I have a critical eye, I guess.

SO: When you're looking for images online, are you ever specifically for images taken on film, and you specifically don't want digital images?

JB: Occasionally, yeah. It would sort of fall into the realm of finding the birthday cake image for a friends. If I want to find a picture of a dog from the eighties that looks cute that I want to send to a friend, then I'm going to look for something that actually looks like it is from the eighties, not from a digital point and shoot. I don't know if it was [name] or even [name] who talked about the aura of the image. And I think even online there is an aura to the image. It's not physical in the same way, but that's important to me.

SO: You are on Facebook®, correct?

JB: Yes.

SO: I've been seeing something lately; it seems to be pretty popular. It's the Hipstamatic® (or Instagram®) prints. Are you familiar with these?

JB: Yeah, I know about those.

SO: Can you talk about your opinion of those?

JB: Yes, I can, because I feel conflicted about it. I am totally fine with them for the most part – I mean, they don't really annoy me. Except when people try to make it art. And

then I just get irritated beyond belief. Because some friends of mine in Chicago were like, “Oh, if you’re getting an iPhone®, you have to get Instagram®, because we all put pictures on it all the time. And you don’t have to put them on Facebook®, just put them on Instagram®, and then we can see what you’re doing, and you can see what we’re doing.” And so I did – I did use it. And the filters that they give you are kind of weird. And it feels weird to do something like that, but the way that I see it, the way that I choose to use this, is that to me it is simply a mode of communication. It has very little to do with how the image looks. And so in that way, I think it’s great. It’s one more form of social contact that I can have with people. But on the other hand, if someone’s trying to have an art show with pictures they took with their iPhone®, then I’m not going to take them seriously.

SO: We talked about print collections a bit. Can you tell me about your collections of digital images?

JB: Yes. Oh, and I should also say that I have a collection of found images, old photographs that I find and are stored, too. So I collect that kind of stuff, too. But as far as digital goes, just on Flickr® alone, I think I have 25,000 images of my own that I’ve put on there. And I actually search through them a lot, so I use the tagging option extensively. So that’s something important to me. Especially being an archivist, I want to be able to access things and categorize them. So I have a lot of images on there, and then I also have two hard drives in addition to my computer that I have photographs on. I also have a lot of digital scans of slides from my family and found slides that are

stored. So the main part of my digital collection is simply photographs I take on a daily basis. And serious photographs as well. But then sort of on the outlying part, I have images I did not create, that I am just scanning.

SO: Can you tell me about how you search your Flickr® collection?

JB: Yeah, I have certain tags that I use a lot, which are usually location based. And there's a hierarchy to the way I type them in as well. The hierarchy doesn't really affect Flickr® at all; it's simply personal in my brain. So usually if I go home and I have a bunch of photos, and I upload them, I'll put "Milwaukee / Wisconsin / Home / Travel / Visit / Family / Friends / Bar / Dinner." So everything I did in that image has some kind of context that I can search for. My cat died recently, and I was really sad. So one day I wanted to just look through pictures just to see her, and so every time I upload a picture of one of my cats, it would be "Los Angeles / California / Highland Park / Home / Cat / Pet / Animal / Ketone." And so there would be all these various ways of identifying that there's an animal in the picture and which animal it is.

SO: That sounds a bit like the Library of Congress Subject Headings.

JB: Yeah. I wish that I could make them even more in-depth. I would just have so many; I can't really devote the time. It would be a full-time job to really make them as detailed as I'd like them to be. But it helps me when I'm searching for something, or when I'm going to a friend's wedding, and then my friend goes a year later to my Flickr®, then

how else could they find those pictures? So they can write in, “Rhonda / wedding / Las Vegas,” whatever, and stuff comes up.

SO: How long have you been using Flickr®?

JB: Since 2005, I think.

SO: When you started using Flickr®, did you already have this tag system?

JB: Yes. I mean, certain things changed. Like at first, I think I didn’t have quite as many digital images. So most of them were coming from film, and I didn’t take, or put up as many as I did on a daily basis. I remember I would occasionally try, if there were any green or trees, I would try to put in the tag “Nature” or something. But then I realized that wasn’t actually that important to me. So I really only used tags that I would find myself searching.

SO: Now let’s move into the collections of images you have on your computer and your hard drives. These aren’t as easy to tag. So how do you organize and search through those collections?

JB: Well, I have a really good memory for dates, and I think I associate dates with emotional experiences. So it’s not hard for me to remember a certain date in 2003 was when this one big thing happened, and I can remember the pictures that were related to

that that I might have put in a week earlier or might have put on my hard drive at that time. So dates are usually how I have it organized. So I have folders – one folder of photos, then a folder for each year, and then within each year, there's a folder for each month. When I first started doing it, I was doing it by seasons, but that got confusing, because I couldn't decide what was summer and spring, and things like that. But then I switched it to months, and within that, I have a week at a time, or just whatever I dumped onto my computer at that time. In the past year, I've started using Adobe Bridge™ and trying to remind myself that I should start using actual metadata in my files. They all have the metadata, like my copyright in them. I don't use a ton of metadata right now, which is something I want to use. Metadata that's basically the same kind of thing I would put into my Flickr® tags. So that then searching will be easier within the hard drives. So that's something I've been wanting to do.

SO: Let's go back to online searches. You talked about the kind of overstimulation that's possible with everything that's on the internet, especially for example, what's on the news and video, but just in general. Are there ever times when you attempt to avoid conducting an image search?

JB: Hmm, that's interesting. I guess the only time I really try not to do that is when it's something I can ask someone about and not have to see visually. I think that as much as I would like to be less connected to technology and searching for anything on the internet, I do like looking at images and looking for images. I sometimes just find myself looking at images I don't like. Like a photographer whose work I'm not interested in, or

that makes me angry, and I'm like, "Why am I doing this? Why am I getting sucked in?" But that's the only time when I have to sort of stop myself and say, "You don't need to look anymore."

SO: Are those situations where you're browsing, or you're actually looking for something in particular?

JB: Usually it's when I'm browsing. But then I'll use that site Pinterest®. I've used that site, mostly again, as a way to collect images of things that I like or I want to remember, like recipes or collecting images of weddings for my sister, who's getting married. So occasionally I'll see something, and then I click on it, and it takes me to this blog, and I see this whole blog of someone's work, and then I'm led to another blog or another artist's website, and that to me is actually very overwhelming, and I try to stop when I get to that point. So there's an inability to trace back where you're coming from, or the amount of images that are out there. It becomes kinds of existentially upsetting to me, and that's usually why I have to try to stop my searching.

SO: You mentioned the inability to trace back. If it's a direct line, like you know what you clicked here, and then you know that you clicked here, and there's no branching out, if that makes sense. Is that less overwhelming, or is that still the problem of too many images?

JB: I think usually it's not as overwhelming. That just has to do with time. If I'm looking



for something at work that is not work related, and I'm in a hurry, to look up things for myself, then I get annoyed even when it's a direct line. When it's a direct line and I'm just at home searching for something, then it's fun, it's interesting. But then there are sites like Tumblr®. I find it kind of, not necessarily problematic, but confusing, in that you can't necessarily find the source of an image. People can co-opt images from anywhere on the internet, and then a hundred other people have that image on their blog then. I find this very bizarre. There are photos of mine that are on my Flickr® that are on people's Tumblr®'s that have been then recycled about three hundred times. And I'm like, "How does that happen?" So I find that kind of expands and the ability to locate sources very bizarre.

SO: How do you learn about these images of yours that are being recycled on Tumblr®?

JB: On Flickr®, you can look at your stats, and you can see how many people look at your images by each day, or the entire time that you've had your Flickr® account. And then you can click on that photo, and you can see where people are being directed from. So you can see if they're being directed from Google®, or from another area on Flickr®, or Tumblr®. More disturbing is when you can't see – when there's a website that's been able to block it. So I've had people look at mine like a thousand times in one day, and I have no idea where it's coming from, and that's weird. But other than that, it's really cool, because you can see who's looking at your pictures, or at least where it's coming from.

SO: Regarding online image search, can you give an example of your image search process?

JB: Yes. I'll give you a simple one and a more complicated one, that are both related to things I've already said. I have often looked up to see if there are other cats with the same names as my cats. And so I'll usually put something in like "Cat / Fritter / Tortoise." Because my cat is a Tortoise, which is a kind of Calico. And the Fritter is like the food, so it's kind of unusual. So I'll try different variations of those three words. So I'll say, "Tortoise / Cat / Fritter" or "Fritter / Cat / Tortoise" or "Cat / Fritter / Tortoise" and usually the one that yields the most results is "Cat / Fritter / Tortoise" so there's sort of a hierarchy. And although actually, a friend of mine told, and I don't know if this is true, that because Google® knows who I am when I'm signed into my Gmail® account, it will bring up results that are more applicable to me. So that's weird; I don't really know for sure if the results I'm getting are the results that other people would get.

A more complicated example would be like the looking for antique china that I collect. I usually do an initial search, which is this one pattern I really like, which is Gold Crown china. But then if that doesn't work right away, then I'll say "Gold Crown china / Homer Laughlin," which is the company that created it. And sometimes that pulls up Fiestaware, because they also make Fiestaware, but I don't want Fiestaware. And then I'll write in, "Homer Laughlin china [minus] Fiestaware" and see what other patterns come up, and see if the Gold Crown will come up. And this is where I would also – like if I was looking for something I wanted an image, this is where I would go to the image

search, so I could see if they have the image as well as the text.

SO: So you refine your search based on what the results are and how effective you're seeing that your search has been. Are there ever times that you recognize that the strategy you're using is not working and you need to switch to something else?

JB: I think so. I feel like I said to you last week, and I'm trying to remember what it was – it might actually have been when I was looking for a birthday cake image, and I ended up giving up on what I really wanted to find, which was my friend's name on a birthday cake, but I wanted a specific kind of cake or a specific kind of photo. And I tried all different variations of "Rhonda / birthday cake" or "Rhonda / happy birthday," "happy birthday Rhonda," all of that, and it didn't give me something that I wanted. So I just looked up "Rhonda birthday" and instead found a picture that was a weird digital alteration of a heart that had her name on it, and I just sent that instead.

SO: That sounds like the search wasn't resulting in what you were actually looking for, so you decided to settle for something different than what you were initially looking for.

JB: Yeah, but I don't think that has happened to me very often. I think I usually find what I want.

SO: It's very common that people will decide to settle for something less than or significantly different even than what they were looking for.

JB: I've actually experienced that, watching someone else searching for images and being sort of dumbfounded about the words they tried to put in to get what they were looking for. Sometimes I have to hold myself back from being, "No, no, no. Use this way," because it's not my thing. It's someone else's thing that they're searching for.

SO: Can you give an example of that kind of situation?

JB: Yeah. Just today at work, my coworker was trying to tell me about this show about zombies in the San Fernando Valley, and I was like, "What are you talking about?" So he wanted to show it to me, so he did a Google® search, and typed in like, "The Valley of Death" or something like that. And I was like, "What is that?" And he was like, "Well, I think that might be close to the title," and I was like, "Ok." And he couldn't find it, and he searched a couple of other ways, and I was like, "What if you just put, "Zombie / TV show / Los Angeles," and of course it just came right up." And he was like, "Oh right, Death Valley. I just had it backwards." So that was a sort of funny example. I feel like my boyfriend and I search very differently for things, and sometimes we irritate each other, because we are like, "No, no. I know the right way to do it." But I can't think of a good example. I guess one time he was searching for vintage stuff for the football team that his dad played on when he was a kid. And he couldn't find any, and he didn't know where to look. He didn't know what websites to search and which words to use. And I just have more experience with this.

SO: You mentioned also where to search. Where did you search?

JB: Well, I think he was just mostly looking at Google® and eBay®. I looked on eBay® and also Etsy®. And on eBay® I didn't use the word "vintage." I just used the other tags that he would have used, and that ended up bringing more results. And Google®, I typed in more specific search terms but put it under shopping, so that you can view what's available rather than just writing an article about what he was looking for.

SO: Why do you think it is that you know these types of tricks and your approach is different than other people's approach?

JB: I don't totally know. I often think that there's a parallel to it in the way that I interact with people, in that I've always been pretty good – one of the things I'm the best at is meeting people and being able to tell what it is they're talking about, or what they're feeling, or what they're trying to explain to someone else, and being able to sort of translate that into something clearer. Like if someone at work is trying to talk in a staff meeting, and I know what they're talking about, I know what they're getting at, I can often summarize it in a way that's more accessible. And the same goes for family and friends. I think that part of it is how quickly I think about those interactions. It's similar to how I work and interact with images. I'm not really sure; it's just a theory.

SO: It sounds like part of what you're explaining about being able to understand and then translate what somebody's saying sounds like good communication skills, good

verbal ability. Does that resonate with you?

JB: Definitely. I think communication has been the most important thing to me in my life and in my art work, and it's the way I've gotten all my jobs. So it really is the most important thing to me.

SO: You are aware of searching for images with images. Can you tell me about when you would search for an image with another image, rather than with text?

JB: The only time I've really done it is at work, because I wanted to find an image of a person that we have a photo of, like using our image to search for that. It was sort of looking for a similar kind of facial structure.

SO: So you're looking for pictures of the person?

JB: Yeah, trying to find other images of the same person that's around the same era.

SO: I wanted to go back to what we were just talking about, communication skills. The fact that you're an archivist must interact with these abilities somehow. Can you talk about that interaction?

JB: I think that my approach to archiving is a very intuitive one, which is why I have been able to work in this field, though I have not gone to school for it, technically. And

aside from being intuitive, I feel like it's very logical, the way that I think about and archive. I'm trying to think of a better way of answering this. Can you ask the question again?

SO: Essentially, there seems to be some kind of interaction between having good communication skills and high verbal ability, and being an archivist, and that in the bigger picture of being good at searching for images. So, which came first? Or how are these things related to each other?

JB: I think that my interest in archives comes directly from my interest in images, and having those images be accessible. And my interaction with photographs as an artist and a person is to communicate something to a viewer. To me, images are all about communication, and I think they are for a lot of people. So having that organized in a way that's accessible is the same thing to me as communicating, whether it's in a professional setting, in a library, at a museum, or a hard drive, it all feels very much the same to me. And I think I approach those things with the same attitude. I mean, I think sometimes it makes me too informal with my approach to archive, and I'm sure other people would do things differently. But usually I approach it with a feeling, rather than wondering if it's the actual appropriate way of archiving.

SO: A lot of things online period have been done by people who haven't been trained in archiving or information science or organization, including a lot of retrieval systems. Can you talk about your experience with interacting with systems which might have a

different sensibility with regards to this organization and accessibility?

JB: Well, there's little things, like with these websites which were made in the nineties that just doesn't even have a navigation bar, or some kind of organization that's obvious and not confusing. In which case I usually don't use that site. But then there's things like certain web development software, like PHP, where you can go in, and you can change things, and there's different tables and logs. And a lot of it, the information feels so busy that it seems inaccessible to me. And it's not necessarily meant to be accessible to me, because I'm not a programmer. But things like that I find sort of odd, because they are developed to store information. I'm not sure how I would feel about it relating to image searches. I was happy when Google® finally added the color thing, where you could search by color. That made a lot more sense. I think there are museum websites that don't have the most easily accessible database, where they either don't have a tagging system, or you have to just know what kind of topic you're looking for, and you just have to look through everything for that topic. I can't really think of anything else right now.

SO: I'm going to read you a sentence. Some searches can be described like this: "I don't know exactly what I'm looking for, but I will know when I see an image whether or not it satisfies my need." Can you talk about your experience with that kind of search?"

JB: Anytime I'm looking for a gift or a pair of shoes that I want – I think it applies for me more for shopping or consumption – looking for things that you want. It can also apply to food for me, like looking at recipes, and the image is what I'm attracted to first. But if I'm



looking for a pair of shoes – like for years, I’ve looked on eBay® for vintage shoes. And I can scroll down really fast, and I know exactly which ones I want. And there is something about – and I can also compare this to going to a thrift store. Because your eyes are looking at so many things at once – so many things you’ve never seen before, and then suddenly you see something that you recognize as an object of desire. And for me, with clothing or with shoes, it’s usually that I can identify that it’s the shape, the color, and what the visible texture is – whatever’s visible – so in terms of physical objects that I can see on the internet. I’m trying to think of other image searches that I’ve been able to just know by looking. I mean, I know that’s mostly how I operate. But it’s something that -- I wish I knew more about the brain. That part is really interesting. The fact that you can just stop scrolling down all of a sudden and just know what you want.

