University of Alberta

Is What You See What You Get? Exploring the Role of Virtual Reference Icons on Academic Library Websites.

by

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ABSTRACT

The goal of this study is to better understand academic library design, selection, and use of web icons. An additional goal is discover some of the possible consequences of icon design decisions for student users. This research is meant to help library staff better understand the factors involved in icon design and to assist library staff with icons in the future. Towards this aim, a categorical assessment of thirty academic library icons was conducted. To enable a holistic understanding of the icons, a sub-sample of nine icons was examined in interviews with eight University of Alberta students. Staff involved with the design/selection of icons, at five libraries, were interviewed. Findings indicate that there are some common areas of weakness in the studied academic library icons which negatively affect the user experience. Further, possible explanations for these design flaws are evidenced in the design process conducted at these institutions.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER 1

Research Problem

Introduction

For library users of all kinds, the library website is an important resource. Libraries strive to attract, guide, and engage users via their websites using a variety of web design techniques. Icons are essential tools for achieving these goals and aiding website aaesthetics and navigation (i.e., graphic representations of services, tools, data etc). Icons can be used to draw attention to features and services as well as to make sites more visually interesting and engaging. Icons can also be used to clarify concepts, distinguish services, provide information and communicate across language barriers. Use of icons on the web is prevalent today and continues to evolve. Icons play an important role in web 2.0 design, (Scratchmedia Ltd., 2006) and have been listed among the top 25 emerging design trends for 2009 by Smashing Magazine (Smashing Editorial). People are becoming more sophisticated in their abilities to interact with visual elements online. In order to keep pace with the visual intelligence of today's online users, library web designers are required to be sensitive to visual and symbolic standards and trends online.

Libraries of all types are currently using icons on their websites to represent categories, applications, programs, resources and services. One motivating reason for the use of icons is to assist users of all literacy levels in accessing introductory library resources, programs and services. Some concerns of libraries when considering icons include being culturally neutral and making sure that there is accompanying metadata so that their pages remain readable to those using assistive technology. A continuing challenge for all libraries is to obtain and incorporate well-designed icons into their online environments in order to enhance the visitor's online experience.

Academic libraries in particular are using icons to represent their reference services online. Library reference services consist of reference

transactions, defined by the American Library Association (which accredits Canadian university Library and Information Science Programs) as “information consultations in which library staff recommend, interpret, evaluate, and/or use information resources to help others to meet particular information needs” (2008). In response to the increased accessibility of new communications technologies in the last decade, libraries have provided additional modes of access to their traditional in-person, phone and email reference services (e.g. Instant Messaging (IM)/Chat, text, and video). The addition of these new modes of service delivery makes it necessary for libraries to identify and market these modes, which has led to the use of visual representations to assist users in quickly recognizing and differentiating between the modes of access when viewed online.

Academic libraries have been conscious of the need to market their services on an ongoing basis as they know their user populations cycle through based on their academic schedules. The Library and Information Studies (LIS) literature is rich with literature examining how best to market and evaluate library reference services (e.g., MacDonald et. al, 2008; Naylor et. al, 2008; Taddeo, 2008). However, little research examines in detail all of the requirements for effective icon design and use, including technical, representational, aaesthetic, emotive, and promotional aspects.

Further, there is little research where in-depth assessment and evaluation of library icons has been conducted within the LIS literature (MacDonald et al., 2008. p. 376). This may be because designing icons for the web has traditionally been the domain of professional graphic designers. However, the increased availability of free graphics and the accessibility of design software, combined with library access to graphic design expertise (e.g., consultations with design students), has increased the likelihood that libraries may make use of in-house resources in their quest for icons rather than outsourcing to designers (Taddeo, 2008, p. 232). In either case, it is essential for library staff to know what they require of their icons, and to be able to determine if proposed icons meet these requirements. The graphic design literature does discuss icon standards and assessment and in-depth research regarding evaluation of icons has been conducted (e.g., Huang et al., 2002; Liang, 2007). However, the standards

regarding design of web icons are not intended for use by non-professional designers. This project examines these standards in their application to reference icons and adapts and applies these graphic design principles to library icons.

The goals of this study are threefold:

- To understand how academic research libraries are currently using icons to represent their reference services (in general) and their IM/Chat services (in particular).
- To provide libraries with a set of assessment criteria to use in evaluating icons for their websites.
- To examine areas of convergence and divergence between library staff and users' perceptions and understandings of library icons.

This research contributes to future design of icons for library websites by helping librarians to understand some of the issues involved with visual representation, good design of icons, and possible user needs in this area.

Research Statement and Objectives

This study is an example of applied social research, which is defined by Bickman and Rog (1998) as "[research that] strives to improve our understanding of a 'problem,' with the intent of contributing to the solution of that problem" (p. x).

The overarching research questions of this study are as follows:

- How effectively do academic library IM/Chat icons convey their intended messages?
- What is the best way to test the effectiveness of library icons?
- What are the advantages and disadvantages of a standard set of symbols for library reference?

This project was designed to provide insight into these questions.

This study has two phases. The first was designed to apply the standards and guidelines used in graphic design to library icons in order to discover whether library icons conform to these standards and best practices. A specific set of evaluation criteria was created using International Standardization Organization (ISO) standards for web icons combined with design and library marketing guidelines and best practices. The goals of the icon assessment and evaluation (Phase 1) were to discover:

1. How, and to what extent, does the sample of library icons conform to standards, guidelines and best practices for icon design?
2. What are some of the common and unique features of current library icons?

