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A Study of Information-Seeking Behaviors and Processes in Subsets of Visual Arts Humanities Scholars: Toward a New Model in Image and Text Retrieval¹

Abstract: Preliminary findings in Phase I of this project summarized here established that members of four subsets of humanities scholars in the visual arts demonstrated strong similarities in their image retrieval requirements. Therefore the proposed methodology in Phase II is intended to broaden the scope of this ongoing study by examining both image and text retrieval within the domain. The primary objective of this project is aimed at contributing toward the development of a specific information-seeking behavioral and processing model for this community.

Résumé : Les résultats préliminaires de la phase I de ce projet sont résumés ici et établissent que les membres de quatre groupes d'universitaires du domaine des arts visuels montrent de fortes similarités dans leurs besoins en repérage d'images. Pour cette raison, la méthodologie proposée dans la phase II est censée élargir la portée de la présente étude par l'examen du repérage de l'image et du texte au sein de ce domaine. L'objectif préliminaire de ce projet vise le développement d'un modèle spécifique du comportement et des procédures de recherche informationnelle de cette communauté.

1. Introduction

The principal purpose of this research is to move beyond previous investigations, dated by advances in information technology, and to concentrate on the process of inquiry considered unique across the domain of the visual arts, specifically, one that often begins with a confrontational image rather than a concept or idea (Bakewell 1988, 7-8). It is anticipated that the foundation for a conceptual image and text retrieval model for visual arts humanities scholars could be framed in an information process that moves from image to text and finally returns to images, where the burden of achieving one's creation, whether it be a work of art or a written document, rests ultimately with the power of specific images contained in its final construction.

Along with our limited understanding about how members of the visual arts community seek and use both imagery and textual information vital for scholarly investigations in their domain, visual arts scholars remain intimidated by technology and question the prospect of accessing electronically the documents necessary to accomplish their research agendas (Bates et al 1995, 15-22). Addressing the combined domain specific information-seeking behaviors and processes of visual arts humanities scholars in image and text could be one of the most challenging platforms for advanced collaborative research in retrieval technology today.

This study is directed at achieving an understanding of the complex processes involved in the information-seeking behaviors of subsets of visual arts humanities scholars, while moving toward an information-seeking model in image and text retrieval for the domain.

The term “subsets” represents categories such as professors of art history, photography, digital arts, and the variety of other professional subject areas that are embodied under the umbrella of the visual arts. The examination of such subsets is utilized in this research primarily because in a previously unpublished study on Web-based image retrieval systems (Larkin, 2003), considered Phase I of this project, participants who were members of four subsets in the visual arts demonstrated strong similarities in their image retrieval requirements in regards to precision, utility and novelty, as well as in their choice of an image retrieval system.

Motivated by the preliminary findings in Phase I, the proposed methodology in Phase II intends to broaden the scope of this ongoing study by incorporating both image and text retrieval. This second phase will embrace the concept of information ecology, adapted from research methodologies in library science. This concept has not been attached to this type of investigation in the past, because it has always been assumed that scholars in the visual arts are isolated creatures. Yet it is probable that in today’s shifting information environment, this model may have applications here. Information foraging theory, a relatively new cognitive model that combines elements of human computer interaction with the anthropological concept of foraging for food, may be appropriate as well because it addresses both solitary information gathering described in the humanities and those actions dependent upon social contact (Gattis 2002, 168).

2. Background

Reflections on Traditions in Art Inquiry and its Conflict with Technology

The Bakewell (1988) report documented the pivotal 1985 collaborative study conducted by the Art History Information Program of the J. Paul Getty Trust (AHIP) and the Institute for Research and Information Scholarship of Brown University (IRIS), whose objective was to discuss applying computer technology to research in the humanities. After close observation it was recognized that little was known about the way this community engaged in the information-seeking process. This prompted AHIP and IRIS researchers to revise their projects agenda to include monitoring a number of fine arts humanities scholars and their research activities. It was soon discovered that these scholars had developed their own idiosyncratic research methodologies and inquiries often beginning with a confrontational image, rather than a concept or idea as in other disciplines (Bakewell et al 1988, 7-8). Researchers also observed that these fine arts humanities scholars, although highly organized during the information-seeking process, were reluctant to change from paper systems because they needed to have all information visually available in a physical sense (Bakewell et al 1988, 44-50).