SO: Do you ever do searches where the search begins with you kind of internally visualizing the kind of image or exactly the kind of image you’d like to find?

JB: Yes. And I would say, for sure when I’m looking for something I’d like to purchase. And I guess looking for doing research about something that I’m interested in. I can sometimes do that as well. If I’m looking for a specific kind of painting by an artist, I can visualize that. I don’t know how exact it would be.

SO: So is that an example of a situation where you have an idea but you would recognize it better once you have started to search?

JB: Yeah. I think the only time I know exactly what it's going to look like is either – when I already own something I want something similar of, or something that I collect that I recognize. I've also had – I don't know why it seems like shopping and animals are the easiest things for me to visualize that I know exactly what they look like, and I want to find them. But I don't think that there are a lot of times aside from that where I know exactly what something looks like, and I'm going to find it.

SO: Let's say that there are things where you have an idea what kind of image you'd like to find, but it's not obvious what kind of keywords you would use to look for it. What do you do then?

JB: That's kind of hard. When I'm looking at my own Flickr®, and I'm trying to search for something that I know doesn't have a specific enough tag, that's when I have to get creative about it and just imagine other aspects of it, other things that it would be associated with. I can't think of a good example that's not cat related. I don't know if I have a lot of good examples of that. I guess, I usually either know what it is and find it – I don't know if there are a lot of times where I look for something that's just sort of a vague idea of what I want. I'm not sure that happens very much.

SO: So if it does happen – you used the example of searching through your own Flickr® collections for something you know that you must have; you just don't know how to find it. Is that accurate?

JB: Right.

SO: Do you consider yourself a writer at all?

JB: No, not really.

SO: What is your sense of how an image conveys something as compared to how text conveys something?

JB: Actually, my sister's a writer, and I'm a photographer. One of the most obvious things – that doesn't really answer – that people say is that, "If I could make words instead of taking a photograph; if I could tell you what I felt, then I would. I don't have words for that, so this image is words for me." When I take my own pictures, I don't usually know exactly what they mean, or I'm not able to form it into words for about six months. And then through a process of looking at the picture within the larger context of other images I took at the same time, I'm able to understand and verbalize what those things are. I think that sometimes people who write have a similar method – where they write and they write and they write, and then larger metaphors arise over time. I don't know if I answered it, but I feel like there is a big difference in how – I mean, words create imagery, and images create words, they create a discussion. It's just a different way of feeling about it.

SO: Can you tell me how your image searches have changed from how you used to search?

JB: I think that probably when I was younger, I didn't get as specific or as vague as I do now. I think I didn't really get very exploratory with it. And I think I also used image searches only for things that I needed, and I wouldn't just use them recreationally, and I wouldn't just use it for fun. And I think those are both things that I do now.

SO: How satisfied are you with the image search resources that are available today that you're aware of?

JB: I'm somewhat satisfied. I don't use search so often for work or personal use that there's so many things I can't find. But I would love it if there were a more directed way, where I could type in, "I'm looking for a photograph of a rug. The rug is red, but the color in the photograph is very blue looking." Like, I hate it that you can't describe an image like that. And it'd be pretty great if you could do that.

SO: Is there anything else that you'd like to share about image search or experience with images that comes to mind?

JB: I'm sure that there is. Well, I could tell you one sort of anecdotal – well, it's kind of cool. I have a friend who's an artist – she's a painter and a drawer. And she did a project for a few weeks, where either every day or every other day, she would choose a

word, or someone would give her a word, and she'd search that word and choose from the first page of results, choose an image that she would then draw. And not photorealistic, but she would draw her stylized representation of what that was. And I thought that was really interesting as a routine, as a project, but also the randomness of the things that you find has so much more to do with society as a whole, what people are putting on the internet, than it does with what she liked best. I thought that was a really interesting project. And if she didn't live in Italy, then I would say that you should interview her.

SO: Great. Thank you very much for your time. Do you have any impressions you'd like to share with me about the interview process or any other comments at all?

JB: I liked it. I found it very enjoyable. Partially because I'm an artist, partially because I'm an archivist. And images are important in my life, and it's nice to have a space to think about those things. I know that when I've done my own surveys and asked people questions, some people have responded by saying that it's nice to have an opportunity to think only about this topic, or to feel something about it. And I felt that way about it, during this experience, so it was a positive experience.

### Interview 3

SO: Let's start with some few demographic questions.

What is your age?

SBS: I am 26.

SO: And you are a male. What is your first language?

SBS: Spanish

SO: Are you fluent in other languages?

SBS: I try to be fluent in English, and Chinese, sometimes.

SO: What is your highest level of education?

SBS: It has to be a completed education, or what? A completed degree?

SO: No.

SBS: Then it is university.

SO: How many years of university do you have?

SBS: Two.

SO: How would you describe your occupation?

SBS: I am a yoga instructor.

SO: How many years have you worked in this occupation?

SBS: Five

SO: Is your education directly related to your current work?

SBS: Yes.

SO: How so?

SBS: First I have to define what I studied, right?

SO: Whatever you feel is related to your work, yes.

SBS: It is, because I studied to become – my bachelor's degree is in Chemist Analyst. It is related, because the things that I do in yoga have to do with a science. So the degree

that I have was oriented to somebody who would become a doctor. So the parts of the body, then the reactions in the body, the chemical reactions, they are all part of the process of yoga that I am teaching. And two years in the university, they were about teaching a foreign language, or teaching itself, so it has helped me a lot with teaching skills and techniques that I apply to my students.

SO: Can you tell me about when you conduct image searches?

SBS: Image searches is when I am studying, when I am doing advertising for myself or for the organization that I work for, and I do it also, because I am a photographer – like a fan – how do you call that?

SO: A hobby photographer?

SBS: Yeah, like a hobby photographer. I think that maybe 60% of the time that spend on the internet looking for images is as a hobby.

SO: Do you mean as a hobby, for fun, or specifically connected to your photography?

SBS: It is specifically connected to my photography.

SO: Can you tell me more about that?



SBS: Yes. When I did my degree on foreign language pedagogy, I realized that there were different types of processes in the mind, and people identified with these different processes. Like, some people are visual, others like to read. So it depends on how the information hits the brain. So I found myself being able to connect with images a lot. That's how I could understand how a topic was – that's the way I perceived things, by images. I cannot read text. It is too much for me. I need images to understand how is the information interacting with myself, with what I want, and with what I am studying. So if my hobby is, for example, photography, I am in love with black and white photography, and I need to understand how the shadows and the light and the new techniques that are around, how they work. And how is the people working with them. So I need images, because I don't understand the technical language that they use. It's not appealing to my brain.

SO: So rather than busying yourself with the technical language, you just study the images directly? Is that what you're saying?

SBS: Yes, and I try to reproduce them with the knowledge that I have of the instrument that I am using, like a camera, or a cell phone, or a tablet – whatever I take photographs with.

SO: So are those tools you use to take photographs?

SBS: Yeah, a camera – like a DSLR camera; or a phone, because now they come with

things you can do, like – well, amazing things; and also with computers or the tablets.

SO: I'm intrigued by what you're saying about how you learn with images and through images. Do you ever find yourself creating images in order to help you understand something better?

SBS: Yes, I do. I do that a lot. For example, for my teaching experience, or what I've been doing, is finding that people will understand whatever you are saying, but they cannot visualize what you are saying. So in that sense, I became creative, because I transformed whatever I was saying into something that is almost like a mental movie for them. Which means, according to, say a yogic technique, I would draw, or use a computer to draw something to create an image that they could relate to, that they could see in their minds when they are practicing. The image is not just in two dimensions – it's something like, it's the image itself, and then you can touch the image, and you can help yourself while you are touching the image. For example, there is this meditation that I – for example, there is this visualization that they need to do that has to do with certain parts of their body, so they have an image that they have in front of them, and they touch, and there's little – like a raised area. So it has raised areas in different patterns, so they know what they are doing, without actually seeing the image. Basically they are doing it with their eyes closed. So it is this interaction with the images, or the image that they had seen previously.

SO: Are they actually touching it but not looking?

SBS: Yeah. First they see it, and they get familiar with the raised edges. So, for example you would have a line and then you would have a cross, and you have three dots, so they know which area of the image in which they are, while they are not actually seeing it. They are visualizing the image. It's kind of complicated to explain, and to realize.

SO: Is it a little like Braille?

SBS: Yes, a little bit like that.

SO: And you created this yourself?

SBS: Yes.

SO: It sounds like you're creating visual images which are then actual tactile images, to help people to understand concepts that words alone are not grasping?

SBS: Yeah.

SO: Let's move back to your image searches. How often would you say that you conduct image searches?

SBS: Like five times a week.

SO: And you were saying, about 60% of your searches have to do with your photography. Can you tell me more about the other types of searches that you do?

SBS: They have to do with the work that I do, which is teaching yoga. That's it. I would say, the rest, which is like 40%, 35% is for the job, and the rest is for – I don't know, I like to change my screensaver, stuff like that.

SO: How do you find new images for your screensaver?

SBS: I have some places that I like to visit, especially ones like websites. One is called DeviantART®. So I pretty much just go over there and do it over there.

SO: So there are a few sites that you know of, and you look at those sites to find images that you like.

SBS: Because they are my selected websites.

SO: And once you're at a website, like the DeviantART® site, how do you go about finding an image that you want to use?

SBS: They have these panels – like search panels to the left, and if it's like – for

example, I also look for photography over there – so if it is photography, everything is organized under that category. If it's a wallpaper or a customization of something, then it's organized over there. So I don't go to search keywords or something like that. I like to be like – only if I want something specific, I would search for it or I'll use a keyword. Otherwise I like to be immersed in that search until I find whatever I like, because I want to see more.

SO: Is it that you don't want to narrow down your search with words?

SBS: Yeah, I don't want to narrow down my search. Unless it's something that I specifically want. Because most of the time when I am looking for something, and I narrow it down, then I find almost the same things, or things that are not appealing to me.

SO: And what do you mean by “almost the same things?”

SBS: Well, for example, if you use, let's say, you are looking for a skeleton, like I have done. And it's always this image, photography of a skeleton, or medical photography, or medical image. And I'm not looking for that, I'm looking for something more artistic.

SO: So if you were looking for a more artistic kind of image of skeleton and you're not finding that using the word skeleton helps you find that, how do you find – you're looking specifically for a skeleton, but you're not using the word skeleton, so how do you look

for it?

SBS: Let's say I go to DeviantART®, and then I know there is a category that is "digital art," for example. So I'll go there, and it depends on what I'm looking, because they have these drawings and these three dimensional art. So I'll go over there, and then I'll search for it. Of course, there are a lot of things; they don't have anything to do with skeleton. But once I'm over there – I mean, the categories help me. So, something, exactly what I wanted – if I wanted three dimensional art, I would go exactly over there. If I want the drawings, I'll go over there. Because I know that drawings are something artistic. So I narrow down my search by doing that and then I actually search by using keywords or the search box or whatever.

SO: Ok, so rather than searching everything for skeleton, you would use the categories to drill down into exactly the kind of image you might be looking for, and then you use the keyword skeleton.

SBS: Yeah. But I would not go to Google Images™ and just type skeleton, because then I know that it's going to take forever to look over there.

SO: Well, do you find that there are ever times that you feel that you need to look for a particular image for whatever reason, but you don't want to? Are there times that you avoid conducting image searches?

SBS: Yeah, I do.

SO: What is that like?

SBS: Well, it's kind of when I don't know what I'm looking for, and I need some kind of idea to narrow it down. For example, there's this images of landscapes, but I don't really know what to use. Like, I'll do an advertising about yoga. So yoga can be presented in various ways, like it can be, for example a winter landscape, or a summer landscape. It depends on the location on where it's going to be, where the course is going to be given and all that. So then I'll just go and just type "landscapes" and wait until there's a landscape that I want, something that's nice to the eye. And then I'll go and pick it up. And if I cannot work with that image, then I'll go and search something similar to that image that I like. Sometimes I don't know what I'm looking for exactly – I just have a rough idea of what I want.

SO: So when you say that if you like something, but it's not exactly right, then you look for images that are similar to it, what does that mean? What's an example of that?

SBS: For example, one time I was looking for a bamboo. And I found on the Google® search, I found a bamboo that I really liked. Like a bamboo plant – only one plant, and it wasn't like a spiral. But when I clicked on it, and I tried to use it, it was too small a piece; it was too small an image to use. So then I have to go and find it on DeviantART®, and I found out that the image that I got on DeviantART® was not exactly what I was looking

for, and then I have to search through like 500 bamboos until I found one that was similar to it.

SO: When you found the similar one, was that exactly what you were looking for?

SBS: Not exactly, but it was close.

SO: In that example, did you start out looking for bamboo?

SBS: Yeah.

SO: How did you learn to search for images?

SBS: I started like everyone else, just typing in Google® search images. And then I realized that that was not enough, and I found where the digital artists were actually posting their images, and I went over there. I typed like “digital art” and this DeviantART® place came, and I was satisfied with it, and I tried to look for other websites close to it. That’s how I learned how to search for images that I liked, that I use.

SO: What are some examples of places – you talked about DeviantART® – what are some other places that you do image searches?



SBS: Hold on – I don't know them by memory; I have them here. For example, there is this wallbase.cc. They're mostly for wallpapers, but they have some – if it's a wallpaper, it's going to be like a big image, so I can use that. I can use it. So I actually go for the wallpapers, because images are ready to use for me. So I'll go there, or I also go to – hold on – I have to open the browser. And then I'll go also to customize.org, and I like this website, because whenever you browse for something, or you find something that you like, then they have it like in a color scheme. So you can look for images that are close to that color scheme. And that helps me when I already have an idea of what I want. So actually I use only these three.

SO: Do you know about, or do you ever search for images with images?

SBS: What do you mean?

SO: For example, there are some image retrieval systems where you can input, upload an actual image into the system as a query, and then, for example, find similar images, or find images that are in some way similar to that image?

SBS: No, I didn't know that was there.

SO: Is that something that sounds interesting to you?

SBS: Yes, that sounds pretty cool.

SO: If you were able to search for images like that, how do you think that would change the way that you do image search?

SBS: I mean, pretty much. Because once I have an image that I think I like, and there are other images around – I mean, on whatever server, then I can just – on the image or the computer can do it for me. That would save a lot of work, if it actually works. I would like to try that.

SO: I can send you some links. Actually Google Image Search™ does have a preliminary sort of search like that. So it could be worth looking into. I can send you some links after this. So you are a hobby photographer. Are your images digital for the most part?

SBS: Yeah, digital. Actually, everything is digital.

SO: Do you ever find yourself searching through your own collection of digital images?

SBS: Yes.

SO: How do you do that?

SBS: I use a program that is called Lightroom. And I organize my libraries there.

SO: Can you tell me about how you organize your libraries?

SBS: I organize them in a way – there are two ways that I organize my libraries. One is that I know that my photographs are going to be shown sometime, somewhere, and I want to show only what that group of people should see. For example, in “yoga” there are only yoga images. And let’s say, family, it’s only family photographs. I do not mix them together. So that’s one way. And the other one is that I do it by date, which is kind of automatic with Lightbox – it’s an automatic process.

SO: So you organize based on audience...

SBS: Yes – audience and date.

SO: Let’s say that you’re searching for something to do with some aspect of yoga. How would you look through your images and find what you want? Can you give me an example of what kind of search you might do for an image you took that you wanted for your yoga work?

SBS: I kind of like to think in advance, so I already have a folder which is only yoga. So I’ll do that. And it doesn’t matter to me if the image is already repeated somewhere else, as long as I have it in yoga. Like, I could have it in the date section that I spoke about, but I would also have it in the yoga. So I don’t want to be looking for it. I’ll just put it in

the yoga folder, and that's in. and inside the yoga folder is like, postures, and people, and then the master.

SO: So there are subdivisions within.

SBS: Yeah.

SO: And what about inside of those. Are there divisions within postures, people, and master, as well?

SBS: Yeah, master and people are both divided. One of the aspects of master is when he's teaching and when he's not teaching. And also the people – when they are in a retreat and when they are not in retreats.

SO: So it sounds like you've set up the categories in your own collection in the same way you like to search for things on something like, the way you described DeviantART® and the skeleton.

SBS: Yeah.

SO: So is that also similar – does Lightroom allow you to search by keyword at all, once you drill down into the categories?

SBS: You know, I haven't even tried it. I don't know if it's there, because I kind of just do it myself. And also, one thing is – when you took pictures, they are all named with numbers, so to search over there with Lightroom – I don't know if you can do it or not – but I would have to input the number, I guess.