The second phase of the study examined library staff and students' perceptions of a sample of library icons. Interview data from library staff and students were compared and contrasted to discover areas of convergence and divergence. The goals of Phase 2 of the project were to discover:

3. The similarities and differences between the perceptions and understanding of library icons by library staff and potential library users.
4. Which representative symbols and design techniques are most appealing to students?
5. What processes are library staff engaging in to obtain their icons?
6. Are design standards considered by library staff in the icon selection/creation and evaluation processes?
7. What is the level of design and/or marketing training of library staff involved in the selection/creation of icons? How is this expertise being used?

In the analysis stage, student perceptions of the icons were compared to potential areas of confusion identified in the icon assessment (Phase 1). This analysis addressed the question:

8. How well do the icon evaluation criteria identify potential difficulties or causes of confusion for users viewing these icons?

Background and Justification

This project builds on the LIS literature evaluating library marketing campaigns and promotion of IM/chat reference services (e.g., Dennison et al., 2003; Vilelle, 2005; MacDonald et al., 2008). In addition, it builds on design research into the design and assessment of computer graphics (e.g., Huang et al., 2002; Liang, 2007). This project draws on the literature of graphic design, visual communication, semiotics and library and information studies. It is an interdisciplinary look at a specific type of visual communication (e.g., web icons), representing a specific library service (e.g., IM/chat reference), in a particular setting (e.g., academic library websites).

Library Context

Preliminary observations of some large urban library websites conducted in anticipation of this research showed that public libraries were more likely to use visual communication and icons throughout their websites than academic libraries, with one exception: i.e., academic libraries were just as likely as public libraries to use icons to represent their reference services. Among academic libraries there are some common symbols in use for phone and email reference services; but, there is a wider variation of symbols representing IM/chat reference services. This observation provided the early motivation to further investigate IM/chat reference icons on academic library websites. The scope of the study was limited to academic libraries that are members of the Association of Research Libraries (ARL) in Canada and the U.S. This had the advantage of providing a group of peer libraries with American Library Association (ALA)-accredited staff to compare, as well as ensuring that any students interviewed would be students of an ARL institution (i.e., University of Alberta Libraries) and therefore part of the potential user group for all ARL institutions.

The ALA states in their “Guidelines for Implementing and Maintaining Virtual Reference Services” that “Internal and external links to the virtual reference service should be designed to catch the attention of potential patrons and to clearly communicate the nature of the service” (ALA, 2004, sec 3.2.5). In

order for libraries to follow these guidelines they must be able to determine if their icons are meeting those criteria. Assessment and evaluation tools are essential for the continued evolution and improvement of library icons. This assessment and evaluation requires investigation of marketing, graphic design and icon standards literature. Applying these standards and criteria to a sample of library icons and testing these icons with potential patrons is a natural next step.

Each academic library institution defines the specific level of their IM/chat reference service (including types of questions the service will answer, as well as patron population the service will serve). In order to analyze potential patron feedback regarding IM/chat reference icons effectively, the parameters of the service, as well as institutional definitions of the service, must be known to understand the nature of the service that the icons are intended to communicate. Interviewing library staff is an appropriate method for gaining insight into these issues.

The University of Alberta Libraries

The topic of this project was selected in the winter of 2008; the following fall, the University of Alberta Libraries (UAL) began the process of obtaining new reference icons. This provided an opportunity to include the UAL's new icons in the sample, and provide feedback to the UAL regarding these icons. It also provided an opportunity for collaboration with the librarians, and for the researcher to receive feedback from the UAL staff regarding the usefulness of the assessment tool created for this thesis.

Contributions

This study builds upon knowledge from a range of disciplines and professions and also uses a combination of methods (see Chapter 3 for details), to achieve a multi-faceted picture of icon use on library websites. The combination of categorical and contextual analysis of data will provide a more complete and complex understanding of the academic library icon phenomenon.

Application of marketing research and knowledge to LIS problems is common (e.g., Taddeo, 2008), as is application of some general graphic design principles (e.g., King County Library System & University of Washington, 2002). However, it is uncommon to apply graphic design standards to graphics on library websites.

Use of unstructured interviews with potential library patrons regarding reference services is common in the LIS literature. However, it is uncommon for this approach to be applied to a single element of a webpage. This project gathers categorical and qualitative information on a subject (i.e., icons) which has not been explored in depth in the LIS literature. It also crosses over into the discipline of Humanities Computing; this is an area where traditional humanities and social sciences techniques for analysis are applied to technological topics, such as online communication of technological concepts.

The academic library community and scholars in Library and Information Studies will find the results of this project useful on a number of levels. It provides a window into the framing of IM/chat reference services at Association of Research Libraries institutions, as well as their icon selection and creation processes. This project situates library design and use of reference icons within the greater visual communication and icon design context and outlines recommendations for the design of reference icons, and other library logos and icons for online use. The results of this project have implications for the ways that users access reference services. Visual Communication and Humanities Computing scholars, as well as graphic designers, will benefit from this project because it demonstrates an extension of current international symbol standards to a new area and to a type of public information symbol that is not covered explicitly in existing standards.

This project, by analyzing reference icons using international icon design standards and visual communications knowledge, provides insight into the ways that academic research libraries portray their reference services to their users via the icons they choose to represent those services. It also explores some of the possible consequences of those icon choices. If libraries consider icon and symbol design standards and use the modified criteria produced by this project to

aid in the production and/or selection of icons this could improve the accuracy with which libraries represent their services via icons in the future.