Studies guided by Marcia Bates (1993) and her colleagues examined the natural language queries of fine arts humanities scholars with the purpose of developing categories of terminology that could be applied to specific online search systems. Here it was determined that their information-seeking was defined by a different combination of terms from a wide variety of distinct categories and although precise, proved to be inherently more complex than in the sciences (1993, 32). According to Bates, her findings generally matched the particular vocabulary of humanities scholars first reported by Stephen Wiberley (1988, 1-28). In a follow-up study (Bates et al 1995, 15-22) focused on online searching in general, arts and humanities scholars reported being overwhelmed with the amount of information available and concerned with its quality. Once again they preferred the printed book or journal in hand when analyzing the material; still others

reported feelings of isolation and detachment during online searching. These initial observations, mostly concentrated in the field of art history, raised important questions about the idiosyncratic information-seeking behaviors of fine arts humanities scholars and their methodologies, yet in general, exhaustive studies failed to contribute the detailed information needed to address the information needs and information-seeking strategies of this domain specific population.

Research in the Visual Arts: The Primacy of Original Works and Documents

Although the information-seeking behaviors and processes reported thus far among fine arts humanities scholars varies somewhat, most scholarship within the domain is propelled by an image supported by related text and secondary images, whether the final creation is an article in a scholarly journal, a thesis or dissertation, or a visual work. For example, in the visual arts, interest in one compelling image can precipitate an exhaustive process that sometimes involves information-seeking within the domain as well as in related disciplines.² Depending upon the complexity of the image, research may begin with a reproduction, although above all, hands-on experience is valued in the domain and is considered to be the most essential aspect of knowing an image (Bakewell 1988, 7). Consequently, art historical information remains reliant upon a tradition of primary images used along with scholarship that is often laden by text and other images, despite the difficulties often encountered in gaining access to an original work of art. As the research process moves from image to text and finally back to images, the burden of proving one's hypothesis rests ultimately with the power of specific comparative images contained in the final document.

3. Visual Arts Theory

The fundamental nature of this research is couched in the perception that there are critical distinctions in the processes of information retrieval in the visual arts. Unfortunately, this perception has been given relatively short shrift in theory and practice in library and information science (Bates et al 1993, 37). This significant deficiency in former research agendas has led to a generalized notion that the domain of the visual arts is lacking theoretical underpinnings at its foundational level (Abramson 1990, 185-186). However, numerous theories of image recognition, visual perception and image interpretation are at the basis of training in the visual arts and a good number are trans-disciplinary in nature. While the topic of theory in the visual arts is too vast to be totally addressed here, understanding some applications of various art theories may shed some light on several critical distinctions in art research and on the complexities of the concept known in the domain as reading an image.

Classic Art Historical Theories

Ernst Gombrich is considered the father of the theory of Perceptualism, defined as one who describes image-making entirely in terms of secret and private events, perceptions and sensations, occurring in invisible recesses of the painter's and the viewer's mind (Bryson 1991, 61-74). As a member of Freud's circle, Gombrich began to develop a lifelong interest in Freud's psychoanalytical interpretation of art and was inclined to consider a work of art as subjective expression (Woodfield 1996, 10-11). A conflicting theory, posited by Rudolph Arnheim, a proponent of Gestalt studies, suggested that images have their own characteristics that demand to be perceived correctly (Arnheim, 1954, viii). Arnheim hypothesized that artists use specific categories, like shape and

color, to capture something universally significant. Arnheim's theory attended to the formal aspects of works of art and moved away from issues of content, meaning and symbolism (Arnheim 1972, 17-22). Richard Wollheim is considered a pioneer in interpretive science as a pervasive source of understanding. According to Wollheim, our understanding of pictorial representation must be understood as seeing-in. Seeing-in consists of a perceptually driven hypothesis in which Wollheim posited that projection changed our perception of the properties that are supposed to be expressive, by involving affection. Here the artist can have a multiplicity of roles; he can be both creator and spectator. According to Wollheim, Seeing-in is a distinct kind of perception that is triggered off by one's presence within the field of vision of a differentiated surface (Wollheim 1991, 130-135).