SO: Oh, is that the only way to search then?

SBS: I don't even know if there's a way to search here. I don't think so.

SO: Then you are focused on browsing through the folders that you've set up to find what you are looking for?

SBS: Yeah.

SO: Do you consider yourself a writer at all?

SBS: No.

SO: Could you tell me a little bit about your impression of how words are used to convey an idea as opposed to images?

SBS: I think that the words should be very precise and succinct to convey a message. I like instructions; that's what I like. An image – I think it kind of doesn't give you the full

picture, like the whole information, but I think that an image is something that your brain can relate to quickly, faster than reading text. Because there is no mental process – you see an image, and you kind of know what is going on, what is happening based on your own experience? Let's say it's like, how to do a yoga asana, or a posture. You immediately know when you see an image what muscle is going to hurt or if you're going to be able to do it or not. While, when you're reading, you first have to go through the whole thing – reading, and then actually trying the posture – you know what I mean?

SO: You have to test it out before you know the things you can see immediately with the image?

SBS: Right, and then you have to have a clear mental process in order to follow the instructions. So that's how I think. I'm talking about in the instruction frame. Because then there are some descriptions of like, say a landscape – while writing, they seem to be more beautiful when you read them than the actual image you could see in front of you. So it depends a lot, but I prefer images. That answers your question or not?

SO: Yes, it does. And I'm interested in what you just said about how sometimes words give a more beautiful impression perhaps than the image.

SBS: Some words, for being words, they have a mental image also. And when somebody is able to use those mental images and combine them in a way that flows, they don't contradict each other. There he is using your own image database to paint a

picture, which is going to be way more beautiful than just one single picture. You know what I mean? It's like bits of information, images, and he's really taking what you really want from that – ok, I'm going to explain in another way. You have an image in front of you – a landscape, like a photograph. And you divide this. Let's say, water, and then mountains, and then sky and sun. So what he's doing with the description is that he's taking that emotion, or that image that you really, really like about water, and he's describing that. And then he's using the same descriptions – or playing with the description, so he gets it from your mind, and then he puts that for the mountains, the sun, and the sky. So it's really, really what you want. He's pulling from your memory banks what you really like to see. Well, when you take a picture or when somebody tries to draw an image, or something like that, then they don't always get right what's the sun or what's the sky, or whatever. You know what I mean?

SO: Meaning, you would image it differently than the image shows?

SBS: Exactly. And when I read, it gives me the opportunity to image it. So again it depends.

SO: You're saying that a writer who's doing that kind of description is drawing on the databases of the audience's memories and experiences. Do you ever find that you are looking for or want to find or even create an image that can speak to that same thing – to the audience's memories and experiences?

SBS: Yeah, of course.

SO: So what is your experience with that?

SBS: Well, my experience with that is that it's kind of difficult to do it, because I need to break that image into pieces, and then I have to search or create those pieces, and then put them together in a drawing or in a photograph, or take some different photographs and create that specific thing that I want to show. So there is no data loss between what I think, what's in front, and what the people perceive.

SO: How do you ensure that you're communicating what you think you're communicating, or what you want to communicate?

SBS: Well, then I have to use speech. I need to describe the image. Even if I have an image that I consider is perfect, and you cannot get it wrong, my interaction with humans is really important, so I kind of use my language, my speech abilities.

SO: So how often do you find yourself using images to communicate with people like this?

SBS: Well, how often means every time I teach.

SO: So every time you teach, you're incorporating images?



SBS: Yes, definitely.

SO: And is that always a physical image?

SBS: What other images are there?

SO: Mental images that you might communicate with words.

SBS: Also. Both would be the answer.

SO: How did you get to this point? Not everybody teaches that way. You talked a bit about how your education in pedagogy has helped you learn how to teach. Can you talk a bit more about how you learned or decided or found that it was good and effective to use images like this?

SBS: Yeah. Well, first of all, I think I have to go back and explain – how can I describe it? When I was in school, like preschool and all these places – you know, the regular school, I always found that there was something missing, because the information that they were giving me was just data, and that data was kind of dead. Ok? So I thought that my kindergarten teachers were really the best teachers that I ever had, because I discovered, they led me to discover things, not just teaching me like, one plus one is two. Like, I don't know, who cares about that? Or the history of my country and all that.

It was not working for me. I didn't know what to do with that information. I just put that information on a piece of paper, and then I got an exam, and then I passed the exam. Beyond that, it didn't go anywhere. And I always had difficulties explaining myself, because I couldn't only use data – I had to use, like an emotion, or I had to use something that the people could relate to. And I found that there were gaps in how the information was transmitted from what I was actually saying and what the people were perceiving. I found it, because in family matters, there was always this misunderstanding, like a word that was said in a different intonation, so I began to ask the people what they understood of what I said, not to have misunderstandings. And that's how I got also interested in teaching all the people, and how the communication abilities relate to everyday life. Ok, I kind of lost myself, because I was trying to explain something.

SO: You were talking about how you came to include or incorporate images in the way that you teach.

SBS: So I found that these people have been taught by some other people – like their teachers or whatever – and they used text and images that the sensible approach was to use the same thing that they used in the schools. And I opted to use something that was easy, like kindergarten. For example, in kindergarten, you didn't have a test; you didn't have to pass the test. There was not a tension to do it. So you got time to actually enjoy what you were learning. Or at least I did. You had space and time to enjoy what you were learning. At least I did enjoy what I was learning. And everything was taught

by images and colors. There was not much text, and everything was like this interaction from the teacher to the student. That's how I perceived my education in kindergarten. So my brain, my ego, my attitude was not fighting with it, and I could take it as something useful.

SO: Can you give me an example of when, during an image search, you might recognize that your strategy is not working, and you change strategies?

SBS: Yeah. For example, I'm looking for something so specific that I can't find it. For example, last week I was looking for an image of the sun, and I was looking for – it was not a photograph, it was just a drawing – I was looking for a drawing, and I wanted the spikes of the sun to be in a specific shape, and I was not finding that. And while I was – first of all, I just typed sun, which gave me photographs and drawings. And then I went only to drawings. And when I was in drawings, I was not finding what I wanted. So I used a more specific word, which was “curved,” because I wanted the spikes to be curved, and from there I found the image, but I had to narrow it down.

SO: You use some of these images for advertisements. Is part of what you do checking for whether or not you're legally allowed to use images? Or are you not concerned with that?

SBS: No, I am concerned. I do check.

SO: How do you check?

SBS: For example, in DeviantART®, there is this Creative Commons, so I check with the user, and if it's an open file, then I just use it. But I always check.

SO: So is it sometimes the case that you find an image you'd like to use, but then the rights would not allow you to use it?

SBS: Yes.

SO: So what do you do in that case?

SBS: I do two things. I contact the person, the author, and I ask for a permission. If granted, I follow my work with that image. If not, then I look for something very, very similar. Or, if I don't find it, and I think that I can create it myself, then I do it.

SO: Some types of searches can be described like this: "I don't know exactly what I am looking for, but I will know when I see it whether or not it satisfies my need." Do you have experience with this kind of search?

SBS: Yeah, but it's not me looking for it; it's somebody else.

SO: Can you tell me about that?

SBS: Well, you know my boss. I have a very picky boss. So sometimes he tells you, say like, “sun” or “surya,” and we go through the images – like sometimes he sees it and he wants it, or sometimes he’s like, “Ok, I don’t know, because these images are not appealing to me, so keep on going, flip to the pages. When I find it, you’ll know.” It’s like that, just as you described it.

SO: Is he saying, when you find it, you will know, or when you find it, he will know?

SBS: No, we are looking together, so when he finds it, he will know.

SO: So is it that you are doing the search for him?

SBS: Yeah, I am doing the search, and he is just looking at the images. So I conduct whether I want to look for it in Google® or in DeviantART® or in customize or whatever.

SO: Then do you decide also how to look, and you show him what you are finding, or does he dictate to you which words to use, which categories to choose, and things like that.

SBS: He dictates the keywords only. And I decide whether to conduct a general search or more like searching inside a category. Of course there is human interaction in between. Which means that I would ask, “What are you looking for?” And he would say,

“Whenever I see it, I will tell you.” And when he kind of gets – through the images, when he gets an idea of what he wants, then he will describe more or less what he wants. So that narrows it down for me also. I transform whatever he says into keywords.

SO: So you’re trying to understand from him exactly what he wants and then communicate that to whichever search retrieval system you’re using?

SBS: Yes.

SO: Do you find that in those searches, you have developed an idea of what it is he’s looking for before you find it? At first he says, “I’ll know it when I see it.” But then, as you get more details from him about what it is that he wants to find, do you then have your own idea of what he wants to find?

SBS: Yeah.

SO: Is that like a mental image that you might be creating of what you think he’s looking for?

SBS: Yes, and I do that based on what we – in previous searches that we have had.

SO: So as you get to know him better as your boss, you’re able to do these searches for him better?

SBS: Yeah. That doesn't work all the time, but most of the time it works.

SO: "That" means looking for images, or getting to know him?

SBS: Like I would think that I know what he wants, and then he completely wants – then he wants something that is completely out of what I was thinking.

SO: In this and other image searching situations, do you ever give up? Stop searching?

SBS: Yeah, I have.

SO: When would you give up?

SBS: When I find that it would be easier to create it than to keep looking for it?

SO: Do you ever create images using photography? Or, how do you create images?

SBS: Yeah, most of the images is photography. That saves a lot of time for me.

SO: In addition to using photography, what are other ways that you might use to create an image that you want?

SBS: I would just use simple circles and lines and then transform that into a basic image, and then from that, keep drawing. But I don't do that often.

SO: So a search is prompted by the recognition that you need something. Can you describe a moment of recognizing that you have a need for an image, a certain kind of image?

SBS: I think most of the time, when I want to explain myself, or when I need to do some advertising or whatever, I always think of images. So I don't know if I understand the question, but for me, it's kind of always. I don't know if you understand what I mean.

SO: Are you saying that basically anytime you find yourself needing to communicate something to someone...

SBS: Yeah, I would rather have a picture and then explain the photo or the picture.

SO: How do you know when a particular image meets your need?

SBS: It's like food. Some people like salty food, or sweets, or whatever. I like a specific color scheme, or specific – I am looking for something specific, and I always know what it is. There's a combination of colors and images and lines and circles that I know I like. That's how I know.



SO: When you say that like a specific color scheme, and a specific combination of colors and images, do you mean for a particular image, or all the time, you like the same kind of color scheme?

SBS: No, for a particular image.

SO: Tell me about how satisfied you are with image search resources that you are aware of.

SBS: I am not satisfied at all, because people tend to post thousands of images, and whenever you're searching for something, all these things just pop up. Things that don't have to do with each other – like, if you're searching for, let's say, a sunset, then you have photographs, and then you have logos, and then you have drawings. So you have to really know how to describe it, all the keyword search. And even when you do that, still, these kinds of things will come up. So I would love for these sites to have everything separate, but I know it's almost impossible.

SO: What do you mean by everything separate?

SBS: Like, if I'm looking for a photograph of a sunset, I don't want to see a logo. So if I type, "sunset / photograph," screw the logo, I don't want the logo.

SO: Have you ever used Flickr®?

SBS: Yup.

SO: What do you think about Flickr®?

SBS: Let me remember. Well, I like it, because it's photography most of the time. And, you see I have an Android® tablet, and there's this [application] which is Flickr®. And I like that they have this thing that is only photography, and they have this thing like the best photography in the world, and I just click on it and click on it, and I just keep clicking, because I like to see what people think about the world in photography. I like it. I don't conduct any search of any type there. And basically because I don't like Yahoo.

SO: Well, Flickr® has a tagging system that allows users to tag images with things like "sunset / photography / Atlanta / dog"... Do the images that you look for on the other websites that you mentioned also have this kind of tagging system?

SBS: Who does the tagging? The people or the website?

SO: The people do the tagging – either the people who upload the images or people who view the images.

SBS: Yeah, they have it.

SO: Is that how the keyword searches work?

SBS: Yes.

SO: Can you tell me how your image searches have changed from when you started looking for images until now?

SBS: Yeah, I went from the basic Google Image Search™ that everyone does, to these services like DeviantART®, or customize.org, or wallbase.cc. It came from kind of something where I was kind of lost, looking at everything that people were posting, that Google® was taking from different websites, to something more concentrated.

Something that I found was right. Let's say, for example, now I'm on Flickr®, and I actually typed "Atlanta" and what I'm seeing is that there are pictures of Atlanta. You have also animals, which I think are from Atlanta, too. So this again is kind of general for me, but I would say that 60% of the images here are to my liking, are to what I would expect when I type "Atlanta." So it became from something very general like Google® to pages like DeviantART®, which I really love, because I know I'm going to find what I want, because it's organized. I'm trying to say it went from a mess to something organized.

SO: We're nearing the end. Is there anything else you'd like to share about image search in general, or about your experience with images?

SBS: Yeah, I mean, now it's very easy to take a picture everywhere, wherever you are. You have a cell phone, and you have the tablets, and even with your computer – there are these mini-computers that you can take everywhere and just take pictures. The prices of the cameras are really cheap right now. Like, normal point and shoot cameras are really cheap. So I've seen in maybe ten years, the viability of people having these instruments to create images and pictures has been increasing like crazy, and these years, maybe in the last four years, I've seen an increase of people getting interested in photography and all that, and it's very accessible now, whether ten years ago it was kind of difficult to get in this world. I think they're doing a good job. Because I like to see the world as other people perceive it through images. There's been a lot of changes.

SO: I think how you said that – I like to see the world how other people see it through images. Ok, thank you for your time and participation. Would you like to share any impressions you have about this interview process?

SBS: Yeah, I think I got something from this interview. I got to analyze myself. Because you want interaction, right? You want to see the image, but you don't want to hear the people talking about it – you want to feel it. I think that's the next step.

SO: What is?

SBS: To feel the image. Yeah, I want to feel what the people is trying to say with the image – and even if it's something like, they are teaching me something, I want to feel

the experience to the image, because if I do that, then I know that experience is not going to be tainted by that person's idea of what it should be.

SO: It sounds like I'm hearing potentially hearing two things. One is that it's important for you to understand what the person who created the image is trying to communicate. And the other is what you yourself feel about or interpret or take from the image.

SBS: Exactly. Like, I want to take from exactly the idea of that person, what that person is transmitting to me. But I also want to make that experience mine. I want that to be my experience. I want to understand that person, but I also want to have my own opinion about it, my own understanding of it. But I don't want to misunderstand that person. That is what I'm trying to say.

SO: It almost sounds like you're interested in an ongoing dialogue. Is that correct at all?

SBS: Yes, that's correct.

SO: And is that dialogue conducted through words or images, or a combination?

SBS: I would say that I would start it always with images, and then with words. From my perspective.

SO: So based on what you've just described, how would you envision an image retrieval

system supporting that experience?

SBS: Say you have a little bit like Facebook but not like that. I see a picture, ok, I have a picture. And then I have a rating system, and I have an opinion system. But it's not only like, "Hey, good photo, man, good job." I don't want that crap. I want something like, when people are seeing the image, it's like, "I think I feel something like that from that image," and then I can rate it. And I rate the image according to my understanding and my perspective of the image and the situation it's transmitting to me. You know? And it's like a forum, something like a forum, but it's not like, "Good job, man." No, I want a serious approach to the image. That's what I would envision. And "serious" means that we are actually talking to other people about what they feel about the image and how it really affects them. For example, you have these photographers, it's like they have their own style. It's like they have marketed their photography in that sense, because it transmits and affects the people in a very similar way. It transmits and affects the people in a very, very similar way. It affects them in a very, very similar way. So I want that. I would love to have that.

SO: You "want that" means what?

SBS: If I was to make this kind of a forum or a website, I would have that. I would have that system where I have an image, and then the image is big enough so it impacts me. Let's say it's almost like 60-70% of the screen real estate, and the comments will come later. I don't want to see the image and then right away go to the text, to the comments.

I want to see the image and then what they think about it. I would do that. I know people don't have time, so that's why it's like a specific kind of website. It's not like Facebook®, where it's like a gathering – you just put a picture and then, “Good job, man, great picture,” or whatever, and then skips to the next one. It has no – it's like a very light interaction. More I want people to focus on the image. It's like a discussion. I don't want to only talk about it; I want to have a discussion about it. Or, I don't want your opinion – I want your opinion, and I want to answer you back. That's what I want.

#### Interview 4

SO: What is your age?

RB: 47.

SO: And you are a female.

What is your first language?