CHAPTER 2

Literature Review

Introduction

Computer icons, as they are often called (Huang et. al., 2002), are defined with varying degrees of specificity. Horton (1994) defines icons as “small pictorial symbols used on computer menus, windows, and screens…” (p. 2). The International Standardization Organization (ISO) has a similar definition of icon as a “graphic displayed on the screen of a visual display that represents a function of the computer system” (International Standardization Organization, 2000, sec. 4.7). The ISO states that the scope of their icon standards is limited to “software products providing office applications such as document production, desktop publishing, finance, and planning that present their functions via a graphical user interface” (International Standardization Organization, 2000, sec. 1). The ISO general standards document categorizes icons within the described software environment as:

- Object icons: representing objects, such as documents and printers
- Pointer icons: representing selection mechanisms (e.g., mouse arrow)
- Control icons: e.g., scroll bar or radio buttons
- Tool icons: e.g., crop or erase
- Action icons: e.g., save or search

These icons are defined by specific characteristics relating to what they represent. This ISO standard document (International Standardization Organization, 2000) lists a third kind of icon, under “other graphical symbols,” which does not fall within the scope of these icon standards, or any other ISO standards. It is in this category of “other graphical symbols” or “logos” that the virtual reference (VR) icons that are the subject of this study fall. A “logo” is defined by Adams and Morioka (2004) as “a distinctive symbol of a company, object, publication, person, service, or idea” (p. 16). A symbol, at its most basic, is something that stands for something else. In this study a symbol was

considered to be the primary element of an icon which stands for a service. The icons which are the focus of this study represent modes of accessing instant messaging software through which users can get assistance from library staff. They are program icons, which represent software *and* service. Icons that represent services are often called logos. The terms icon and logo are often used interchangeably in graphic design literature (see, for example, Adams & Morioka, 2004; Capsule, 2007). When logos are used on websites to stand for and give access to services (as they are on the library websites examined in this study), then they are considered icons.

Defining Reference Services

The library services that the icons represent are referred to as reference services in the Library and Information Studies (LIS) literature. The way library professionals have defined reference services has evolved. In January of 2002 the ERUS (Evaluation of Reference and User Services) committee of RUSA (Reference and User Services Association), an association of the American Library Association, began reviewing definitions of reference used by libraries in order to develop new guidelines for the collection of reference statistics. The committee found that "the library profession has grappled with both constructing a definition of reference and creating tools to measure and evaluate reference services for the past 75 years" (Rabner & Lorimer, 2002 p. 1-2). They note that as reference practice has expanded along with technology-based innovation, the necessary expansion of traditional definitions has been a struggle.

ERUS submitted the results of their review to NISO (the National Information Standards Organization) and, in 2008, a new NISO definition of reference was made available and adopted by the ALA. Unlike the previous definitions, the new definition does not mention technology, which may be because a new category of reference has been labeled "virtual reference." Understanding the ways the libraries and library staff view their reference services is vital to understanding the ways that they construct visual representations of these services.

The American Library Association defines the act of providing reference service (or a reference transaction) as follows:

> "Reference Transactions are information consultations in which library staff recommend, interpret, evaluate, and/or use information resources to help others to meet particular information needs. Reference transactions do not include formal instruction or exchanges that provide assistance with locations, schedules, equipment, supplies, or policy statements" (ALA, 2008).

The Association of Research Libraries defines a reference transaction, similarly:

> "A reference transaction is an information contact that involves the knowledge, use, recommendations, interpretation, or instruction in the use of one or more information sources by a member of the library staff. The term includes information and referral service. When a staff member uses information gained from previous use of information sources to answer a question, the transaction is reported as a reference transaction even if the source is not consulted again. If a contact includes both reference and directional services, it should be reported as one reference transaction. Duration should not be an element in determining whether a transaction is a reference transaction" (ALA, 2008).

Both the ALA and the ARL definitions of a reference transaction make a distinction between what is considered a "reference transaction" and what is considered a "directional transaction." The ALA further defines a directional transaction as:

> "an information contact that facilitates the logistical use of the library and that does not involve the knowledge, use, recommendations, interpretation, or instruction in the use of any information sources other than those that describe the library, such as schedules, floor plans, and handbooks. " (ALA, 2008)

These definitions are created and used in the context of collecting reference statistics, which is the reason for the distinction between directional and reference assistance; however, having a definition of reference which distinguishes between these kinds of questions and services as used by libraries (when no such distinction may be made by the user) does not aid libraries in promoting their services. For example, many library websites present their reference services along with their circulation or directional services in one

package under a banner such as “Reference Services,” “Help,” “Ask a Librarian,” or “Ask a Question.” There may be further instructions describing what kinds of questions are expected or best suited to a particular kind of technological mode of access, but this information is often less prominent or even linked to another page apart from where users would directly access services (e.g., see the “about Askon” link http://www.lib.uoguelph.ca/assistance/ask_us/).

It should be noted that some libraries have started calling what was traditionally referred to as reference services, simply “Public Services” or “Customer Services” or “Information Services.” Changing the terminology from something that was recognizable only to library insiders (e.g., “Reference desk”) to something more broadly recognizable outside of library contexts (e.g., “Information Desk”) is welcome. However, for the purposes of this study, which is directed at the library community, the term reference service (RS) is used to refer to the combination of reference and directional services.