Signs, Symbols and Linguistics

Nelson Goodman developed a general theory of symbols and representation and explored topics such as aesthetics, epistemology, philosophy of science, and the philosophy of language. Goodman, grounded in his theory of symbols, attempted to analyze various art forms according to their symbolic features. According to Goodman, various art forms shape our experiences just as linguistics and scientific representation do. Symbols to Goodman are colorless and general, covering letters, words, texts, pictures, diagrams, maps and models; his theory of symbols in art is an extension of structural linguistics to non-verbal systems of meaning (Kose, 1984, 29). His argument was directed against any position that would maintain that a picture is representational because it shares certain properties or resembles some object or event; a picture is not a copy or imitation of objects in this world. Goodman's position on the issue of pictorial representation is as follows: "The plain fact is that if a picture is to represent an object, it must be a symbol for it; it must stand for it and refer to it. No degree of resemblance is sufficient to establish the requisite relationship of reference. Nor is resemblance necessary for reference; almost anything can stand for anything else. A picture that represents is like a passage that describes. Only an object can refer to, and more particularly denotes it. Denotation is the core of representation and is independent of resemblance (Goodman, 1968, 5)."

Catherine Elgin, a colleague of Nelson Goodman during his lifetime, addresses pictorial and linguistic representation and posits that the linguistic model cannot be extended to pictorial comprehension because understanding a picture is not a matter of bringing to bear universal rules that determine the identification of symbols. In contrast to Goodman, Elgin's definition of pictorial competence relies on resemblance. She posits that in understanding a representation, we use the cognitive resources we have, although they may be inadequate. Elgin employs a theoretical division between signs in language and signs in images. She posits that recognition of what a picture resembles is sometimes a consequence of the knowledge of what it represents. "We bring to the task of interpreting an unfamiliar picture the background or related interpretations that we already understand along with any additional knowledge that we can press into service" (Goodman & Elgin 1988, 101-120). Elgin and Goodman disagreed on a number of points concerning pictorial and linguistic representation. Elgin posited that the linguists' model could not be extended to pictorial comprehension because understanding a picture is not a matter of bringing to bear universal rules that determine the identification of symbols. In other words, pictorial competence differs here because it relies on resemblance and is discernible to the uneducated eye. Goodman attempted to clarify the ambiguous nature of the term representation by removing it from similar terms such as depiction and likeness.

Goodman concluded that representation is the most flexible of the three, yet he found it to be most problematic to define. Goodman was unsatisfied with Elgin's definition of resemblance and considered degrees of resemblance and of realism as transient interacting properties that fluctuate with practice. Goodman reserved the term depiction for specific pictorial representations and the term likeness for images in cultural context (Goodman & Elgin 1988, chap. 7).

Norman Bryson's (1983) theory of Structuralist Semiology conceives of a work of art as a visual system of signs; he posited that what is suppressed by the account of a painting as the record of a perception is the social character of the image and its reality as a sign (Bryson 1983, vii). In Bryson's Semiology, art is constituted by cultural signs, which when decoded, identify the breadth of its role in society. He moves beyond the structural limits of Saussure with the intention of avoiding entrapment in a closed linguistic system. Bryson applied his argument for a system of signs for images to Saussure's linguistic formula, (Sign=Signifier/+/Signified) and restates it along these lines: in recognition, the signifier seeks another signifier; it is the relationship between signifiers that forms the sign (Sign=Signifier→Signifier). Bryson's model is horizontal or lateral, and less instantaneous than the linguistic model. Bryson's model is only applicable when the term perception is replaced by recognition, because according to Bryson, it takes one person to experience a sensation, and at least two people to recognize a sign (Bryson 1983, 78-80). As an art historian, Bryson is neither a formalist nor an iconographer. Bryson argued that formalism denies the semantic discussion of the image, whereas iconography tends to disregard the materiality of painting practices. By combining these methods and giving equal consideration to signifier and signified within the painterly sign, he proposed to revitalize art history (1983, 38). Bryson analyzed a work of art by first considering it as a system of signs, and second, discarding theories of visual perception, such as Gombrich's Perceptualism, as a precondition of high art fortified by twentieth century cognitive psychology (1983, 65-69). Bryson preferred to rely on a system of signs or socially generated codes of recognition to interpret works of art. By virtue of considering the visual image as sign, Bryson posited that painting is relocated within the social domain, permitted to re-circulate as fresh, and capable of facilitating renewed currents of discourse (1983, 70)