RB: English.

SO: Are you fluent in any other languages?

RB: Not fluent.

SO: What is your highest level of education?

RB: Two Masters Degrees. One is a terminal degree in studio work – an MFA.

SO: What your occupation?

RB: Reference librarian.

SO: How many years have you worked in this occupation?



RB: About six, as reference.

SO: Is your education directly related to your current work?

RB: What your occupation?

RB: Reference librarian.

SO: How many years have you worked in this occupation?

RB: About six, as reference.

SO: Is your education directly related to your current work?

RB: Yes it is.

SO: Can you give me an example of when you conduct image searches?

RB: As a reference librarian, I have students who need images for their papers and for art research. They will need high quality, high resolution images that they can print, that they can zoom in on to really look at the details, and images that these days could even be in place of going to see the image in the art museum. So a lot of art history type uses

of images. And images for studio majors who are looking for paintings and works by certain artists who their teachers say have a similarity to their works, and that kind of thing. Also students just want to use images for their PowerPoints™.

And then on the other side of my job, I also use Photoshop® a lot. So aside from just my reference duties, I use images to develop, sometimes for the library, or mostly for our department now, and also I am on the assigned work groups, and we make library maps and stuff, so we can put them all over the library. They can be used also in electronic database and on the website for the patrons also.

Let's see, how else do I use it? Also, I make a newsletter that I send to two academic departments on campus, letting them know of some of the new books and innovation that the library offers for their use. And images always spice it up; it gets rid of all that ugliness of text. Librarians always want to overdo the text.

I'll use some for brochures.

Sometimes if I teach. So, a little of everything.

SO: Can you tell me a little about the classes that you teach and how you use images there?

RB: For the classes, I try to always use images from ARTstor®. That's an image database that we subscribe to. In those classes – I teach one that's iconography research, so I pull images from ARTstor®, and I compare the imagery and use the image with the student to have them identify objects in the image. For example, they'll be an image of a saint, and they'll tell me or identify objects, like, "He's holding a

chalice,” or, “There’s a serpent by his foot,” or that kind of stuff, or, “There’s an eagle on his head.” And then we go to iconography resources together and look those up to help solve the question of who is being depicted in that image. That’s just one example.

SO: How do you choose which images to use?

RB: I choose images that are going to be overly simple and not overly complicated for that particular assignment. Because these are all sophomore level students. You want something very direct. And I did want images that are high resolution images and pretty much close to the way they originally looked – nothing else added. The full image, not a part taking out of the image or something. Am I describing this too much?

SO: No, that’s perfect. So it sounds like it’s an alternative almost to actually going to a gallery and looking at a painting. Is that correct?

RB: To some degree. Now, a lot of the students still do that, to go to a museum to find objects for their classes. But some of them are allowed to choose images from ARTstor®. And what I like about ARTstor® also is that you’re able to pan around in the image and look around from different angles. And especially that’s very good for architects, because you can go to the Alhambra in Granada, Spain, and you can look around the different rooms, and the courtyard, and see where the images – where the different art works are on the architecture, so you see – they weren’t taken out of context, as they are in a museum.

SO: So this ARTstor® is something that the university subscribes to, or the library?

RB: Yeah. Now I guess it's probably the biggest art image resource on the market. They now have over a million art images from museums around the world, and they're copyright-clearance for education and in the classroom – you can't make any of it available on the web. If I did use an image from a brochure or something, then I can only print the brochure – I can't put it up electronically.

SO: So when you search ARTstor®, you don't have to worry about rights issues?

RB: No, I don't. And we all have to have an account now, so they know everything you've downloaded, basically. I follow their user's guidelines. You can use it; you just can't put it up on the web.

SO: Do you ever search for and want to use images that you find via another method where you do need to think about rights issues more explicitly?

RB: Yes, I do in some cases. And I always make sure they are copyright clearance, or are in the public domain, and they have a message saying they are. And if I use it, then I will put the link to where they came from right under there.

SO: Have you ever run into a situation where you find an image you want to use, but it's

not copyright cleared?

RB: Oh, yes. And I try when I can to take my own photos. I have a very nice camera; I have an art background, and I know Photoshop®. So I'll try to get my own image when I can.

SO: When you do that, you mentioned Photoshop®. Do you use Photoshop® to modify your images?

RB: Yes I do, for my own personally images.

SO: And how do you modify your images? Can you give some examples?

RB: I will crop out what I really want; I will increase the saturation of color using brightness/contrast. I will put text over some images – I'll make it say what I want it to say. I think that's it. And of course, make it fit what I want to put it in, like the size. Well, if I take an image myself, I don't have to interpolate it or anything; it's already large enough.

SO: What was that word that you used?

RB: Interpolate. It's an ability to falsely use pixels to fluff up or make an object bigger. You can only do it so much. Like if an image is pretty small, you can use it to extend, to

add more pixels. And what it does is, Photoshop® will take – it will match the pixels, the pixel information, it's going to use pixels which are already there, and it will take extra fluff pixels to go in between to make that simulation of a larger picture. It only works so much. You can't take a 32K image and do much with that.

SO: You mentioned sometimes students come, and they need works by certain artists who have a similarity – is that to other artists, or to other works of art? Can you tell me more about that?

RB: Sometimes a professor will look at your paintings and say, "Oh, you need to go look up the works of Jasper John. You have some similarity that I've seen in your work of Jasper John." Of course they like to let the students know they're right up there with these famous artists and stuff. The hardest thing I have there is so many times they are trying to get them to find images of contemporary artists. And as you probably know, there are usually no books written on these people yet. They just showed up in Art in America last month, or they just got a show at the Whitney, and so they got the stamp of – "You are an artist now." "You've made it." And all students want those images. So a lot of times, the only source for those images are the journal articles. We hope to find at least a couple on those people – sometimes it's just their website, and we just hope and pray that the artist has a website.

SO: Does that mean that images don't get onto ARTstor® as quickly as maybe journal articles?

RB: Yes, definitely. Because the images in ARTstor® are only art images owned by other art museums, so like paintings, photographs of buildings. And some of the stuff they do where they'll film the buildings and pan around the buildings, and that kind of stuff. But yes, definitely, ARTstor® definitely doesn't have a lot of really contemporary works. But ARTstor®'s really good too when a faculty member has told their students – and this is one that we have all the time, “Well you need a medieval work from medieval Spain to write about.” So with ARTstor®, we can go in there and limit to Spain and the time of the middle ages that they need, and we pull up lots of images of artwork, so they can choose one from there.

SO: It sounds like one of the helpful aspects of ARTstor® is that they do have a lot of metadata for the images that they have?

RB: Yes. They have a geography search – they have an advanced search that allows you to search all these different fields, and some of the fields are geography – they have a format, like painting, sculpture, mural, that kind of stuff I really like, and they have a date search, and you can do all of those together. Oh, and then they have culture. So you can really hone it down.

SO: Do you do image searching also in a personal capacity?

RB: Yeah, I guess so. You mean away from work?

SO: Yes.

RB: For me personally, what I use it for mostly is, to be honest – I will go and do a Google Image Search™ and pull up images – like I was wanting to find an ibis the other day to paint, or to draw and paint, because I also make paintings. So I was able to pull up everyone's photos of ibises, and have it on my screen and draw an ibis from it. So that's really great. Then of course I'll paint that. So I'm not really using their image. But sometimes I will print off their image and draw from it for my painting.

SO: Do you even use an image search to learn more about something?

RB: I do, to see for example, how different people have depicted certain things. So what I'm doing there is looking for a very modern – like say, I have an interest in visionary art, so I'm trying to find out what everyone is currently creating that fits that category out there. So there's just a big jumble of websites out there right now. And the art as a movement is sort of trying to get off the ground and trying to formulate itself as an art movement – a kind of underground sort of art movement. Still it's interesting to me, and that way I can find all the most current stuff that they're creating, what they're thinking.

SO: Do you find that also through Google image search, or in another way?

RB: Yeah, Google Image Search™. I love the image search. Well, I also do just the



keyword searching, too. And Google® has an advanced search, and I like to use their advanced search. Say I'm looking for a pdf, then I can say format pdf. But looking for images, that's not really what I use. But I can use textual searches too, if there's a certain artist I'm looking for, and I want to find their website. Then I might search their name, quote, you know in natural language format, first name, comma last name. Or, first name, last name, with quotes around it.

SO: Is that the way of searching for artists that you've found is most effective?

RB: Just Google®. Of course, if you're searching anything from the library, you're going to want to use last name, comma first name. In these databases or WorldCatalog [WorldCat®] or anything else – you don't use the natural language.

SO: Do you do any personal searches with the library catalog or WorldCat®?

RB: Yes, all the time. Probably once a week.

SO: What are those searches for?

RB: Not necessarily for images – well, some are for images. Mostly for different things that I'm interested in – just different studies that I want to keep up on. I'm interested in a lot of things that aren't library-oriented. Like esoteric literature, or kabalistic works, or things like that. So I would do searches in the WorldCatalog [WorldCat®] and see if any

works might be translated into English yet, and that sort of thing. Sometimes the World Catalog is kind of behind on that, so I may find that, again, on the web. Like, I know there's a group in Italy where they have a lot of translators who are translating, and I'll find their works for sale on their site only. So just knowing the different writers and looking for their works, I guess again, I can use Google® search to find those, too.

SO: How do you feel like you learned how to search online?

RB: It's so long ago, I really don't remember. I guess there were just librarian tips here and there. Like use quotes if you want to find a word side by side, using the asterisk for the wild card, use an advanced search for formats, or to target a certain domain. That's mostly just the library, although there was some I learned from a really good art history professor who was a really good researcher, before I even began in the library science program. I guess she's the one who really got me interested in librarianship at all.

SO: How do you feel like your library degree plays into how you search for things online?

RB: To be honest, I think that my library degree was only a beginning point, and everything else was learned on the job. Like, I will be at the reference desk, and I'll learn from the older librarians who are more successful searching. A lot of my degree seemed like it was theory instead of practice, and so I learned a lot on the job. When I first began, I felt like I wasn't really totally prepared for some reason. I guess I just expected

to know everything right away. And when I was first hired in reference, I remember studying all the databases – I remember there were over three hundred of them, and I was learning everything about them – I had to know everything. So it's just maybe me.

SO: At this point, do you feel like you've mastered that, what you'd set out to understand about the databases?

RB: No, I think that for most databases, they work pretty much the same, but then there's always these weird oddities that require someone to really just – they're not made really well for anyone to understand them really easily. Like we have a bunch of Citrix databases that are going away, because they haven't changed to be easier for the user to use, and they have some technology problems, too. It's kind of a platform, really, I think. There's also a database that we have – it's an anthropological field database, and you have to know a lot about anthropology to even search it. Because searching the different tribes – we would classify them differently. We're going to want to use the most basic name for a tribe. Whereas, if you go there, they have a different set of names and numbers for them and all this. Some botany databases are like that, too. They really require you to have knowledge of the subject before you can even search it.

SO: Do you have any of your own image collections?

RB: Do you mean, like images I've put away that I've found on the web and stuff like that? Or just things I collect? Or like, I make my own database of images?

SO: Any of those things. If you've collected things, if you've made your own images, if you've bookmarked them – any collections of images...

RB: Actually, yeah, I guess I do. I have a lot of bookmarks, and I have a lot of images that I guess I'm just saving, that I personally like. Of course, most of those were scanned – like scanned from books. There are images of landscape architecture and art that I love. And I keep them – and I take lots of photographs, too, of different architecture. And I want to remember how things are made. Like a beautiful courtyard that was created, how it was created. So I have those pictures to remind me. It's kind of like a database of all the things that I love that I'd like to create someday in a way. But it's only for me personally.

SO: How do you use that collection? Can you talk about when you would talk about when you would go into that collection and look around?

RB: When I need inspiration.

SO: When you're looking for inspiration in your collection, are you looking for anything in particular, or are you looking for just anything that might be inspiring?

RB: I'm usually thinking, "Well, what did this courtyard look like?" And I think I need to go back and look at that image, and it's just jogging the memory, I guess. And I usually

get inspired some more when I look at it.

SO: How do you organize that collection so you can find the things?

RB: It's not a database database. It's just like different sections, like maybe a flash drive with different PowerPoints™ of different aspects. Like one would be courtyards, one would be herb gardens, that kind of stuff.

SO: So do you organize the images in PowerPoints™?

RB: I'll have PowerPoints™ in a big folder, and the PowerPoints™ are all just images, so I can have them on my screen and play them back and put them together in my mind. I take a lot of pictures of provincial French garden design, and I like those a lot. I collect images.

SO: I think that's really interesting that you put images into PowerPoints™. Would one PowerPoint™ be for one session of photography, or how does that work? How do you decide what goes into a particular PowerPoint™?

RB: A PowerPoint™ is going to be all of a certain aspect, like tools, or like courtyards. It's the type of object, or type of place.

SO: So if you found a garden that you really liked, and you took pictures of it, would you

make a new PowerPoint™ with that, or would you put that into a PowerPoint™ that you already have about gardens?

RB: It depends on how different it is from the others. If it is provincial gardens, or gardens from the south of France, but then I have Japanese gardens, I'd rather have Japanese gardens separated from those, because they're so different.

SO: You talked about searching to get inspiration. Can you describe for me the experience of knowing you've found the inspiration that you were looking for?

RB: What it does is – the feeling is, “Oh, I haven't thought of that part or that way of representing that idea.” So then lots of times I'll integrate that idea into my idea that I already have, and then I'll draw something that comes up with something totally new. So then I'll think, “Well, that concept is really very much associated with that other one, and the two together with communicate the object or the idea in the painting even better.” I get ideas like, how other people – like imagery other people are using to depict an idea.

SO: Can you guesstimate what percentage of the time you are looking for inspiration specifically for a painting you want to do?

RB: Probably once a month. I try to keep up with it, so probably once a month.

SO: Are there times when you look through you collection for inspiration that's not related to a painting that you want to do?

RB: Yeah, just for inspiration to build something, like to build a garden. I'm always building little garden structures, and I like passive solar architecture and things like that. So I want to know how a solar frame is built. So I need information diagrams, too, that show how something is built. How a passive solar home is built, how a greenhouse is built.

SO: Do you build gardens and structures for yourself or for other people?

RB: For myself, and I'd like to maybe do it for other people someday. That's really the field I'd like to go into. I don't know about working with crews of people and stuff, but I love the design part.

SO: Are there ever times when you feel that you need to look for an image, but you don't want to, and you try to avoid that image search?

RB: If I knew that someone was looking for something like someone getting murdered or something, I wouldn't necessarily want to look at that image. Something with violence. But otherwise I love images and I like to search for images, to see what other people are thinking.

SO: In those cases where somebody is looking for things that are unappealing to you, like those images of violence, how do you handle that?

RB: I'll still look for it. We don't get very many of those at the reference desk.

Sometimes there's some violence in artworks, but that's just art works. Photography is a little more gruesome, compared to a painted image, most of the time.

SO: Do you consider yourself a writer at all?

RB: No. It's also like I'm very good at finding – I'd rather look for the information, or the ideas. And even when I paint, when I draw out the total painting, I think, "Aww, now I have to fill it in with paint." So it was the idea that was so interesting, more than the finished product.

SO: That's interesting. Can you talk more about that? What do you mean by the idea being more interesting?

RB: The idea is more interesting, because it's alive, and it's moving, and it's happening in the mind, and it's something totally new. It's not been done before – well, it's hard to improvise a totally over-general idea, but there are little things that make it more original for you. So that's very interesting, and I like to keep going from idea to idea, and then build up kind of the ultimate, the best expression of the idea. So when I make paintings, too, I draw lots of what I call little thumbnails, to play out my ideas. And I learned that



back in graphic design, where they would say, “Go home and do fifty thumbnails for this assignment.” So we would have to come up with fifty different designs for how to say that idea.

SO: So when you’re doing a painting and you make thumbnails for it, how do those thumbnails relate to the painting? How does that work?

RB: The thumbnails relate to the painting in the arrangement of the objects in the painting and the interplay of how I see the communication happening, also the movement of the eye through the painting. Every really successful painting has a way that the viewer’s eye will sort of move through the work, and it will always land in the place that is probably the most important, or the most rich in meaning. So that’s very important. Also, I’ll work out color schemes. But it’s more just sketches of the work. I mean, I’ll just do them in ink and quick sketch the ideas. It’s almost like developing a storyline. When I go farther, it gets more developed.

SO: You mentioned color schemes. Is that something that plays into your online image searches as well at all? Are you ever looking for an image with a particular color scheme or particular colors?