Defining Virtual Reference Services

The Reference and User Services Association (RUSA) of the ALA defines virtual reference as follows:

> “1.1 Virtual reference is reference service initiated electronically, often in real-time, where patrons employ computers or other Internet technology to communicate with reference staff, without being physically present. Communication channels used frequently in virtual reference include chat, videoconferencing, Voice over IP, co-browsing, e-mail, and instant messaging.
>
> 1.2 While online sources are often utilized in provision of virtual reference, use of electronic sources in seeking answers is not of itself virtual reference.
>
> 1.3 Virtual reference queries are sometimes followed-up with telephone, fax, in-person and regular mail interactions, even though these modes of communication are not considered virtual” (ALA, 2004).

This broad definition of virtual reference services includes any transaction where an internet technology is used to communicate with reference staff. This

definition includes voice over IP and video conferencing/calling which would include services offered over Skype, while excluding the use of phone lines and satellite channels of communication. Some libraries are offering reference services which can be accessed via text messaging, using cell-phone technology that does not use the internet. Under the current definition this mode of access would not be included in the definition of virtual reference although it could be argued that it should be. The NISO (National Information Standards Organization) definition of Virtual Reference Transaction is somewhat more compact and inclusive than the RUSA version: "Virtual reference transactions conducted via e-mail, website, or other network-based medium designed to support virtual reference" (National Information Standards Organization, 2004, sec 7.3.1). In light of these broad definitions of virtual reference (including email and phone access), the term IM/chat reference is used in this study to refer only to real-time reference services accessed using instant messaging and/or chat software. This does not exclude the possibility that a user may be using a portable device such as a Blackberry or IPhone that connects to the internet to access the IM or chat software.

What Do Icons Do?

Horton (1994) answers the question, "why use icons?" by saying, "To help users work smarter" (p.3). He explains that "well-formatted graphical displays improve the productivity and reliability of work, especially for impatient or harried users" (ibid.). Some of the specific ways that icons can help users is by speeding visual searching, as icons stand out amongst text on a webpage; as Horton notes "a well designed icon says much in a few pixels" (p.4). Icons are used by web designers to save space, which in turn allows an interface to look and feel more spacious. An example of an icon that takes up less space than its text equivalent is the battery indicator on a laptop computer (see Figure 1). The battery icon is still recognizable at any size where as "Low Battery" or "Battery: 80% charged" takes up more horizontal space and is not readable past a certain font size. Horton notes, "icons are more visually distinct from one another than words are" (p. 5), which makes them easier to remember, recognize and recall. Another

advantage is that icons have the ability, if properly designed, to communicate across cultural and linguistic boundaries. Icons can be used as signposts, helping users navigate and locate information online. Icons can identify services and reflect overall organizational attitudes and values. The best icons combine clear, effective communication and functional aspects with appealing promotional aspects.

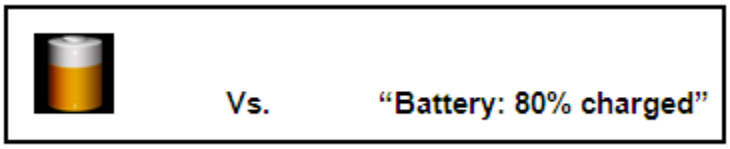


Figure 1. The battery icon can communicate the same information in less space and without the limitations of a specific language.

Why study icons?

It is well known that icons have distinct advantages (see Lodding, 1983;Pavivo, 1971; Rogers, 1989). Many principles, criteria, and guidelines have been developed to guide the design of icons (e.g., Gittens 1986; Waterworth et. al, 1993; Zammit, 2000).The science and art of icon creation and those characteristics that make them effective and appropriate for different contexts is still being explored (e.g., McDougall & Isherwood, 2009; Cheng & Patterson, 2007). The literature shows a wide range of icon design guidelines and recommendations, which speaks to the importance of icons as interface components.

The benefits of icons can only be achieved if they are designed and used properly in their web contexts. Cheng and Patterson (2007) conducted a study with thirty-eight Iowa State University Students regarding twenty-five icons from e-commerce sites and found that "…not all icons reduce complexity and mental load" (p. 68). They explain that only easily identifiable icons produced the positive results of decreased complexity and increased system usability as seen in previous studies. If icons were not readily identifiable they increased ambiguity for the user (ibid.). These results support previous findings regarding ambiguity

and the icon-referent relationship (e.g., Lin, 1994; Goonetilleke et. al, 2001; Huang et.al, 2002).These results warn that using poorly designed icons carries great risks that threaten users' positive experience of a web environment.

One of the reasons that the topic of web icons was chosen for this study was because of the high stakes involved with using icons. Another was because of the wide range of icon design guidance offered in the literature. Naturally, it would be hard for anyone who does not have a design background to investigate, interpret, and select any of these criteria for application in their own setting. This literature was reviewed and used to create a set of criteria that could be applied by an information and technology professional in an academic library setting; however, these findings may also apply to other individuals working in related contexts.

Design

Richard Buchanan discusses the complexity and "diversity of ideas and methods gathered together under the label [design]" (p. 3) in his essay entitled, "Wicked Problems in Design Thinking" (Buchanan, 1998). Indeed, "design" and all its theories and practices are admittedly too vast to be addressed in this literature review. There are some histories of design focusing on influential designers and their school of thought or practice (Eskilson, 2007; Margolin, 1989). While these are informative and contribute to the identity of design as a discipline, they will not be covered in depth here because the purpose of this review is not to define design as a discipline or to chronicle its history, but to examine design literature relevant to this study, primarily graphic design, and to situate this study within the larger design context. This review provides a background for understanding some of the thinking behind certain graphic design practices, which informed the analysis of the virtual reference icons in this thesis project. This literature review also provided a base of design knowledge which informed the analysis of interviewee responses to design techniques used in virtual reference icons.