Questioning Visual Theories: Principles and Concepts in an Image Laden Environment

W. T. J. Mitchell, James Elkins and Barbara Maria Stafford are not intent on developing visual theories, although they acknowledge past theorists and investigate their contributions. Conversely, Mitchell, Elkins and Stafford confront the confines that classic visual theories impose on today's image laden environment. W. T. J. Mitchell is interested in the things people say about images, related notions of picturing, imagining, perceiving, likening and imitating. Throughout his writings, Mitchell focused his discussions on this important question, "What is the difference between images and words (Mitchell 1986, 3)?" According to Mitchell, the terms word and image are deceptively simple labels for two kinds of representation. Mitchell characterized logos, as the word, ideas, discourse and science, and icons as images, pictures or likenesses (1986, 5); unlike classic visual theorists, his understanding of images is grounded in current social and cultural practices. Mitchell developed a family of images, and assigned disciplines to each branch (adapted from, Mitchell 1986, 9-10):

Art History	Physics	Psychology	Linguistics	Combined
Graphics	Optical	Mental	Verbal	Perceptual
Pictures, statues	Projections	Dreams	Metaphors	Sense data

At first glance Mitchell's categories here reflect the classic inter-disciplinary theories on the study of images addressed by early theorists, yet contrary to traditional theory, he posited that images are not stable, static or permanent and are not perceived in the same way by the viewer (1986, 13-14). In fact Mitchell characterized his lineage of images as a "far-flung" family that has migrated in time and space and undergone profound mutations in the process (1986, 9)." Consequently, Mitchell continued to question early attempts at understanding visual theories, describing them as self-limiting and purist. In 1994, Mitchell published *Picture theory: Essays on Verbal and Visual Representation*, as a companion to his earlier work. *Picture Theory* is not about developing a theory of pictures; he is careful to qualify this work as an ambitious attempt to investigate theories about the complex relationship between image and text. Mitchell acknowledged that we live in a society dominated by pictures and visual stimulation. Mitchell "pictures" existing theories that examine the ongoing struggle between words and images in today's culture and reaches far beyond the tension between verbal and visual representation discussed in his prior book. Mitchell portrayed our contemporary environment as one caught up in a paradigm shift between a cultural past once dominated by the book and a cultural future where the image threatens to take over (1994, 4), and proposed that there is a real need for combining textual and visual disciplines in the current milieu while surmounting today's tension between art history and literary studies (1994, 210). James Elkins is often criticized for exposing the shortcomings of existing theories without providing models for future scholarship. In particular, when Elkins's examined Wollheim's theory of Seeing-in, he called upon his own experience as a painter and art historian. According to Elkins's, the painter's studio is often excluded from art theory and art history and although a number of art historians draw, sculpt and paint, their experiences as visual artists are rarely incorporated into their historical and theoretical text (Elkin 1997, 45). Elkins addressed a number of theories derived from other disciplines that have been applied to art history and criticized their inclusion. He posited that psychoanalysis and semiotics are forms of repression, preventing art-historians from coming to terms with a sense of their own discipline (1997, 12). Barbara Maria Stafford is an art historian focused on the conflict between art history and the digital environment that invades the discipline. (Stafford, 1997a, 214-217) Stafford has taken on the mantle of visual competency, a new discipline that she considers vital in education today. According to Stafford, education is based on language and images are marginalized. Stafford, in her constructivist manifesto, called for a distancing from Saussure's schema of linguistic imperialism while moving toward a post-Gutenberg constructive model of education through images (1997b, 3-9).