RB: Not personally, because I realize I can just go to Photoshop® and change them any way I want. But students are, especially at the beginning design class and the art appreciation class. They’ll all come in and they don’t know the terminology – they’ll say,

“I need to find a monochromatic painting, or a monochromatic work.” So it is really helpful to be able to search monochromatic as one of the words. I actually search the design terms. And I’m always thankful when someone has indexed the image at that level.

SO: Is that probably in ARTstor®?

RB: Yes, you can do that to a degree in ARTstor®. Actually, there’s a neat database that the College of Visual Art and Design came up with, their personal image database of different students work, like MFA students’ work and things like that, some art history. Like a lot of their art history images taken by professors. And they have it really arranged interestingly for beginning students. Like, they’ll have it by all those interesting little design terms that students always use, or are supposed to be looking. And they’ll also have words like, of the different tribes that created the work. And I just found it really useful. They’ve made that whole database in relation to what the students need. And that’s one of the databases. We also have it linked under V on the electronic resources page – it’s called “Visual Resources Collection.” It’s great. It’s great for a beginning student, because with art, you have to have a whole language. With art, it’s a whole different language, and they have to know what all those terms mean. And it’s very hard for them a lot of times. So I get a lot of image searches asking for that. “I need a monochromatic painting,” “I need something that has a high value structure,” and things like that.

SO: You mentioned that you have some background in graphic design. Can you talk about that? Was that a part of your MFA, or something different?

RB: I came in trying to be practical, so when I first came to school from a science – I was in a science program before, and I kind of have a science part of me, I guess, and I still loved art, so said, “I’m going to be practical and go into graphic design. So I started out in that, and I found that it was too limiting, and I didn’t want to have to please an art director, basically, or make something less than and put my name on it. It was too limiting. And then I went into illustration, and I finally got into painting, and that’s what I really love today. So I kind of worked my way around it. I also have an art history degree – I have a BFA in Art History. I was trying to be practical again by teaching art history.

SO: Can you give me a sense of what you feel about the power of words versus the power of images to convey some message?

RB: The power of words can be very strong – actually, I think it’s even stronger when it’s paired with an image. Just one or two words paired with an image. Because that guides a person a little bit to the possible meaning. When a person comes from a different culture, it’s a little harder for them to understand an image – say, when I look work from India, I have to pretty much already know that that’s Ganesha. Or I’ll make the mindset of, “Why is that elephant sitting there or whatever?” “Who is that elephant?” Images, though, can be more profound. I think that the word limits the meaning too much. Like they say, an image is worth a thousand words, or a picture is worth a

thousand words. So the image serves as a place to begin with the ideas. People usually respond to an image first by its color, and then there's a color and a mood, so their emotion is usually the first thing that appeals to it. I know sometimes when I know somebody in art or something, people will keep gravitating towards a certain color scheme, and it's really some color that appeals to them personally. So that may be their first way into it, and then they start looking at the imagery and all of that, the actual objects.

SO: In relation to image searches that you're doing for someone else, like in a professional capacity, for example, how do you determine when you've found the right image?

RB: Well, that has to be determined by the person I'm searching for. Sometimes I will pull up lots of different images and let them decide. Like say they'll say, "I need Athena." I'm going to try to find all the statues of Athena, all the pictures of Athena. And let them decide which one fits what they need the most. Maybe they're looking for a special symbology, like Pallas Athena aspect, compared to another aspect.

SO: How are they involved in that search with you? Are they looking over your shoulder, or do you show them when you've found results?

RB: They're looking at the same screen. When I'm at the public reference desk, the librarian has a screen that they're looking at, and there's another computer screen

turned to face the patron. So they're looking at the same screen with me, and we're going through together. It's kind of a group search. They're searching along with me, and they're telling me yay or nay.

SO: Do you feel like that works well for you?

RB: Yeah, I think so. I have no other way to really know what they need. They say librarians kind of read people's minds sometimes. We do a little of that. I don't know, I just let them choose. I think it works well. Sometimes they don't know – well, many times they don't know what they're looking for – especially the ones with Iconography. There's one class that we have, where all students are given an unidentified painting, and they have to write about the iconography, and those really give the students a lot of trouble. It seems that it's gotten worse, since I was younger – maybe not, I don't know. Lots of these are literary stories, and they have no idea what that story is. And it will be something as simple as Christ rising from the dead out of his tomb and Mary Magdalene seeing him, or clutching onto the [clothing] or whatever. And they have no idea what that is. They saw, there's a person, there's a box back here, and it looks like a cave, and there's this woman holding something in front of this man. And I'm standing there kind of flabbergasted. It's better when something like that's appeared in the movies, I guess.

SO: Then they know to recognize it a little?

RB: Yeah, and the Catholic students fare better on identifying that, I would say. That's not funny, but they really don't seem that they've read a lot or studied a lot outside of popular culture sometimes. Now, if it were Lady Gaga, they'd know who it was right away.

SO: So is part of your work to communicate with them or help them to understand that story, or is that not part of what you do?

RB: I can only say, "What do you think this object is?" And they'll say, "An eagle," or "A bird." Then I'll say, "Now come to this book," and I'll pull out IconClass™. Unfortunately, it's still the best iconography source, and it's in paper, and it has its own hierarchy and its own way of searching and everything, so I have to be there right with him, showing him how to do that. And so, I'll say, "So, we looked up Eagle in the Index under E, and what did it say there?" And then they finally collect all the information, and then they go to another set of references that I've also outlined for them. I have a whole list of reference books to go to for different, say, Christian themes and stuff. So they'll go to those after they've kind of gotten an idea of what the theme may be in IconClass™. So as they look up Eagle, stories that point to John the Evangelist, they'll go look up John the Evangelist in those other additional reference books and find the whole story. And then they'll put the whole story together by then, and then they'll start researching the story, and they usually get pretty excited about that.

SO: That first reference that you mentioned – is it called Iconoclast?

RB: IconClass™. They're also trying to build an online version of that in the Netherlands right now. You can look it up online. And the way that can be helpful over the books is that it has the ability to show all those paintings that are only listed by titles in the blue books – there are several sets of books that go with IconClass™. And one of the sets is called Bibliography, and that has every painting that they know of where John the Evangelist is depicted. But the online site is really good, because it shows all those other paintings right away. You don't have to go and find all of them. But one thing that's not so good about it is, most of it's still in German. But it doesn't matter with the images, because the images transcend the language -- the language barriers.

SO: So there is an online site, but it's not –

RB: Yes, it's being developed. And actually, it's not called IconClass™. Well, you can search IconClass™ to get to it, but I think it's called – Let me see if I can see it right here. I just can't think of the name of it right now. It's funny, they contacted me when all those iconography students here started hitting their database, and they're like, "What the heck? It's all coming from your university." Yeah, "they were all doing their assignment." I can't remember the name of it anymore. Just search IconClass™, and it will come up.

SO: As they're in the process of developing this online site, do you feel like there might be room for you as a user to give input about what you'd like to see?

RB: Yeah, they've asked that actually, and I gave a little bit of input. It was pretty neat.

SO: So how satisfied are you in general with image search and image search resources?

RB: In general, I'm happy that there are so many images out there and we can search and see what people are making all over the world right now. But the thing that I'm not very happy with of course is all the limitations on user rights. And I'm kind of stuck where I really feel about it. I would like some images cleared for educational use – but then again, I do understand the artists' side in all of this and not just having everyone using your images everywhere. But part of me as an artist who wants to share those images, as long as they're small – you know, small images for enjoyment. You know, somebody could maybe use my images in their personal little image inspiration database or whatever, but whatever – as long as they're not selling it or making t-shirts. So I am frustrated a lot when I'm just looking for images for general signs and stuff, and I've been given – I had my regular workload, and I have to make a sign for the library, and everything is of course copyrighted, or expensive images. Stuff I think somebody would really benefit by making a – if it's possible – to make a database where they sold ninety nine cent images that people could automatically download right there and pay for. Like almost a PayPal® or something so simple. But everything is like seventy to a hundred or two hundred dollars. You're not going to pay that when you're trying to make it for a company, where you're not getting that great a salary. So you can't pay for that.



so in that case, I'd just make my own image – I'd get my camera and go take my own pictures of what I need and alter it.

SO: How often do you use up doing that, making your own image with a camera, because you can't find what you'd like to find?

RB: Probably once a month.

SO: Would you say that you would always do some kind of work with Photoshop®?

RB: Yes. Sometimes I need to make a logo or something too. And I work with [Adobe] Illustrator® some, too.

SO: Are you familiar with the kind of image search that allows you to enter an image as the query?

RB: Yeah, I've heard of that, and I know it matches things like face recognition, those types of things. But I don't feel like so far what I've seen is going to help me in my day-to-day life. They're pretty interesting in general, like biometric face identification type searches. Or you can search "blue tree" and get all the ones with "blue tree." I remember in [Library School] studying some of those many years ago, so I haven't revisited since that stage. So hopefully they're a little more advanced now. But I couldn't see them, from what I remember, as being useful for my day-to-day life. It's just for

interest in how our vision works and how they make those logarithms behind it to do the searching. I think that's interesting.

SO: We are coming to the end of this time, and I'd like to ask you if there's anything else you'd like to share about image search, or your experience with images, that we haven't already covered.

RB: I can't think of any. I love images.

## Interview 5

Library of Congress, Helena Zinkham and Michelle Springer

SO: My dissertation work explores the question of how users think about images in the context of online image search. I've been conducting interviews with expert image searchers to gain insight into how they think about images in general and how they use images and approach image search. I know you've had a lot of experience with images and image search – particularly with the Flickr Commons™ project. I'm interested in understanding what you've learned about how people search for images and how these approaches might have changed over time. Would you please each state your name and a brief description of what you do?

HZ: I'm Helena Zinkham, Chief of the Prints and Photographs Division for the Library of Congress in Washington, DC. So, I am a picture librarian.

MS: I'm Michelle Springer. I work for Web Services in the Office of Strategic Initiatives here, and I work on our web policy.

SO: I know that the Flickr Commons™ project has been an enormous undertaking in many ways. Because I am particularly interested in the user experience of image search, could you talk about the way that you think about image search has changed since becoming involved in the Flickr Commons™ project?

HZ: The Flickr Commons™ project confirms several things that we already knew

anecdotally, from years of experience working with picture collections in the research center, or Reading Room, that people prefer direct access to images – in other words, visual browsing. So in the old days we had file cabinets full of prints, and Flickr has more automated tools, like the photostream, the grid views, the slideshows. Flickr in particular I think helped to show the way others have been doing it, but they showed the benefit of perhaps a few words to get you started, but then really you're doing the searching by looking at the pictures directly. So, color, horizontal, vertical, an expression on a face that catches your attention. And while we have long had collections where people had to request a box and then look through, any picture library has known that you needed to provide visual browsing tools. And that's why we would put the most popular or heavily requested pictures on a mount or later on, a Xerox copy in a sleeve. It didn't always have to be that fancy. The second thing Flickr confirmed is that access by subject, more than creator, is critical. And again, I think that's long been known for the world of pictures. That's tags, in other words.

SO: So in the use of tags, we're able to understand better how actual users are actually defining the subject of an image, correct?

MS: Did you have a chance to review that more extensive report that we released for the Common Good, the report that actually talked about tagging behavior that we saw from the users?

SO: Yes.

MS: So you saw in the report that we saw a lot of people who repeated metadata that was already in the descriptions that we in fact put into Flickr.

SO: Right. And there are also tags that are not present in the existing metadata, correct?

MS: Yes, definitely. But a lot of it proportionally was actually copied from information we had actually put in. And there were tags that were used obviously only for the tagger, that we have no idea what they even mean. And then there is another strata of tags that were reactions to the photos and then tags that attempted to bring up keywords of: location or type of image, black and white, format, all of those different permutations. It's not just subject, and it's also not necessarily original tagging. There was metadata there, and they often repeated it in the tags. We gave very little instructions to the people who were tagging. We just invited them to tag. We didn't ask them to come up with tags we didn't already provide, or really give any instruction at all of what we were looking for in terms of tags.

HZ: Because the library wasn't really looking for something precise from the tags. We wanted the tagging to see what was meaningful to the people looking across the pictures.

SO: And what you learned in terms of what was meaningful to the people in terms of

what they tagged, does that correspond to what you've known about how people have looked for images even before the online databases were available, when they were just browsing through prints in a reading room? For example, the reactions to photos.

HZ: I think so. A lot of it is based on what you can see in a picture. So, the image content, what I would call subject. Michelle's absolutely right that there's tagging by creator, but they usually know that name, because we've provided it in the metadata. The Flickr users are sophisticated; they know that a tag, you can go after a surname, for example, things like that. We saw more tagging by format, black and white, sheet film, roll film, but we saw less of that format based [tagging]. And then there are those that were, what does an image evoke? So, a classic example. They would put a tag of Norman Rockwell on a family scene. He's not the creator, but it reminds them of a Norman Rockwell picture. A lot of tagging by place name, which I would count as a part of subject, although they would usually know that from the metadata we would provide, and they're spelling it out, or making it more precise. My sense is, the bulk of it is the image content, whether that tag bows parts of the boat. There's a fair amount of translation into different languages. People are helping each other out by putting the same word down in three or four different languages. With analysis, we try to find out how much is content, and how much is "reminds me of" or reaction to. And I think that's in the Common Good report. I don't have a copy of that in front of me. It might be worth just a second look at the tag section.

MS: Also, we've not updated that analysis. There are so many tags at this point, we

were just commenting to ourselves how we come in here, and it's difficult for us to load the list of all of the tags, because frequently it will time out before you can actually get to upload all of the tags. You can get to the tag cloud, which has a large number of tags, but the actual union list of all tags is a really, really big list.

SO: What kind of challenges does that present to you in organizing your presence on Flickr?

MS: We use that for moderating the tags. That's a faster way of moderating the tags than going through the homepages and looking at the activity, but it doesn't affect what we've done. We don't import the tags; the tags remain on Flickr, so it hasn't really affected the way we do anything.

HZ: And we could pull down a list if we needed to; we just can't open it online anymore. The first two years, we were able to open the cloud and see the whole list live. And now we have to pull it down through one of the API's.

SO: Do you have a sense of how valuable these tags have become over time as access points for users to find the images?

HZ: I think they have. We use the comments, and we'll pull out information, like the full name of a person, the spelling of a place name, names of events. We'll pull those back into our own catalog records, and I believe it's twice now that we've reloaded that data

out to Flickr. So that's a big job, and it doesn't happen more than once a year. So in the interim, people are really quite reliant on the data in the tags for, if you're just searching across Flickr, and you have no idea that the Library of Congress, or other Commons accounts are there, they're very reliant on the tags. And it's helped the people who are pursuing groups. They can feel sometimes that we've gotten a set of group requests because people are able to look for tags, or a certain type of bridge or boat, and hats, or mustaches. Things that we wouldn't have the resources to index here at the Library of Congress. For more small components, parts of the picture that caught someone's attention. And that's just wonderful. And then that allows the groups to come in, who are focusing on that topic, and request a couple of photos to put in their display spaces.

MS: And when we look at our statistics, we can see where people are coming from for the photos on Flickr. And by far, always the most traffic to them is within Flickr, so they came from someplace else in Flickr. And so, we know that tags also up their findability in search engines – Google and others. Sometimes we've found that photos we have on our own site, actually they come up on Flickr higher in the search results in Google and some other search engines, and it's because of all the tags that are added, and the comments that are added in Flickr, as opposed to on our site. So that also makes a difference as well. And the more activity on the image, be it tagging or commenting, places its interestingness, however they want to do that formula that Flickr uses, so it ups it in the search results even within Flickr. So it all kind of relates to each other. It heavily increases the findability or the weight of that image coming up within Flickr.



SO: You've said that the Library of Congress images are much more often accessed on Flickr than they are on the LC website. How are you looking, going forward, at integrating that community and interaction that's happening on Flickr with the Library of Congress website proper?

MS: I'm not sure about the first part of that statement, that they're accessed more on Flickr than they are on our site. They come up, if you search on a search engine, they may come up more quickly or higher in the rankings on Google or something like that, but that doesn't really translate. I guess we don't have any data to say that a particular image has been seen more often on Flickr or seen on our site.