The Expanding Field of Design

Buchanan (1998) writes about the growth and evolution of design in the twentieth century from a specific "trade activity" to a more pervasive way of thinking that invades every aspect of everyday life (p.3). There is support in the literature for expanding the purpose of graphic design beyond the creation of a product to the process of solution finding, which may end in product creation, but will not start there (Frascara 2004; Rosted et. al. 2007). In *Concept Design* (2007), Rosted et. al describe a shift in the kinds of questions that designers ask themselves. That shift is from designers asking themselves *how* products should be designed, produced, and marketed, "to asking more fundamental questions such as *what* should be focused on or what problems should the company's innovations solve" (Schindlholzer, 2007). The term concept design is defined as "the discipline of creating concepts that provide answers to these questions and solutions for the identified problems" (Schindlholzer, 2007). Concept design, and the portrayal of designers as problem solvers (Meggs, 1992), characterizes the expanded purpose of graphic design that has emerged and is developing in the twenty-first century. Buchanan (1998) argues that those who are drawn to design from many different disciplines may not share a methodology, or a definition of design, but they do share an interest in a common theme: "the conception and planning of the artificial" (p. 12). This describes design at its most basic and most complex.

This study attempts to view designers as problem solvers whose solutions sometimes require them go beyond questions of *how* to questions of *what*. In this case, the root problem is, "how to best represent IM/chat library services?" Within this problem are sub-queries related to promotion and ease of access. However, the larger implied question is "Why are students not making as much use of IM/chat reference services as they could be?" This study attempts to view the library staff designers in the context of this larger question and so examines icon design as part of larger processes of promoting the services.

Tableic Design

Graphic design is characterized in the literature as a specialized area of design as well as a professional practice (Buchanan, 1998). Regina Wang and Chun Cheng Hsu (2007) define the function and goal of graphics respectively as "to communicate efficiently and accurately in human life" (p. 267), and "to reach mutual understanding" (p. 266). This is a practical approach to graphic design that suits the context of sign, logo and icon design particularly well. The creator of Isotype, Otto Neurath, also understood the purpose of graphic design to be efficient and accurate communication (Lee, 2008, p.159). There are authors who feel that graphic design can be used for more complex communication, however, the goal is still to communicate a mutually agreed upon meaning with clarity (Zender, 2006).

Isotype, which stands for International System of Typographic Picture Education (Lee, 2008, p. 159), is a set of simplified pictorial representations meant to have a one-to-one relationship with their signified. They were used to display economic and social statistics for the public by relating the quantity of Isotypes to statistical quantities. Isotype were early predecessors of icons, and pictograms (Lupton, 1989 p. 145). Isotypes were also precursors to the present sophisticated methods of data visualization.

Jae Young Lee in his article "Otto Neurath's Isotype and the Rhetoric of Neutrality" (2008), analyses Isotype using Robin Kinross's concept of the "rhetoric of neutrality." Lee discusses the important concepts of neutrality and universality which continue to be central to the concept of a universal system of symbols or a visual language today. The concept of neutrality as it is applied in the literature to icons refers to the designer's goal to communicate without bias, be it political, gender or class based. The goal of universality is to make an icon recognizable and understandable consistently across culture and class, regardless of audience. Lee concludes that Neurath's Isotype were neither universal (they were culturally dependant), nor neutral (contained cultural, social, and political assumptions). Further, Lee concludes that Neurath used the rhetoric of neutrality to make them appear neutral, even though they were not, using

simplified and generic forms (p. 161). Neutrality is still an issue in developing sign systems for use by the general public, as is evidenced by a 2005 study of 49 signage systems at the University of Aveiro, which "concluded that the female gender was under represented, and heavily stereotyped" (Bessa, 2008, abstract). Bessa examines the results of a decision by a small town on the outskirts of Madrid named Fuenlabrada, to change all of their traffic signs to reflect the female gender. Bessa found that the situation in Fuenlabrada illustrated the difficult societal issues that also underpinned his 2005 study findings.

Abstraction and simplification are design techniques that remain at the core of sign and icon design for public information. Abstraction is achieved through simplification, which is the process of removing and reducing all but the most essential clues to the sign's referent. The goals of abstraction and simplification in graphic design are to make design items easier to understand (Wang and Hsu, 2007, p. 269). Some authors question the role of abstraction in icon design. Zender (2006) questions whether abstraction is an essential icon design technique for clear communication, or if it is simply a tradition born out of the limited contexts for which icon and sign systems have been developed. Traditionally, sign systems have been developed for safety, transportation, and public facilities. These contexts all have limitations as far as the kinds of messages they are attempt to convey. Lupton (1989) refers to the simplification used by Neurath as reduction and says that this technique does not necessarily strengthen the relationship between a picture and its represented object (p. 152). Lupton, much like Lee feels, "the implicit, rhetorical function of reduction is to suggest that the image has a natural, scientific relationship to its object, as if it were a natural, necessary essence rather than a culturally learned sign" (ibid).