4. Selected Literature Review

This abbreviated review is divided into four categories: A.) The differences between the information-seeking behaviors and processes in the sciences and humanities are well documented and will not be discussed in depth here; the three publications mentioned below are relevant because they reiterate and update the state of the divide between the two domains. B.) Works specifically directed toward fine arts humanities scholars are less voluminous and their findings tend to be redundant; most fall under the category of library usage studies and are sometimes criticized for lacking insight in the domain of the visual arts. C.) A number of existing information-seeking behavior and processing

models have been developed and utilized in library science over time; a portion of that research is discussed herein because of their application in this ongoing research toward a model for information-seeking and processing among fine arts humanities scholars. D.) Because images play a pivotal part in the information behaviors and processes of fine arts humanities scholars and because image retrieval is a primary component in this ongoing study, a section of the literature review briefly covers two main topics in image retrieval research, descriptive-based (or concept-based) and content-based image retrieval.

A. State of the Divide

Rebecca Watson-Boone (1994) goes beyond earlier portraits of the information needs of humanities scholars to construct a more contemporary profile of the community. She posited that humanists continue to work alone and appear to graze rather than browse, passing lightly along the surface of interesting material, rather than jumping from one thing to another. In her opinion, the humanist scholar accumulates, selects and interprets information in a way that transforms it into knowledge (1994, 212). Humanists seek to provide a new interpretation of a subject in a cumulative nature, seeking primary material wherever it is located. Susana Romanos de Tiratel (2000) examined the information-seeking behaviors and processes of humanists and social scientists across continents and established consistencies in her findings, including the preferred format of scholarly literature and the rate of obsolescence of materials used in research agendas (2000, 347). William Brockman and colleagues (2001) reviewed some of the literature published during the last two decades relating to the different information-seeking behaviors and processes of humanities and science scholars and posited that a noticeable divide still existed, rooted in technology-driven advances in the sciences. Even with the broad sense of optimism that the use of technology could soon lead to an easier and faster research process for most humanities scholars, current trends continued to leave members of the community underserved. Although humanities scholars in general had begun to incorporate technology into their research practices, Brockman observed a general level of confusion among them in terms of their understanding of the scope and function of electronic systems. As in the past, the essential use of many states of primary materials such as films, paintings and artifacts remained central to some humanist's research practices (Brockman et al 2001, 1-22).

B. Overview of Library Usage Studies

When Deirdre Stam (1984) investigated how art historians looked for information she observed that the population relied heavily upon their personal library, including books and periodicals. Most made frequent visits to two or more institutional libraries regularly and made little use of computerized databases. Stam characterized the art historical information search process as contemplative and relating directly to objects of art (1984, 30). Later, Stam (1989, 13-16) discussed ambiguities in tracking art historians' information needs and information-seeking behaviors, categorizing the domain as part art, philosophy, archeology, and anthropology, yet she concurred with the art historian Richard Brilliant (1988, 120-129) who posited that all art historians begin their study of an object with some form of *it looks like*, and then seek to find the other objects and images which compliment the proposed resemblance. Similar to former studies, Sara Shatford Layne (1994) discussed information-seeking and the information use of artists and art historians and pointed out their strong need for both visual and textual information. She reiterated that like artists, art historians have a unique research process that is particularly reliant upon images and requires ready access to a large number of images to successfully investigate matters of style, composition, motif, iconography and connoisseurship (1994, 25). She added that for the methodology basic to the discipline of

art history to come into full play, art historians also need links between image and text. Much of her discussion focused on the role, present and future, of reference librarians in understanding the unique information needs of artists and art historians and the failure of existing library techniques to address their domain specific needs. However, later in her assessment of the information-seeking behaviors and processes of artists and art historians, she speculated that the domain may not like research to be too easy, and in fact they may benefit from imprecise retrieval methods and serendipitous discoveries (1994, 34). The notion of fine arts humanities scholars embracing serendipitous or imprecise information retrieval was later challenged by Suzie Cobbledick (1996) who posited that this preconception has attributed to the lack of attention given to information needs in the visual arts. Cobbledick noted that in the library artists used mostly visual material supported by literary, art historical, and historical, textual material when creating a work and suggested that in past studies, browsing as a tool was overstated as an information search behavior for artists, positing that artists have specific needs in mind when beginning the information search process (1996, 362). Of the four artists interviewed, only one was interested in making a leap toward technology; the remaining three described themselves as reluctant or militantly technologically illiterate (1996, 359). All considered computer generated works to be too mechanical and indicated that they needed visual and printed material in hand and for it to be made portable for further use (1996, 363).