HZ: I don't think we can prove it statistically. And this is in part a change. If we look at the Farm Security color photographs, putting them in Flickr, mostly the fact that the Flickr blog wrote about them brought a level of attention, a degree of awareness to those photos which has not been present before. Even though they had been on the Library of Congress site, even though they'd been in exhibitions and a well-reviewed book on that collection. But I think that Flickr has greatly broadened the audience, and I don't know that that's related to tags or overall searching, so from a Flickr blog to blogs in Boston and London and so forth. But then recently, within the past year, a Denver newspaper put a beautiful blog together about the Farm Security color photos, which initially was triggered from traveling exhibition that the library had on the road. But their blog led back into Flickr. So I think it just becomes very hard to tease out the parts. But whether a single picture on Flickr has been more seen or more used than that same

picture on the library's website... For the first two years we were on Flickr, the Library of Congress Prints and Photographs online catalog was buried from the web. It was a database that you couldn't search online, but the individual records and their indexes lived within the Library of Congress website. So you had to do a search here to find anything. Now we have a catalog where every image has its own static URL. And what that has meant is that Google, or Yahoo, or Bing, has been able to crawl the library's website and index every record in our catalog. But since we've joined Flickr – if it weren't complicated enough already – since we joined Flickr, our database of pictures even here is much more integrated with the internet search engines' [databases]. And we have not had the metrics, tools, or even the mental agility, at least from me, on how we could do a comparison that wasn't apples and oranges.

MS: It was very complicated even to come up with the trend data that we reported in that report; it took a lot of analysis. There were three or four different ways, depending on the URL or whatnot, the way that our metric program would report these internal searches on our own site, so it was complicated.

SO: Who are the people who still want to look at the printed photographs?

HZ: That's usually people who come to our research center or write to us where they need a property of the physical image in order to carry out their task, or the question that they have set themselves. Let me tell you that differently. There are of course people, for example, photo historians, where they're seeing the actual print made by

Ansel Adams. It makes a difference to see it in person simply because the size of it is a clearer factor than homogenized on a computer screen. They can see the way the grains of silver are setting on the paper. They can appreciate the way that it was signed or matted originally in the context of fellow pictures. They gain insight. Something like the Farm Security color, it was always here color transparencies and slides. It doesn't evoke the same kind of artifactual awe that an Ansel Adams print would, but there are people who want to understand about notch codes, confirm a format, they want to test a dye, how much has been faded, things like that. And those are all some of the properties. Probably the most frequent reason people come is they want to see what's written on the back. And that's so true for a colored slide or a photo, but some of our treasures, they want to see, what notes are with the case, what's written on the back. And even when we put that into the catalog records, when you see it in person, and you begin to recognize the size of the pen and the nature of the hand, and then you're using those patterns to help you learn about provenance for the source, or the reliability of the information as you look at other pictures, even in other repositories. They come for a detail, they come for what's on the back, and they come for physical characteristics that are hard to convey in a digital scan. But compared to the number of people who are purely working online, the number of persons is relatively small.

MS: Related to that, we do see a large interest of, they always want to find, where's the link to the high-resolution version? And we provide that on our own site, because the version we put on Flickr is not the high-res version. And they don't always get that what we call the persistent URL is in fact the link to the high-resolution version, so sometimes

they'll ask questions and other Flickr members will point that out when the question is asked.

SO: In terms of use of the reading room, are there any lessons that you've learned through putting images online that have translated into doing things differently in the reading room?

HZ: Not so much in the research center itself, but certainly in the design of the online catalog. So having the catalog bring back the search results as a slideshow, the thumbnail grid where you can have 100 on a page at the same time – you know, the really tiny thumbnails. Some of the sensibilities of the way Flickr was making digital images available, I think or hope you can see that in the new Prints and Photographs online catalog, which just went up just about a year and a half ago, in March 2010. The guy who helped set that up works with us on Flickr. I think there was some inspiration. Not really direct copying, because we can't use all the same tools in the same way that they can. But in the sense that rapid visual browsing was critical and even though our statistics had been saying it, once you work in Flickr, see a hundred tiny thumbnails, "Oh, we get it!" So, it was very helpful that way.

SO: How satisfied are you with the types of image search resources and supporting technologies that are available today?

HZ: Very satisfied. There's always a wish list. Probably at the top of that, in terms of

how researchers interact with the catalog, we would love for them to be able to have what's variably called a light box, or a bookbag, where they could pick out images they'd most like to pursue and park on the side. But the shared technology tools helped a lot with that concept at least, even though that's more one at a time, one picture at a time. The fact that you can now email yourself a catalog record, or an image, or a link.

MS: Share to Facebook, share to social media sites.

HZ: But in the more sophisticated visual systems, they get often called a lightbox. That means, I've been looking through a deck of slides, and I've picked out the ones that I think are my strongest candidates, and so those are the ones that you set out on top of a light box, so that you could look at them more carefully. Or the shopping comparison would be, the things you put in your shopping cart. Not that we're trying to sell them anything, but just some tool where you can make your own set of pictures – the freedom to pick your own set.

MS: In Flickr, you can “favorite” an item, and then you go review your favorites, or you can create your own gallery from others images and other sites.

SO: There is the myLOC. Is that something that you're looking at integrating in the short term? [Note: myLOC is a personalized part of the Library of Congress web presence.]

MS: I can't say where the development is with myLOC, just because I don't know what

kind of functionality is on the table for that. We're just not the people to talk about myLOC.

HZ: Our focus for Prints and Photographs collections – you asked about long-term, Flickr and our own databases. So we're still pursuing that path of, spend some time making our databases useful, functional, but the fundamental hazard is always there, that people don't know to come to the Library of Congress. So we need to be exposed through the search engines, but we also need to keep putting portions of the collection out in Flickr. Then people will trip across them. So spending a lot of time trying to get more pictures into myLOC.gov – I don't think so. And that's a heavily proprietary piece of software.

SO: I would like to ask you about your own image searches. Can each of you tell me about when you conduct your own image searches?

HZ: I probably do a little bit more than Michelle, since I'm based the Pictures division, will be the situations that cause searching as a reference request, I receive an email from the Librarian's office asking about a particular topic, or I'm working on a collection that's just come in, or a potential acquisition, and you're trying to find out, how much of it do we already have or not? To give a specific example, we were asked not so long ago for pictures related to the War of 1812, and asked to divide them between what was made during the era of the war or at least contemporary or before the civil war, and then separate out the more commemorative, after-the-fact images related to the war of 1812.

At any rate, we have plenty of pictures that have the name of a particular battle or admiral or general in them. But they never manage to flat out say “War of 1812.” So like any librarian, we’re just very good at knowing likely collections to peruse. We might go after it by historical prints as a collection area, and even go so far as to browse visually – back to the gallery display, having looked up something about the names of admirals involved. So I rely on visual browsing, knowing something about where the pictures of the War of 1812 era would have an appearance of. I rely on name access. I would rely on subject access if I could, but we usually have to back it up with something else. By the time people are asking me questions that means they haven’t been able to find it. So I wouldn’t take my experience as necessarily typical. A personal example, recently we were having a baby shower for a staff member. The guy who was organizing it set us the task to bring pictures related to babies. It was just classic library science kind of stuff, or human nature – you’ve got to try one word and then try another. So, you know, baby, children, infants, mothers and children, consulting the thesaurus to a certain extent but also looking for keywords – playgrounds, places you knew that children would be. So, trying lots of different terms, would be the short answer. Or tags.

MS: I actually am a librarian, though my current job doesn’t have any reference responsibilities in it. I would say that my technique when I’m searching for images is the classic librarian training of going back and finding out what we would call the pearl gathering – that is, if I find an image that is the image and what I’m looking for, then I will look at the tags associated with that image or collection and start browsing and think, ok, did they do anything more like that? That’s what I’m looking for, what did they

call it? I don't know that the standard user operates that way. I fall back in the librarian training, too, so when I find something that represents what I'm looking for, then I can expand outward by looking at the tags and the subjects for that. But I don't know what other users do. I'll start broad and then limit it. When I'm searching in Flickr, too, I'll start with a very broad term, and then I'll see all the tags and see, what are the people using for that, and then I'll start going into the tags and getting more specific. But I'm not sure that most users do that.

SO: In your experience, do you find that you'll have a mental image of what you're looking for – you know very well what you're looking for, and then it's a matter of finding an image that matches that mental image? How often does that happen in your own searches?

HZ: It depends on the question.

MS: It depends on what you're looking for. Like, just searching for an image to be on the title of the report was just like, well, we'd like something that shows people volunteering, or something very vague, but I certainly didn't have any idea of people standing in line trying to convey terms, and thinking, yes, that image conveys.

SO: Was that an example of when you saw the image that you ended up choosing, you just knew, yes, this is what I'm trying to convey?



MS: Right, in that particular instance, yes. I didn't have anything particular in my head. I just kind of has some concepts and I need something that would visually show that, and so I tried some words to see if others used to that, and something came up.

SO: In reference questions from other people, how often does that seem to be the case? I understand that you would only be getting the requests that are more difficult, that a person wasn't able to find on their own, but how often do you sense that a person is describing an image that they already have a visual representation of in their heads?

HZ: Perhaps because it's Library of Congress here and not so much an image stock agency, we're usually asked for a name, a topic, a person, a place. And people are pretty grateful to have anything – so, a building, a bridge. They're not so much saying, "I need young children." Well, sometimes they might say, "Do you have pictures of young children smiling?" but usually they'll be asking us, "Do you have the USS New York, or the Maine, a war?" And we'll try to point them in a direction where they can browse visually. If they then need beautiful pictures in blue, then we can help them to a certain extent. That opportunity to have these digitized, and people look through them, they more do their own selection. Whereas in an image stock agency, you'll see search limits along the lines of, people in action, people static, but more evocative components of an image – horizontal, vertical, color palette.

SO: Part of my interest in particular is in understanding what would the image search process look like independent of the tools. Practically, we have to interact with the tools

we have available to us, whether they're retrieval systems, image databases, or reference librarians. But I'm interested in understanding ultimately what is the internal process that a person experiences, and so I'm wondering, what is your sense of how well the digital tools that we have accessible to us now better support that image search process, as opposed to basically browsing through prints in one collection, as in a reading room?

HZ: I think there are many types of image searches, and you've already alluded to them. There are people who are imagining – maybe they're coming more from a design circumstance – so they're imagining a building out of brick with a wide front porch and a couple of towers of turrets. So if we were trying to match against something like that, then the kind of visual tool that could be handy are the image query searches, such as shape vectors. We don't have those kinds of tools yet, but I understand they're getting a little bit stronger. Of course, facial recognition and such. But that kind of, "I need happy children," "I need a house that looks scary," some of that might happen through image search recognition. Then you have the more factual queries – "I need a picture of President Kennedy at such and such an event." That will tend to be more driven by words, or at least the Kennedy name, and then browse visually until you find something that looks, or fits your need – that's horizontal, vertical, what resolution. In terms of the difference online to being in the reading room, I guess searching by shape is probably the biggest visual tool. And the speed of the transaction online is a lot faster.

SO: Is there anything else in particular that you would like to share about image search,

or your experience with images, or users searching for images?

MS: Well, yes, another permutation that is new is also 3D, and using 3D visualization tools, and being able, depending on the device on which you're actually viewing the image, to actually view it in 3D or not. Newer innovations. We have put some images on Flickr that were designed that way so that you can look through – we have a special glasses tool, and you can see them working online through a viewer, through a software viewer, you would see them in 3D. So I would browse that way.

SO: Did you have an example of that in your reading room, actually?

HZ: We have stereograph viewers in our reading room for the stereograph collection, sure. We have 3D glasses, red and blue, anaglyphs, for the online anaglyph stereograms.

MS: That's another tool, too. And I was thinking about how when I look at images on my iPad, with the sweep of my finger, I can see a whole bunch of images swing by, even in a grid pattern, so I can pitch and zoom and do a lot of other things like that. That depends on the device on which you're looking at even separate from the reading room, and of course you can bring in your own device – and be viewing the collection wherever you are in a different way, it will give you some different functionality. We don't provide those devices to our users. We have terminals and desktop computers that they can look at, but we don't give them iPads to view.

SO: Would you like to be able to do that?

HZ: Someday it would be fine. We've got a few other fish to fry first that are more fundamental. Like getting more tags and subject indexing, and getting a ton more pictures digitized.

SO: Are you aiming to have all of your photographs – your entire image collection – digitized and online?

HZ: It's difficult. There are 15 million pictures, all different sizes and eras. It will take awhile. But we're currently trying to put up about 30,000 to 50,000 new pictures each year. That's the level of funding and other resources that we have.

MS: And we haven't talked at all about the comments. We're getting a lot of really good data in the comments, and those are feeding back – not in the tags, per se. One thing we found – you either tag or you don't. In keyword searching, people who comment don't necessarily tag and vice versa. We get a lot of activity in the comment that again heighten the ability to find those pictures by searching, because comments [on Flickr] are in fact indexed on Google [and other search engines], so that also increases their findability.

SO: Has it also been the case that the comments have also provided information that

the library then puts into their own records?

HZ: Absolutely.

MS: Absolutely, more so than tags.

HZ: The comments are critical.

MS: The comments are where you get the fuller surnames, the identification of people, discussions about a particular type of aircraft and why it's this type and not that type. A lot of the data that's coming back to us is coming in the comments, even more so than the tags. And that's data that we mine and that changes to the PPOC [Prints and Photographs Online Catalog] records, more so than tags. I mean, it is possible that there would be data in tags, but you get a fuller description and background and questions, and they can provide verification with links back to the New York Times, or links back to other sources that support what they are asserting about the image, that that's not John Doe but that's John Doe Smith, and for some reason the photographer left off the last name, or something along those lines. And here's his obituary, or something along those lines.

HZ: And while Flickr itself doesn't index text in comments, or at least it didn't used to, Google does. So people out there in that broader search universe – even though our photo inside of Flickr might just say “brown” and “baseball,” people figure out that it's

“Arthur J. Brown,” the famous shortstop of Cleveland athletics. All of those words, whether or not they ever became tags, are retrievable through Google. Our collections here at the Library of Congress that we can put out on Flickr is very historical, and it’s not heavily curated or vetted. In other words, we’re not putting out the best, we’re putting out what we have. So for these baseball players, for example, that might be the only portrait of the person. So people searching Google, to have that name, will come very quickly, directly to that picture. But as with other things, if all they do is search for baseball, I am aware, just on that simple tag, they probably would never be offered up the Flickr baseball pictures, wonderful as they are. They actually have to go into Flickr and then they have to search for baseball, and then they’d likely land on our material. I think that’s a pattern that’s abroad with Google – very precise, where there’s not much on that name or location, then you’ll get pretty directly into the account. Whereas, Thanksgiving, Declaration of Independence, not so much.

SO: It sounds like you’re saying that actually searching by Google will bring more specific and relevant results than the Flickr search, just because Google does more thorough indexing?

HZ: I think that’s true in terms of the comments. People will sometimes write you a wonderful comment, and they won’t tag a thing. And we’re not trying to control them. People get to participate as they will.

MS: But also when there’s new data, then we’re verifying that data and then loading that

data back into the notes field or summary field in the images, citing the Flickr Commons™ community as the source of materials so that that data is also then linked to the PPOC [Prints and Photographs Online Catalog] record, so that will then also increase the findability both on our site ... or whatever search engine.

SO: Do you feel that there could be value in capturing how much interaction a certain image or a certain collection of images has inspired in the Flickr community, for example? Is that interaction something that's of particular interest to you?

HZ: Sure, that would be wonderful to see. We get some glimpses of it, because we'll hear about a blog post or a remash mix-up. This is a fabric – remash smash up. The group requests give us a sense, but no, we don't have anything comprehensive. It's like citation tracking. We love to learn who's published our images on the web or in books, or about us – all useful information.

MS: Sometimes in the statistics we'll see a spike where an image all of a sudden has been going around five or six links, and then suddenly there's three hundred on this particular image. And then sometimes you can look back and you can kind of trace back and figure out, oh, it's because the Denver Post said something about this, or somebody put it on StumbleUpon, or there's a thread in a chatroom, or a civil war buff suddenly picked up this image in a long conversation about it. Sometimes you can keep track of that, as far as refer traffic to it, but that doesn't necessarily mean that those people commented on the photograph. But you could look at that photograph, and if you

didn't realize it had been touring along, touring along, and it's 30 views, and then suddenly it became 300 views. You wouldn't necessarily realize that something has happened on that image if you were just looking at the image. We can track it a little bit that way. I also have some canned searches on Google and some others that indicate to me when somebody posts. I can look in my feed and see that somebody's posting about a particular image, or something has caught someone's attention recently. For example, some of our photographs about Maskers and Thanksgiving created a very detailed post with a lot of background information that was very interesting to read, someone picked up on our images. And it was that feed, from my Google search alerts that I've created picked that up, so I was able to track it back and say, "Oh, look at this blog that somebody posted on about this stuff."