The New Tableic Design

Regarding graphic design and visual communication, Buchanan (1998) advocates a repositioning of graphic designers "as communicators who seek to discover convincing arguments by means of a new synthesis of images and words" (p. 10). The view that visual communication is argumentative grows out of visual communication literature that questions the essentially linguistic nature of

visual communication (Mitchell, 1994; Kress & Van Leeuwen, 2006). The argumentative characterization is also fed by the view of communication as mutually created and interactive. This interactive view of visual communication paints the viewing audience as active; in the past, visual communication theory considered spectatorship a passive activity (Arnheim, 1972). Including the viewer in the process of meaning making has led to the parallel inclusion of perception as a focus of graphic design study along with representation, which has been a traditional concern for visual communication.

Some writers in visual marketing (e.g.Janiszewski, 2007), have turned to information processing theory, which focuses on attention, perception, and comprehension to examine the viewer's perspective and explain visual behaviour. This thesis project applies knowledge of attention, perception and comprehension along with their impact on viewer selection or preference to enhance analysis of viewer interaction with the virtual reference icons. This study focuses on comprehension of visual icons. Support for this project's focus on the investigation of viewer comprehension of icons can be found in Janiszewski's summary chapter in *Visual Marketing* (2007) when he suggests research questions for future visual communication research. He writes: "Traditional measures of advertising effectiveness have been recall and recognition. A more relevant measure may be the experienced meaning suggested by the [visual object] or brand" (Janiszewski, 2007, p. 290).

The characterization of the audience as actively participating in the creation of meaning is part of what W. J Mitchell (1994) called "the pictorial turn," which he defined as "a post linguistic, post semiotic, rediscovery of the picture as a complex interplay between visuality, apparatus, institutions, discourse, bodies and figurality" (p. 16). Mitchell goes on to note that the scholarly community recognizes the complex and interactive nature of the act of viewing, and attributes this recognition in part to the "pictorial turn" (ibid.). The pictorial turn is also mentioned by Malcom Barnard (2005) as beginning in the 1990s (p. 4). He believes it is responsible for the growing demand for "critical texts which analyze and explain the workings of what is called graphic design" (ibid.). By saying this Barnard is stating the case for his book, *Graphic Design as Communication*

(2005); however, his statement also provides some justification for this thesis project. As in Barnard's book, this thesis project examines the relationship of graphic design techniques to the construction and understanding of meaning, albeit in a more specific, and as of yet unexplored, context.

Buchanan (1998) points to the integrated complexity of the visual design process and its products as one reason that analytic approaches to design analysis other than deconstruction are necessary. In addition to deconstructing and analyzing the virtual reference icons by category, this project explores the complexities of viewership and interactive meaning via interviews. The argument or message presented by an icon must be seen as more than the sum of its parts (see Sudick, 2006, p.186), however, by examining the icon's elements we can gain greater understanding of how each part contributes to the overall meaning.

The deconstructionist approach is still used in icon analysis research. For example, in his article, "Advancing Icon Design for Global Non Verbal Communication" (2006) Mike Zender identifies principles "designed to expand icon based communication so that [the icon] can communicate more complex messages and more abstract concepts with greater specificity than previously" (p. 178). The principles Zender identifies, context and abstraction, are applied to assessing the virtual reference icons for this project. Zender concludes that abstraction in systems such as the U.S. Department of Transport (DOT) symbol sign system may be more a result of limitations of context and function than an essential element of icons. He suggests expanded context and varying levels of abstraction and complexity of the image may allow more complicated meanings to be conveyed (p. 194).

Wang and Hsu (2007) also take a deconstructionist approach in their study of abstraction and simplification by designers using popular graphic design software. They state, as does Zender, that abstraction does not always result in clearer communication, nor does simplification (p. 277). However, simplification does aid in recognition, which has traditionally been a major consideration when designing icons such as virtual reference icons which are both informational and promotional. According to Janiszewski, (2007) it may be time to consider

perception and comprehension of the viewer as much as recall and recognition. This thesis project aims to consider both. What we know about design approaches that contribute to recall and recognition will be considered alongside anecdotal information about viewer perception and comprehension.

Visual Metaphor

The graphic design literature discusses metaphor as continuum from the concrete to the abstract. In its more concrete sense, Westendorp and van der Waarde (2007) define metaphor as describing one thing in terms of another (p. 197). They contrast this definition with Lakoff and Johnson's (1980) broader understanding of metaphor as being utilized in all abstract thinking, because abstract thought is only understood in terms of more concrete representations (p. 199). Lakoff and Johnson feel that metaphor need not be necessarily related to language, verbal or visual. This thesis project makes use of both definitions, in different situations. When speaking of visual metaphor as related to elements of virtual reference icons, the more restrained definition is employed. When considering abstract ideas being communicated by a site as a whole, the broader definition better serves the purpose of analysis. Bessa (2007) explains that, in his view, metaphor only applies to ideograms and not to pictograms (p. 122). Ideograms are signs whose intended meaning is a connoted meaning rather than a denoted one. In other words ideograms do not physically resemble their referent. For example a picture of a coat hanger is meant to mean coat room, not coat hanger and is therefore an ideogram (ibid.). Lakoff and Johnson's end of the metaphorical spectrum allows for both ideograms and more representative icons (e.g. desktop trash can) to be characterized as metaphorical because of the general metaphorical (e.g. "office") online environment in which they operate. Library icons can be both ideograms and pictograms and in both cases use metaphor.