C. Information-Seeking Behavior and Processing Theories and Models

In a mandate for user-centric studies, Brenda Dervin (Dervin & Nilan, 1986) made an early call to address the information needs of humanities scholars and a general call to serve the information needs of library clients better by refocusing on the users' world. As adjunct to her sense-making approach, Dervin introduced her latest model labeled Situation-Gap-Use, which mirrors the human experience of facing obstacles and building bridges before completing a task (1986, 21) and posited that human beings actively construct rather than passively process information. Dervin's model is often discussed along with Nicholas Belkin's anomalous states of knowledge approach (ASK), whereby in concept, users are seen as being unable to specify what is needed to resolve anomalies while facing gaps, uncertainties and incoherencies in the search process (Dervin & Nilan, 22). Kuhlthau (1993) proposed a principle of uncertainty for information-seeking during a noticeable shift in the literature toward the user's perspective in information-seeking and use (1993, 339). Kuhlthau's theoretical position is grounded in former scholarship, especially in the works of Taylor, Kelly, Belkin, and Dervin, whereby she proposed that uncertainty and anxiety, coupled by confusion and frustration, are to be expected in the information search process, followed by clearer thoughts and increased confidence. Kuhlthau discussed Kelly's mood corollary as an important component in information search attitudes (1993, 340-342). T. D. Wilson (1999) outlines existing models of information-seeking already established in the literature and suggests that by nesting (combining) these models, alternative models are created. Wilson explored a variety of models including the ones discussed here and suggested that new clarity could be accomplished by considering the complimentary aspects of existing systems toward a broader understanding of information behavioral research (1999, 262-267).

D. Descriptive-based and Content-based Image Retrieval Research

Descriptive (or concept-based) Image Retrieval

Edie Rasmussen (1997) recognized that the performance of visual information systems has been extensively studied by art librarians who may not be equipped to address the

specific information needs of fine arts humanities scholars. This controversy is often centered on Sara Shatford Layne's interpretation and application of the art historian Erwin Panofsky's theory of iconology and iconography. According to Rasmussen (1997, 177-178), Layne determined that Panofsky's iconographic levels of interpretation could be expressed in the ofness and aboutness of an image, while iconology required a great depth of cultural knowledge extrinsic to the image and that varying interpretations would lack indexing consistency (Shatford 1986, 45). Although the formalist theories of Panofsky and his contemporaries no doubt have a place in understanding the complexities of information retrieval in the visual arts, they are far too limiting to stand alone in the midst of today's advanced image technology. Taking visual theory out of context and applying it to today's image information environment is a precarious issue and should be approached in collaboration with the visual arts community (Stafford 1997a, 214-217). W. J. T. Mitchell (1994), described Panofsky's use of form, motif, image, and symbol as overlapping constructs in a three dimensional model of interpretation that moves from pre-iconographical description to primary or natural subject matter to iconographical analysis of secondary or conventional subject matter to iconographical interpretation of the intrinsic meaning or content to the iconological world of symbolic values. According to Mitchell, Panofsky moved from surface to depth, from sensation to ideas, from immediate particulars to an insight into the way essential tendencies of the human mind were expressed by specific themes and concepts (1994, 22-34). This complex multiple levels of meaning represent in a very real way, the challenge of applying Panofsky's theories to the description-based indexing of images. Mitchell (1986, 2) suggested separating iconology from iconography, by differentiating the interpretation of the total symbolic horizon of an image to a particular symbolic motif, might be helpful in future indexing techniques specifically designed for image retrieval. Hastings (1999) reported that with the proliferation of the number of images available on servers connected to the Web, it is more difficult to find images that meet users' specific needs. In terms of current image retrieval scholarship, Hastings identified a number of issues that demand further study. For example, Hastings was concerned with the inadequacy of traditional textual retrieval and indexing methods for images, the limitations of current content-based retrieval research, and insufficient testing methods for image retrieval systems that rely on text retrieval standards such as precision and recall. In addition to technical, semantic, and content issues, Hastings (1999, 440) summarized Layne's interpretation of Panofsky's theory of the aboutness of an image, reiterating the difficulty in the consistencies of an image's interpretation for the purposes of indexing.