SO: Do you then incorporate that somehow into the image – maybe the comments section? Do you do anything with that information?

MS: No.

HZ: No, we haven't. When pictures in the library are published in books, or used in an exhibition, to the extent that we have the resources to track, then we will incorporate that in a catalog record. But we haven't held on to many blog usages to date, in that the blogs themselves can be very ephemeral.

MS: It's making kind of the Flickr team aware of the interest and then send a link to



those of us internally who are watching these things, so we can be aware of it.

HZ: A more flexible – or a mechanism within the web itself, so you can do the citation tracking would be handy. That's a good point. To actually have to embed things back in the source – I'm not sure how many people would have the time to undertake that.

SO: In terms of the person who would actually put that information into the metadata?

HZ: Right.

SO: Relatedly, I understand limited resources are a big concern. In a perfect world, would you like to see these communities of interaction, or these various manifestations of interaction with the photos just growing organically as it has, more or less, or would you have interest pursuing communities who would like to talk about and use your images? So, the question is, an organic process of seeing these communities develop and discover your images, or would you in an ideal world like to pursue those communities?

HZ: I think we've done both. Baseball is an eternal topic, civil war an eternal topic – for pictures. Or evergreen, how about that. So we actually did reach out to the Society of Baseball Historians, the Society for American Baseball Research. That's all. Football, basketball, the fact that they don't have an organized, ready-made group that you can go after means that there's less of a target to go after. Civil War, they have a couple of

different photo seminar people, plus historians, and we reach out to them. Or we reach out to the editors of the civil war magazines and stay in touch. And I don't mean because they're just writing – but they can tell one kind of gun from another, if we need to know that.

SO: So it's actually a good partnership for both parties?

HZ: Right, we trade. We have a collection about garden history, and we reach out to a garden historian for help. We can do a basic level of description, but having to cover the whole universe, we can't always tell one kind of plant from another.

MS: It's useful sometimes to identify some of those communities of interest, or they'll link to some kind of airplane aficionado website where it's very detailed, obviously, where communities are residing, so that it gives us clues, where if we do need to reach out, we know where to go.

HZ: Exactly. That happened with the boxers. They helped us find the two or three most reliable websites, and if we get stuck, we can write to the webmasters of those websites.

MS: By heightening the interest and request for groups, and putting them in a place like Flickr, where people are really focused on photographs, so if the community of interest there is specific to a particular subject, you often touch those communities, even though

you aren't trying to, because you have such a large, broad base of community just interested in images.

SO: Thank you so much for your time.

HZ: You're most welcome.

## APPENDIX C

### REFERENCES FOR SELECTED TERMS FROM INTERVIEWS

## Online Image Search

ARTstor®

<http://www.artstor.org/index.shtml>

Customize.org

<http://customize.org/>

DeviantART®

<http://www.deviantart.com/>

eBay®

<http://www.ebay.com/>

Etsy®

<http://www.etsy.com/>

Flickr®

<http://www.flickr.com/>

Facebook®

<https://www.facebook.com/>

Getty Images®

<http://www.gettyimages.com/>

Google+® (“Google Plus”)

<https://plus.google.com/>

Google Image Search™

<http://www.google.com/imghp>

Google Search by Image™

<http://www.google.com/insidesearch/searchbyimage.html>

Hipstamatic®

[http://hipstamatic.com/the\\_app.html](http://hipstamatic.com/the_app.html)

IconClass™

<http://www.iconclass.nl/>

Instagram®

<http://instagr.am/>

iStock®

<http://www.istockphoto.com/>

LinkedIn®  
<http://www.linkedin.com>

Pinterest®  
<http://pinterest.com/>

Tumblr®  
<http://www.tumblr.com/>

Wallbase.cc  
<http://wallbase.cc>

Yelp®  
<http://yelp.com/>

#### Technology Related to Image Use

Adobe Bridge™  
<http://www.adobe.com/products/bridge.html>

Adobe Illustrator®  
<http://www.adobe.com/products/illustrator.html>

Adobe Photoshop®  
<http://www.photoshop.com/>

Android® [operating system for] phone or tablet  
<http://www.android.com/>

iPhone®  
<http://www.apple.com/iphone/>

Microsoft PowerPoint™  
<http://office.microsoft.com/en-us/powerpoint/>

#### Other References

PayPal®  
<https://www.paypal.com/>

WorldCat®  
<http://www.worldcat.org/>

## APPENDIX D

### TABLE OF FLICKR COMMONS™ PARTICIPATING INSTITUTIONS

The following is a table of participating institutions in the Flickr Commons™ project, as of September 20, 2011. This data was collected through the Flickr Commons™ website from <http://www.flickr.com/commons>. Contents of this table are discussed in Chapter 5.

*Flickr Commons™ Participating Institutions*

Institution	U.S.	Items	Collections	Sets	Galleries	Tags	Dates Posted
Australian National Maritime Museum on The Commons	no	268	0	22	0	Many	02/2009 - 09/2011
Australian War Memorial collection	no	129	0	8	0	Medium	09/2008 - 09/2010
Bergen Public Library	no	708	3	13	0	Medium	04/2009 - 09/2011
Biblioteca de Arte-Fundação Calouste Gulbenkian	no	7,219	8	207	0	Very many	05/2008 - 09/2011
Bibliothèque de Toulouse	no	2,353	0	110	0	Medium	05/2008 - 09/2011
Brooklyn Museum	yes	4,912	7	110	11	Many	04/2006 - 09/2011
Center for Jewish History, NYC	yes	679	5	24	1	Very many	04/2009 - 09/2011
Cornell University Library	yes	200	0	3	0	Many	04/2010
DC Public Library Commons	yes	200	0	8	0	Very many	03/2009 - 03/2010



Institution	U.S.	Items	Collections	Sets	Galleries	Tags	Dates Posted
The Field Museum Library	yes	1,684	5	17	0	Very many	03/2009 - 10/2010
Fylkesarkivet i Sogn og Fjordane	no	382	2	9	0	Very many	04/2009 - 04/2011
Galt Museum & Archives on The Commons	no	271	3	33	0	Many	03/2009 - 08/2011
George Eastman House	yes	1,052	1	20	0	Many	07/2008 - 04/2011
Getty Research Institute	yes	72	0	3	0	Very many	03/2009 - 04/2009
Imperial War Museum Collections	no	10	0	1	0	Very few	12/2009
Jewish Historical Society of the Upper Midwest	yes	200	0	1	0	Very many	03/2010
JWA Commons	yes	81	0	3	0	Many	03/2009 - 07/2009
Keene and Cheshire County (NH) Historical Photos	yes	1,591	0	29	0	Very many	04/2008 - 05/2011
The Library of Congress	yes	14,005	2	17	0	Many	01/2008 - 09/2011
The Library of Virginia	yes	677	0	3	0	Many	09/2008 - 08/2011
Ljósmyndasafn Reykjavíkur / Reykjavík Museum of	no	31	0	1	0	Few	05/2009 - 06/2010

Institution	U.S.	Items	Collections	Sets	Galleries	Tags	Dates Posted
LIGC ~ NLW	no	750	0	21	0	Very many	04/2009 - 09/2011
LSE Library	no	1,389	3	39	0	Medium	02/2009 - 09/2011
Museum of Hartlepool	no	243	0	6	0	Medium	03/2010 - 09/2011
Museum of Photographic Arts Collections	no	582	5	54	0	Many	05/2011
Musée McCord Museum	no	473	0	10	0	Medium	09/2008 - 01/2011
NASA on The Commons	yes	364	0	7	0	Very many	08/2010 - 12/2010
Nationaal Archief	no	1,458	0	45	0	Many	09/2008 - 07/2011
The National Archives UK	no	5,274	3	36	2	Medium	10/2008 - 08/2011
National Galleries of Scotland Commons	no	107	1	7	0	Medium	10/2008 - 12/2008
National Library NZ on The Commons	no	662	0	24	1	Medium	11/2008 - 08/2011
National Library of Australia Commons	no	306	0	8	0	Few	09/2011
National Library of Ireland on The Commons	no	468	5	21	0	Many	08/2010 - 09/2011

Institution	U.S.	Items	Collections	Sets	Galleries	Tags	Dates Posted
National Library of Scotland	no	2,297	1	18	0	Very many	10/2008 - 01/2011
National Maritime Museum	no	797	3	21	0	Many	08/2007 - 09/2011
National Media Museum	no	188	0	11	0	Medium	08/2008 - 10/2009
New York Public Library	yes	2,525	9	31	0	Many	12/2008 - 10/2009
nha.library	yes	240	0	11	0	Many	01/2009 - 08/2010
Oregon State University Archives	yes	2,484	13	93	0	Very many	01/2009 - 09/2011
Powerhouse Museum Collection	no	1,917	2	44	0	Medium	03/2008 - 08/2011
Riksarkivet (National Archives of Norway)	no	334	16	36	0	Medium	02/2011 - 09/2011
The Royal Library, Denmark	no	75	0	2	0	Medium	06/2011 - 08/2011
San Diego Air & Space Museum Archives	yes	103,911	0	44	0	Many	04/2010 - 09/2011
Smithsonian Institution	yes	2,263	0	29	0	Many	04/2008 - 08/2011
SMU Central University Libraries	yes	518	3	14	0	Many	08/2009 - 09/2011
State Library and Archives of Florida	yes	1,303	0	25	0	Many	10/2008 - 09/2011

Institution	U.S.	Items	Collections	Sets	Galleries	Tags	Dates Posted
State Library of New South Wales collection	no	1,315	0	68	0	Few	08/2008 - 09/2011
State Library of Queensland, Australia	no	1,199	0	41	0	Very few	01/2009 - 09/2011
Swedish National Heritage Board	no	868	3	10	0	Medium	01/2009 - 09/2011
Texas State Archives	yes	277	0	11	0	Very few	03/2010 - 09/2011
TWAM - Tyne & Wear Archives & Museums	no	370	0	21	1	Very many	11/2010 - 09/2011
The U.S. National Archives	yes	7,989	9	152	0	Many	06/2009 - 09/2011
UA Archives   Upper Arlington History	yes	245	0	11	0	Very many	04/2009 - 01/2011
UW Digital Collections	yes	200	0	4	0	Many	08/2010 - 11/2010
Woodrow Wilson Presidential Library Archives	yes	624	11	63	0	Many	01/2010 - 02/2011

Note that non-U.S. institutions are shaded grey for ease of visual understanding.

## BIBLIOGRAPHY

- Abstract. (n.d.). Oxford English Dictionary. Retrieved October 25, 2011, from <http://dictionary.oed.com>
- Allen, B. (1996). *Information tasks*. San Diego: Academic Press.
- Anderson, R. L. (2006). *Functional ontology construction: A pragmatic approach to addressing problems concerning the individual and the informing environment*. (Unpublished doctoral dissertation). University of North Texas, Denton, TX.
- Anderson, R. L., & O'Connor, B. C. (2009). Reconstructing Bellour: Automating the semiotic analysis of film. *Bulletin of the American Society for Information Science and Technology*, 35(5), 31-40.
- Armor, J., Wright, P., Hersey, J., & Adams, A. (1988). *Manzanar*. New York: Times Books.
- Baeza-Yates, R., & Ribeiro-Neto, B. (1999). *Modern information retrieval*. New York: Addison Wesley.
- Barthes, R. (1977a). Rhetoric of the image. In R. Barthes & S. Heath (Eds.). *Image, music, text* (pp. 32-51). New York: Hill and Wang.
- Barthes, R. (1977b). The photographic message. In R. Barthes & S. Heath (Eds.). *Image, music, text* (pp. 32-51). New York: Hill and Wang.
- Barthes, R., & Sontag, S. (1983) *A Barthes reader*. New York: Hill and Wang.
- Bates, M. (1989). The design of browsing and berrypicking techniques for the online search interface. *Online Review*, 13(5), 407-424.
- Bates, M. (2007). What is browsing – really? A model drawing from behavioral science research. *Information Research*, 12(4).
- Bates, M. (2009). An introduction to metatheories, theories, and models. In K. Fisher, S. Erdelez & L. McKechnie (Eds.), *Theories of information behavior* (pp. 1-24). Medford, NJ: Information Today.
- Belkin, N., Oddy, R., & Brooks, H. (1982). ASK for information retrieval: Part I. Background and theory. *Journal of Documentation*, 38(2), 61-71.
- Benoit, G. (2011). *Measuring relevance theory's effects in an image-driven explorative information system*. Poster prepared for iConference 2012. Toronto, Canada. Retrieved from <http://web.simmons.edu/~benoit/research-projects/RelevancyInterfacePoster.pdf>

- Berger, M. A. (2011). *Seeing through race: A reinterpretation of civil rights photography*. Berkeley: University of California Press.
- Blair, D. (1990). *Language and representation in information retrieval*. New York: Elsevier Science Publishers.
- Bolter, J., & Grusin, R. (2000). *Remediation: Understanding new media*. MIT Press.
- Bopp, R., & Smith, L. (Eds.) (2001). *Reference and information services: An introduction* (3rd ed.). Englewood, CO: Libraries Unlimited.
- Brand, S. (1999). *The clock of the long now: Time and responsibility*. New York: Basic Books.
- Bray, P. et al. (2011, March 31). Rethinking evaluation metrics in light of Flickr Commons. In J. Trant & D. Bearman (Eds.), *Museums and the Web 2011: Proceedings*. Toronto: Archives & Museum Informatics.  
[http://conference.archimuse.com/mw2011/papers/rethinking\\_evaluation\\_metrics](http://conference.archimuse.com/mw2011/papers/rethinking_evaluation_metrics)
- Buckland, M. (1991a). Information. In *Information and information systems* (pp. 3-14). New York: Praeger.
- Buckland, M. (1991b). Information as thing. In *Information and information systems* (pp. 43-54). New York: Praeger.
- Buckland, M. (1992). *Redesigning library services: A manifesto*. Chicago: American Library Association.
- Buckland, M. (2006). *Emanuel Goldberg and his knowledge machine: Information, invention, and political forces*. Westport, Conn: Libraries Unlimited.
- Burke, C. (2005). *Lee Miller: A life*. New York: Knopf.
- Burke, G., & Lin, J. (2011, November 23). *UC Davis officer, Lt. John Pike, honored, accused*. *SF Gate*. Retrieved from <http://www.sfgate.com/cgi-bin/article.cgi?f=/c/a/2011/11/22/MNTP1M32LS.DTL>
- Case, D. (2006). *Looking for information: A survey of research on information seeking, needs, and behavior*. New York: Elsevier Science Publishers.
- Chia, R. (1995). From modern to postmodern organizational analysis. *Organization Studies*, 16(4), 579-604.
- Chiesa, M. (1994). *Radical behaviorism: The philosophy and the science*. Boston: Authors Cooperative.

- Conway, P. (2010). Modes of seeing: Digitized photographic archives and the experienced user. *American Archivist*, 73(2), 425-462.
- Copeland, J. H. (1997). *Engineering design as a foundational metaphor for information science: A resistive postmodern alternative to the "scientific model"*. (Unpublished doctoral dissertation). Emporia State University, Emporia, KS.
- Damasio, A. (1999). *The feeling of what happens: Body and emotion in the making of consciousness*. New York: Harcourt Brace.
- Dawkins, R. (1982). *The extended phenotype*. Oxford, UK: Oxford Press.
- Dervin, B. (1992). From the mind's eye of the user: The sense-making qualitative-quantitative methodology. In J. D. Glazier & R. R. Powell (Eds.), *Qualitative research in information management*. Englewood, CO: Libraries Unlimited Inc.
- Dervin, B. (1998). Sense making theory and practice: An overview of user interests in knowledge seeking and use. *Journal of Knowledge Management*, 2(2), 36-46.
- Dervin, B. (2003). *Sense-making methodology reader: Selected writings of Brenda Dervin*. Cresskill, NJ: Hampton Press.
- Enser, P. (2008). Evolution of visual information retrieval. *Journal of Information Science*, 34(4), 531-546.
- Ferren, B. (1998). The lost art of storytelling. In P. Denning (Ed.), *Talking back to the machine: Computers and human aspiration*. New York: Copernicus.
- Foster, A. (2004). A non-linear model of information seeking behavior. *Journal of the American Society for Information Science and Technology*. 55(3), 228-237.
- Foster, A., Urquhart, C., & Turner, J. (2008). Validating coding for a theoretical model of information behaviour. *Information Research*, 13(4) paper 358. [Available at <http://informationr.net/ir/13-4/paper358.html>]
- Gilbert, T, F. (1978). *Human competence: Engineering worthy performance*. San Francisco, CA: Pfeiffer.
- Goodrum, A. (2003). Image intermediation: Visual resource reference services for digital libraries. In R. D. Lankes, S. Nicholson & A. Goodrum (Eds.), *The digital reference research agenda* (pp. 139-147). Chicago, IL: Publications in Librarianship, Association of College and Research Libraries.
- Goodrum, A. (2005). I can't tell you what I want, but I'll know it when I see it. *Reference & User Services Quarterly*, 45(1), 46-53.