"Visual metaphors are widely considered to be central to the design of software user interfaces" (Blackwell, 2001, p. 225) and according to Blackwell the use of icons to represent software abstractions was pioneered over thirty years ago. Visual metaphor is a concept that is closely tied with electronic

environments, because computer icons already operate in a represented environment. Often the online environment is characterized by an allusion to the "real" world. For example, Facebook = year book, Microsoft Office Operating Software = your office complete with a desk top and file cabinet. The office metaphor is a visual metaphor used by computer operating system designers and is based on the premise that people will find it easier to learn to use a computer interface if it is based on a concrete, real-world model that they understand and with which they can associate aspects of the interface. "Very few will debate the value of a good metaphor for increasing the initial familiarity between user and computer application" (Dix & Finlay, 1997, p. 149).

Visual metaphors are equivalent to language techniques used to express what cannot be said, or pictured, literally (Horton, 1994, p. 42). Barnard (2005) describes metaphor, metonymy, and synecdoche as different ways in which something can stand for something else (p. 50), which is similar to Westendorp and van der Waarde's definition (2007). Metonymy and synecdoche are specific kinds of metaphor. In *The Icon Book* (1994), William Horton describes metonym as when "a characteristic stands for an object" (p. 62). He cites the example the shape of the building housing U.S. military headquarters, referred to as "The Pentagon" (ibid.). This example illustrates metonymy, because a single characteristic, the shape of the building, stands for the whole organization. Metonymy can be performed using colour, shape, or any other characteristic. Horton (1994) describes synecdoche as using "a single, familiar part to stand for the whole object" (p. 42). An example is the use of a gas pump to signify a service station (ibid.). The distinctions between types of metaphor are very fine; however, they are useful to analyzing the icon choices made by library institutions. For example, some libraries have used a computer mouse to stand for their virtual reference service. This may indicate that they are using a familiar part of a computer to stand for the whole computer using synecdoche. It also indicates that what they are communicating with their icon is "computer," not "customer service," or "research help." However, these other messages may be communicated in other ways on the webpage that contains the icon using "enablers." Enablers are defined by Horton (1994) as those elements of a page

which help users to interpret the icon (p. 30). Examples of enablers are titles, columns, grids, labels, or background colours.

Examining metaphor allows for insight into how graphic designers perform semiotic operations; a graphic designer performs a metaphorical operation when he/she takes something from one context and puts it in another (e.g. by representing something real with a drawing of it). Visual metaphor of a different kind is very common in advertising (e.g. using a picture of a happy child to stand for a children's sunscreen). This is the kind of metaphor that is employed by libraries when they use a computer mouse to represent an online reference service, except that a mouse may not have the same kind of emotive qualities that a happy child does.

The affective nature of certain design elements is addressed by Stephen Boyd Davis (2007) in his "Schema for Depiction," which essentially describes the icon design process. Davis includes the concepts of informational and affective elements in his schema, which is a useful distinction. Not all elements of an image, even one that is meant to educate and inform, are necessarily included for the purpose of informing. Some elements are meant to appeal to people's aesthetic and emotional senses. For example, people prefer perspectives where they can look down on an object because it makes them feel in control of a system (Carroll & Thomas, 1982, p. 112).

Theoretical Framework

Semiotic Theory

Icons, as discussed here, have evolved from the semiotic concept of "a sign" described by Charles Sanders Peirce (1955) as "something that stands to somebody for something in some respect or capacity" (p. 99). Peirce was describing the part of the semiotic process where a person associates a sign with a referent; hence, it stands for something to that person. Ashwin (1989) notes that Ferdinand de Saussure and Peirce were the formative theorists of semiotics, which began as a study of signs in society (p. 200). Sless (1986), defines the

subject of semiology as the study of "…our ways of making meaning" (preface). No matter how it is defined, the scope of the discipline is so enormous that it would be an understatement to call it "multi-disciplinary." The study of how we know what we know encompasses all of human knowledge and, as such, it encompasses disciplines such as anthropology, communications and linguistics rather than just spanning them. However, semiotics is so closely associated with the study of communication, that some refer to semiotics as a branch of Communications (Sebeok, 2001). One reason they are so closely associated is that the processes that are the central concern of semiologists include communicative processes.

The central object of study in semiology is the process of semiosis, which is defined by David Sless as "the process by which communication and understanding occur" (1986, p. 4). The process of semiosis revolves around the relationship of the sign and the referent, where the sign stands for the referent. In addition to the sign and referent, there is a third party in the triangular process of semiosis, the user. The user is the party or person who is engaging in the interactive process of understanding the sign to stand for the referent. The sign, the referent and the user form a relational triangle, of which no single part can be studied in isolation (see Figure 2) (Sless, 1996). For example, the peace symbol (Figure 3) is the sign and the concept of peace is the referent. There are many users of the peace symbol in different contexts. Each specific use of the peace symbol has its own purpose as defined by the user and its own specific connotations of peace to which it refers. All of this takes place within the process of semiosis, which can also be called the process of making meaning.

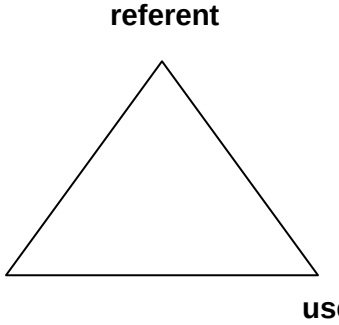


Figure 2– Semiotic Triangle

Figure 3– Peace Symbol

In his textbook, *Introduction to Two Dimensional Design*, John Bowers (2008) notes that “semiotic theory has become a useful tool in applied design when creating and evaluating massages seen by diverse audiences” (p. 36). In this study, semiotic theory was used to evaluate the icons studied and to understand the interactive relationship between the icon, its referent and the user. Much like the triangular model of the semiotic process, there are three main branches of semiotic theory used to evaluate icons: syntactic, semantic, and, pragmatic. Syntactic semiotic theory refers to the relationship among elements in a form. For example, if an icon contained an outline of a person and an outline of a dog the syntactic line of investigation would focus on how these two symbols were visually related to each other. Semantic theory “refers to the relationship between a form and its meaning” (Bowers, 2008, p.37). This study makes use of semantic theory to investigate the aspect of comprehensibility (message clarity) by asking, “how well does the icon represent its referent?” and, “how easily is the meaning of the icon understood?” The third aspect of semiotic theory, pragmatics, refers to the relationship between an icon and its user in an applied situation. This aspect is examined via the portion of the student interviews that examines the icons in context and asks how the context affects the meaning of the icon.