Content-based Image Retrieval

The state of the art of content-based image retrieval (CBIR) was addressed in 1999 by Eakins and Graham who characterized image queries into three levels of abstraction: 1) primitive features such as color texture and shape, 2) logical features such as the identity of objects shown, 3) abstract attributes such as the significance of the scene depicted. Eakins and Graham conceded that CBIR systems were currently operating effectively only at the lowest of these levels, while most users demand higher levels of retrieval dictated by their specific domains. Eakins and Graham provided a list of issues in research and development as a focus for further study: 1) understanding the image users' needs and information-seeking behavior, 2) identification of suitable ways of describing image content, 3) matching queries and stored images in a way that reflects human similarity judgments. Later, Heting Chu (2001, 1011) recognized that a divide still existed between content-based and descriptive-based image retrieval research. According to Chu (2003, 155), research in image retrieval is expanding, especially in the content-

based domain, even while the need for integrating the two approaches becomes increasingly apparent.

5a. Summary Report on Phase I: Pilot Study

The current research proposal underway incorporates as its catalyst an unpublished pilot study, carried out by the author (Larkin, 2003). The study addressed the issue of domain specific user satisfaction with popular existing image retrieval systems by examining the information search behaviors and processes in an assigned task with subsets of professors in the visual arts including digital art and design, graphic design, photography, and art history. The data collected, using an interactive questionnaire and recorded think-aloud protocol, determined that all members of the sample population were consistent in their preference for a particular image retrieval system among the three systems available in the study; all were primarily concerned with precision over utility and novelty as defined in the literature in their retrieval results; all acknowledged that they rarely utilized image retrieval systems in their work and finally, all displayed some degree of uncertainty and experienced gaps in their information-seeking behaviors and processes. Kelly's Personal Construct, Dervin's Situation Gaps and Kuhlthau's Uncertainty Principle are important theoretical underpinnings in the think-aloud protocol implemented in this research. In turn, the data analysis overall indicated that Wilson's theory of nesting models in information-seeking behavior and process research may be significant toward developing an information-seeking behavior and processing model for fine arts humanities scholars proposed in Phase II of this project.

Within the limits of this exploratory pilot study, some specific and significant findings and observations can be reported. Out of three possible choices, all participants chose Google and AltaVista to explore their image retrieval tasks. In retrospect, this was a fortunate happenstance, because it provided clarity to the findings reported here. All participants ranked AltaVista higher in overall precision in terms of user satisfaction when using an artist's name as a search term. All participants ranked AltaVista higher in precision overall in terms of user satisfaction using the visual elements, color and shape, as search terms. After reviewing the taped interviews, it was obvious that this sample population was most interested in precision in the image retrieval process. A great deal can be learned from the think-aloud recorded remarks of the participants, some anticipated and some insightful. Although the participants had slight differences in levels of expertise in technology, all were aware of image searching on the Web. They were very verbal during the interview process, making information quality judgments throughout while experiencing degrees of uncertainty with original query choices and search procedure. Gaps and digressions, as well as levels of frustration and self-doubt, were recorded during the interviews. Although beyond the scope of this paper, participants digressed to other issues such as suspecting relevant paid links in AltaVista's returns and annoyance with its interface. Not surprisingly, others admitted to not knowing about content-based searching before the interview, but they were delighted with the opportunity to introduce it into the classroom as a design tool. One observation made by the researcher after examining the data collected was the retrieval order format of the images on AltaVista. Unlike Google's horizontal image return (four across the page), AltaVista was linear and similar to documents in text retrieval. Although this was at first considered a topic for further study because it could have affected the precision evaluation of AltaVista, AltaVista has at present borrowed Google's image retrieval template.

Because image technology research is still in its infancy and divided into two separate factions, (description-based and content-based fields of study), image retrieval systems with their features, functions and applications, are still in a state of flux. Thus they usually provide less than adequate information to domain specific users such as art professionals. Many of these users, disappointed in the past because they were unable to find good or useful images related to their topics of interest, now shy away from image retrieval systems available on the Web. The limitations of this study are obvious. The small sample population was solicited by and acquainted with the researcher on a professional level. Still it is possible that this study could be improved upon and extended to a larger population because the comparative data collected may indicate that domain specificity plays an important role in users' information-seeking behaviors and processes in both image and text.