- Goodrum, A., Rorvig, M., Jeong, K., & Suresh, C. (2001). An open source agenda for research linking text and image content features. *Journal of the American Society for Information Science and Technology*, 52(11), 948-953.
- Gorman, M. (2001). Human values in the technological age. *Information Technology and Libraries*, 20(1), 4-11.
- Greenwald, G. (2011, November 20). The roots of the UC-Davis pepper-spraying. *Salon*. Retrieved from [http://www.salon.com/2011/11/20/the\\_roots\\_of\\_the\\_uc\\_davis\\_pepper\\_spraying/](http://www.salon.com/2011/11/20/the_roots_of_the_uc_davis_pepper_spraying/)
- Greisdorf, H., & O'Connor, B. C. (2002a). What do users see? Exploring the cognitive nature of functional image retrieval. In E. Toms (Ed.), *Proceedings of the 65<sup>th</sup> ASIST Annual Meeting* (pp. 383-390). Medford, NJ: Information Today.
- Greisdorf, H., & O'Connor, B. C. (2002b) Modeling what users see when they look at images: A cognitive viewpoint. *Journal of Documentation*, 58(1), 1-24.
- Greisdorf, H., & O'Connor, B. C. (2008). *Structures of image collections: From Chauvet-Pont-d'Arc to Flickr*. Westport, Conn: Libraries Unlimited.
- Gross, M. (1995). The imposed query. *RQ*, 35(2), 236-243.
- Guba, E., & Lincoln, Y. (1983). *Effective evaluation: Improving the usefulness of evaluation results through responsive and naturalistic approaches*. San Francisco: Jossey-Bass.
- Hillis, W. D. (1985). *The connection machine*. Boston, MA: MIT Press.
- Hillis, W. D. (1995). Close to the singularity. In J. Brockman (Ed.), *The third culture* (pp. 379-388). New York: Simon & Schuster.
- Hoffman, R., Shadbolt, N., Burton, A., & Klein, G. (1995). Eliciting knowledge from experts: A methodological analysis. *Organizational Behavior and Human Decision Processes*, 62(2), 129-158.
- Holmes, O. W. (1859, June 3). The stereoscope and the stereograph. *The Atlantic Monthly*, 3(20), 738-748. Retrieved from <http://www.theatlantic.com/magazine/archive/1859/06/the-stereoscope-and-the-stereograph/3361/>
- Hutchins, W. (1977). On the problem of "aboutness" in document analysis. *Journal of Informatics*, 1, 17-35.



- Jørgensen, C. (2003). *Image retrieval: Theory and research*. Lanham, MD: The Scarecrow Press.
- Jørgensen, C., & Jørgensen, P. (2005), Image querying by image professionals. *Journal of the American Society for Information Science and Technology*, 56(12), 1346–1359.
- Kennedy, L. (2009). *Advanced techniques for multimedia search: Leveraging cues from content and structure*. (Doctoral dissertation). Retrieved from ProQuest Digital Dissertations. (AAT 3343514)
- Krippendorff, K. (1980). *Content analysis: An introduction to its methodology*. Beverly Hills: Sage Publications.
- Kuhlthau, C. (1991). Inside the search process: Information seeking from the users' perspective. *Journal of the American Society for Information Science*, 42(5), 361-371.
- Kuhlthau, C. (2004). The information search process. In *Seeking meaning: A process approach to library and information services* (2<sup>nd</sup> ed., pp. 29-52). Norwood, NJ: Ablex.
- Lee, H. & Neal, D. (2010). A new model for semantic photograph description combining basic levels and user-assigned descriptors. *Journal of Information Science*, 36(5), 547-565.
- Lenhart, A. (2010, April 20). Teens, cell phones and texting: Text messaging becomes centerpiece communication. Retrieved from Pew Research Center Publications: <http://pewresearch.org/pubs/1572/teens-cell-phones-text-messages>
- Lincoln, Y., & Denzin, N. (1996). The fifth moment. In Y. S. Lincoln & N. K. Denzin (Eds.), *Handbook of Qualitative Research* (pp. 575-586). Thousand Oaks, CA: Sage Publications.
- Lotan, G., Graeff, E., Ananny, M., Gaffney, D., Pearce, I., & boyd, d. (2011). The revolutions were tweeted: Information flows during the 2011 Tunisian and Egyptian revolutions. *International Journal of Communications*, 5, 1375-1405.
- Mandelbaum, M. (1982). Vietnam: The television war. *Daedalus*, 111( 4), 157-169.
- Manguel, A. (2008). *The library at night*. New Haven, CT: Yale University Press.
- Marchionini, G. (2006). Exploratory search: From finding to understanding. *Communications of the ACM*, 49(4), 41-46.

- Marlow, C. Naaman, M., boyd, d., & Davis, M. (2006, August 22-25). HT06, tagging paper, taxonomy, Flickr, academic article, to read, *Proceedings of the seventeenth conference on Hypertext and hypermedia*, Odense, Denmark.
- Maron, M. E. (1967). Relational data file i: Design philosophy. In Schechter (Ed.), *Information Retrieval*, 6, 211-223.
- Maron, M. E. (1977). On indexing, retrieval and the meaning of about. *Journal of the American Society for Information Science*, 28, 38-43.
- Michael, J. (1982). Distinguishing between discriminative and motivational functions of stimuli. *Journal of the Experimental Analysis of Behavior*, 37(1), 149-155.
- Minsky, M. (1986). *The society of mind*. New York: Simon and Schuster.
- Mitchell, W. J. (1995). Representation. In F. Lentricchia & T. McLaughlin (Eds.) *Critical Terms for Literary Study* (2<sup>nd</sup> ed., pp. 11-12). Chicago: University of Chicago Press.
- Munch-Petersen, E. (1996). Patrick Wilson and the classics. In J. Olaisen, E. Munch-Petersen & P. Wilson (Eds.), *Information authority and user knowledge* (pp. 233-243). Oslo, Sweden: Scandinavian University Press.
- Neal, D. (Ed.) (2009, June/July). Special Section, "Visual representation, search and retrieval: Ways of seeing," *Bulletin of the American Society for Information Science and Technology*, 35(5), 6-12.
- Niller, E. (2011, April 11). How Civil War photography changed war. *Discovery News*. Retrieved from <http://news.discovery.com/history/civil-war-photography-warfare-110411.html>
- Occupy Together*. (2011). Retrieved October 26, 2011, from <http://www.occupytogether.org/>
- Occupy Wall Street*. (2011). Retrieved October 26, 2011, from <http://occupywallst.org/>
- Occupy Wall Street Los Angeles*. (2011). Retrieved October 26, 2011, from <http://www.livestream.com/owslosangeles/>
- O'Connor, B. C. (1993). Browsing: A framework for seeking functional information. *Knowledge: Creation, Diffusion and Utilization*, 15, 211-232.
- O'Connor, B. C. (1996). *Explorations in indexing and abstracting: Pointing, virtue, and power*. Englewood, CO: Libraries Unlimited.

- O'Connor, B. C., Copeland, J. H., & Kearns, J. (2003). *Hunting and gathering on the information savanna: Conversations on modeling human search abilities*. Lanham, MD: Scarecrow Press.
- O'Connor, B. C., Kearns, J., & Anderson, R. L. (2008). *Doing things with information: Beyond indexing and abstracting*. Westport, CT: Libraries Unlimited.
- O'Connor, B. C., & O'Connor, E. (2009). *Utterances & photocutionary acts: An engineering model of photographic documents*. Paper presented at the 6<sup>th</sup> annual meeting of Documents Academy (DOCAM), Madison, WI, March 28-29.
- O'Connor, B. C., & O'Connor, M. (1998). Book jacket as access mechanism: An attribute rich resource for functional access to academic books. *First Monday*, 3(9). Retrieved from [http://www.firstmonday.org/issues/issue3\\_9/oconnor/index.html](http://www.firstmonday.org/issues/issue3_9/oconnor/index.html)
- O'Connor, B. C., O'Connor, M., & Abbas, J. (1999). User reactions as access mechanism: An exploration based on captions for images. *Journal of the American Society for Information Science*, 50(8), 681-697.
- O'Connor, B. C., & Wyatt, R. (2004). *Photo provocations: Thinking in, with and about photographs*. Lanham, MD: Scarecrow Press.
- Oyarce, G. (2007). From a property of the average of fractions to a text-processing interface. In S. Hawamdeh (Ed.), *Creating collaborative advantage through knowledge and innovation* (263-277). Hackensack, NJ : World Scientific.
- Oyarce, G. (2008). Using the shape recovery method to evaluate indexing techniques. *Journal of the American Society for Information Science and Technology*, 59(9), 1479–1492.
- Panofsky, E. (1962). *Studies in iconology: Humanistic themes in the art of the renaissance*. New York: Harper & Rowe.
- Persons, A. C. (1965). *The true Selma story: Sex and civil rights*. Birmingham, Alabama: Esco Publishers.
- Pew Research Center. (2011, July 11). 35% of American adults own a smartphone: One quarter use their phone for most of their online browsing. Retrieved from Pew Research Center Publications: <http://pewresearch.org/pubs/2054/smartphone-ownership-demographics-iphone-blackberry-android>
- Prensky, M. (2002) The motivation of gameplay: The real twenty-first century learning revolution. *On the Horizon*, 10(1), 5 - 11.

- Purcell, K. (2011, July 27). E-reader ownership doubles in six months: Tablet adoption grows more slowly. Retrieved from Pew Research Center Publications: <http://pewresearch.org/pubs/2039/e-reader-ownership-doubles-tablet-adoption-grows-more-slowly>
- Roddy, K. (1991). Subject access to visual resources: What the 90s might portend. *Library Hi Tech*, 9(1), 45-49.
- Rorvig, M., Turner, C., & Moncada, J. (January 01, 1999). The NASA image collection visual thesaurus. *Journal of the American Society for Information Science*, 50(9), 794-798.
- Rorvig, M., Jeong, K., Pachlag, A., Anusuri, R., Jenkins, D., & Oyarce, S. (2002). UNT TRECvid: A Brighton Image Searcher Application. *NIST Special Publication*, 500, 619-623.
- Safian, R. (2012, January 9). This is Generation Flux: Meet the pioneers of the new (and chaotic) frontier of business. *Fast Company*, 162. Retrieved from <http://www.fastcompany.com/magazine/162/generation-flux-future-of-business>
- Schaaf, L. (1997). Invention and discovery: First images. In A. Thomas, M. Braun, & National Gallery of Canada (Eds.), *Beauty of another order: Photography in science* (pp. 26-59). New Haven, CT: Yale University Press in association with the National Gallery of Canada, Ottawa.
- Schamber, L. (1996). What is a document? Rethinking the concept in uneasy times. *Journal of the American Society for Information Science*, 47(9), 669-671.
- Schamber, L. (2000). Time-line interviews and inductive content analysis: Their effectiveness for exploring cognitive behaviors. *Journal of the American Society for Information Science*, 51(8), 734-744.
- Shatford-Layne, S. (1986). Analyzing the subject of a picture: A theoretical approach. *Cataloging & Classification Quarterly*, 6(3), 39-62.
- Shatford-Layne, S. (1994). Some issues in the indexing of images. *Journal of the American Society for Information Science*, 45(8), 583-588.
- Sidman, M. (1960). *Tactics of scientific research: Evaluating experimental data in psychology*. New York: Basic Books.
- Simon, H. A. (1976). *Administrative behavior: A study of decision-making processes in administrative organization* (3<sup>rd</sup> ed.). New York: Free Press.
- Skinner, B. F. (1953). *Science and human behavior*. New York: Macmillan.

- Skinner, B. F. (1959). A case history in scientific method. In S. Koch (Ed.). *Psychology: A study of a science* (Vol. 2, 359-379) . New York: McGraw-Hill.
- Smiraglia, R. (2007). Two kinds of power: Insight into the legacy of Patrick Wilson. In Canadian Association for Information Science (Ed.), *Information sharing in a fragmented world: Crossing boundaries*. McGill University, Montreal, Quebec..
- Smith, A. (2011, June 1). Twitter update 2011: 13% of online adults use Twitter. Retrieved from Pew Research Center Publications:  
<http://pewresearch.org/pubs/2007/twitter-users-cell-phone-2011-demographics>
- Sontag, S. (1980). Fascinating fascism. In S. Sontag, *Under the sign of Saturn* (pp. 73-108). New York: Farrar, Straus & Giroux.
- Sontag, S. (2002, December 9). Looking at war: Photography's view of devastation and death. *The New Yorker*, 82-99.
- Sperber, D., & Wilson, D. (1986). *Relevance: Communication and cognition*. Oxford: Basil Blackwell.
- Springer, M, Dulabahn, B., Michel, P., Natanson, B., Reser, D., Woodward, D., & Zinkham, H. (2008, October 30). *For the common good: The Library of Congress Flickr pilot project*. The Library of Congress. Retrieved from  
[http://www.loc.gov/rr/print/flickr\\_report\\_final\\_summary.pdf](http://www.loc.gov/rr/print/flickr_report_final_summary.pdf)
- Sturken, M. (1997). *Tangled memories: The Vietnam War, the AIDS epidemic, and the politics of remembering*. Berkeley: University of California press.
- The Economist. (2011, December 17). How Luther went viral: Five centuries before Facebook and the Arab Spring, social media helped bring about the Reformation. *The Economist*. Retrieved from <http://www.economist.com/node/21541719>
- Trachtenberg, A. (1989). *Reading American photographs: Images as history*. New York: Hill and Wang.
- TREC. (2011). Overview. Retrieved 2011, from Text REtrieval Conference:  
<http://trec.nist.gov/overview.html>
- Wells, L. (2000). *Photography: A critical introduction*. London: Routledge.
- Whitehead, A. N. (1985). *Science and the modern world*. London: Free Association Books.
- Williams, M. E. (2011, November 23). The geeky triumph of Pepper Spray Cop: How did the horrific image of U.C. Davis police officer John Pike become a hilarious

- Internet meme overnight?. *Salon*. Retrieved from [http://www.salon.com/2011/11/23/the\\_geeky\\_triumph\\_of\\_pepper\\_spray\\_cop/](http://www.salon.com/2011/11/23/the_geeky_triumph_of_pepper_spray_cop/)
- Wilson, P. (1968). *Two kinds of power: An essay on bibliographical control*. Berkeley, CA: University of California Press.
- Wilson, P. (1973). Situational relevance. *Information Storage and Retrieval*, 9(8), 4557-4571.
- Wilson, P. (1977). *Public knowledge, private ignorance: Toward a library and information policy*. Westport, Conn.: Greenwood Press.
- Wilson, P. (1983). *Second-hand knowledge: An inquiry into cognitive authority*. Westport, Conn.: Greenwood Press.
- Wilson, P. (1996). The future of research in our field. In J. Olaisen, E. Munch-Petersen, & P. Wilson (Eds.), *Information science; From the development of the discipline to social interaction* (pp. 319-324). Oslo: Scandinavian University Press.
- Wilson, T. D., Walsh, C., & British Library. (1996). *Information behaviour: An interdisciplinary perspective: A review of the literature*. London: British Library Research and Innovation Centre.
- Wilson, T. D. (2006). On user studies and information needs. *Journal of Documentation*, 62(6), 658-670.
- Yoon, J. (2008). Searching for an image conveying connotative meanings: An exploratory cross cultural study. *Library and Information Science Research*, 30, 312-318.
- Yoon, J., & O'Connor, B. C. (2010). Engineering an image-browsing environment: re-purposing existing denotative descriptors. *Journal of Documentation*. 66(5). 750-774.
- Zhang, Z. (2008). *Focused image search in the social web*. (Doctoral dissertation). Retrieved from ProQuest Digital Dissertations. (AAT 3352064)
- Zipf, G. K. (1949). *Human behavior and the principle of least effort: An introduction to human ecology*. Cambridge, MA: Addison-Wesley.