5b. Proposed Further Research: Phase II

It is anticipated that the data collected and the subsequent findings in Phase II of this project will move toward the resolution of the following research questions:

1. Can particular patterns in the information-seeking behaviors and processes of visual arts humanities scholars be characterized?
2. What domain specific requirements are responsible for the differences in the information-seeking behaviors and processes of fine arts humanities scholars?
3. Can information-seeking behavior and processing models already published in the literature be adapted to the domain specific research needs of fine arts humanities scholars?
4. Is there a new domain specific information-seeking behavior and processing model emerging for fine arts humanities scholars?

A recent article on technologies' impact on the information-seeking behavior of art historians (Rose 2002), as well as Larkin's unpublished study (Larkin 2003), have helped to clarify the techniques that will be used to gather data and to proceed with this examination. Rose recommended that further user studies include human computer interaction tests and techniques to identify how art historians respond to particular interfaces. Despite the limitations and the exploratory nature of Larkin's study, she demonstrated similarities in the information-seeking behaviors and processes of subsets of visual arts humanities scholars utilizing Web-based image retrieval systems, while recording their comments, including their reactions to particular interfaces selected for the study. Rose's recommendation and Larkin's exploratory study sketch out the direction of the future research agenda of this investigation.

While employing information foraging theory (Gattis, 2002), it is projected that the techniques used to gather data for this study will be first, a questionnaire designed to query visual arts humanities scholars from three academic institutions (The City University of New York, Long Island University and Princeton University) on pertinent background information and their research methodologies; in other words, solitary information gathering. Second, utilizing a survey instrument and think-aloud protocol with audio and video recording for data collection, a complex interactive task designed to examine participants' decision making processes and choice behaviors with both a commercial Web-based information provider of image and text, and a family of academic databases that provide information in image and text will be administered. This stage of the process will be facilitated by social interaction with a mediator proficient in information retrieval and familiar with the retrieval tools (to be determined) employed.

The research techniques discussed here are not designed to compare commercial and academic entities in information retrieval. As an alternate approach, the study is designed to uncover similar tendencies in the information-seeking behaviors and processes in image and text retrieval across subsets in the domain. It is projected that data collected in Phase II of this project will continue to conform to the scope of the theoretical framework characterized in Larkin's study, despite the individuality common among persons in a particular lifeworld. It is also probable that this data, using this new unified and ecological approach to understanding the information-seeking behaviors and processes in subsets of visual arts humanities scholars, will facilitate movement toward an information-seeking model in image and text retrieval for the domain. Based on the theory of User Modeling with Personas, user demographics and behavior data obtained from real user observations, can serve as effective tools in defining users' characteristics needs and behaviors (Aquino & Filgueiras 2005).

6. Concluding Remarks

The question at hand is how to achieve a greater understanding of the complex processes involved in the information-seeking behaviors of subsets of visual arts humanities scholars, and to use that understanding to move toward an information-seeking model in image and text retrieval for the domain. Earlier studies, most addressing the needs of art historians, have been overrun by the dynamic changes in our information environment, and now offer unsatisfactory conclusions. As suggested in Larkin's study, and in the existing literature, probing further across subsets within the domain of the visual arts seems to be the logical and timely path to follow.

Notes

¹ This paper represents ongoing research in preparation for my doctoral dissertation, now in progress at the Palmer School of Library and Information Science, Long Island University. The current project still underway, was generated by my earlier study (Larkin, 2003) entitled, *An exploratory study of web-based image retrieval systems with user feedback from subsets of fine arts humanities scholars*, presented at Ithaca College, Ithaca NY, in May 2004 at the conference on Technology in the Humanities. Those findings are reviewed here in section 5a. The methodology for further research, including both image and text retrieval, is proposed in section 5b of this paper.

² For example, as an art historian with a concentration in medieval art, I researched an image in stained glass at the Abbey Church of St. Denis, Paris (book chapter in press). This precipitated a visit to the Abbey, obtaining access to original drawings and text at the Bibliothèque National, as well as an understanding of twelfth-century history and liturgy. Thus, in the visual arts, the tension between original works and reproductions requires constant evaluation of appropriate use during the research process (See also Bakewell 1988, 11).

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