Horton’s Model of the Pragmatic Relationship Between User and Icon

Horton (1994) has conceptualized the viewer’s encounter with an icon using four tasks that viewers must be able to complete for an icon to be effective:

- Decoding: a process of deconstructing the icon into more simple parts, puzzling out the meaning of these parts and combining them to arrive at the meaning for the whole icon (p. 18);
- Recognizing: the second time a viewer sees an icon its meaning is recalled (p. 19);
- Searching: an icon must be easily draw the eye and be immediately identifiable on the page (p. 20);
- Activating: a viewer must be able to easily activate an icon (p. 20).

These tasks correspond with many of the criteria found in icon design standards and guidelines. For example the concept of visibility, represented in ISO standards by reference to contrast, and in the WCAG (Web Content Accessibility Guidelines) by reference to perceivability, aids the first three tasks above, but especially the task of searching. The concepts of comprehensibility (ISO) and understandability (WCAG) inform the decoding and recognizing process. The requirements of activation feedback (ISO) and operability (WCAG) allow activation. Although Horton's tasks do not include explicit demands for aaesthetic appeal, they do not discount the advantages of these for both the client (libraries) and the user. Examples of how visually enticing aspects contribute to the pragmatic aspect of icons are illustrated throughout his book. Colour, for example is described by Horton (1994) as not only having the potential to "make the message clear or hopelessly opaque" but also to "delight and entertain" (p. 163).

Uncertainty Reduction Theory (URT) is a communication theory that is well used in the fields of information design and information seeking, the premise of which is that people are uncomfortable with feelings of uncertainty (Visocky O'Grady and Visocky O'Grady, 2008). Horton's decoding phase can be further illuminated by using URT to understand what may motivate a user to complete this task (decoding) and what kind of emotional or behavioral responses they might have to an ambiguous icon. Although Charles Berger and Richard Calabrese, who first presented URT in 1975, intended it to apply to interpersonal communication, as Visocky O'Grady and Visocky O'Grady (2008) note, "Some of the axioms it presents apply equally to visual communication" (p. 88). They have paraphrased those axioms as:

- "When we are uncertain, we actively seek information."
- "Certainty is enhanced by similarities and minimized by differences."
- "That of which we are uncertain becomes less favorable."

(Visocky O'Grady and Visocky O'Grady, 2008, p.88)

These tenants of Uncertainty Reduction Theory were useful as framework for understanding student interactions with and reactions to icons in this study.

User-Centered Design & Usability Engineering

Donald A. Norman (2002), a notable author in the field of design, defines user-centered design as "a philosophy based on the needs and interests of the users with an emphasis on making products usable and understandable" (p.188). He summarizes the main principles of this design philosophy as making sure that "(1) the user can figure out what to do, and (2) the user can tell what is going on" (ibid.). Achieving these goals involves making things visible, including setting clear paths for action and feedback regarding actions. Norman believes that there should be a minimum amount of system learning required of the user, or that the system should inherently make sense to the user. This is the ultimate goal of user-centered design, that something designed from the users' point of view will seamlessly fill his/her needs without the experience of difficulty or uncertainty.

User-centered design philosophy informs the practice of usability engineering. The international standard ISO 9241-11:2003 defines usability as follows:

"Usability: the extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context."

In their textbook on usability engineering, Levanthal & Barnes (2008) discuss three major models of usability, those proposed by Shackel, Nielsen and Eason, and integrate elements of those models into their own model of usability. Three of these four models, Leventhal & Barnes', Shackel's and Neilson's, include a variable addressing user satisfaction. Shackel calls this variable "*attitude"* and Neilson calls it *"subjectively pleasing"* while Levanthal & Barnes call it *"satisfaction"* (Leventhal & Barnes, 2007, p. 29). In all cases, this variable is defined as something that both contributes to and is the result of interfaces that are easy to use and learn. As part of measuring ease of use, Leventhal & Barns suggest that users' "subjective responses to an interface as a whole or to specific interface features" (e.g., icons) could be gathered via interviews, discussions,

surveys and questionnaires (2007, p. 218). An example of a survey question provided is as follows:

> "Rate your overall satisfaction with this product (circle your response). 1 = not at all satisfied, 2 = not satisfied, 3 = no opinion, 4 = somewhat satisfied, 5= very satisfied" (Levanthal & Barnes, 2007, p. 218).

In the context of usability testing, which measures usability based on data generated from the completion of certain "tasks," the above question, whether asked in a survey, questionnaire, or as part of an interview, would logically elicit a participant response regarding their satisfaction in relationship to how easily they were able to complete the task. Evaluating user satisfaction along with ease of use could lead to results that only measure user satisfaction in terms of how little resistance they meet in completing the task. Usability testing is intended to address subjective elements of how visually appealing or "friendly" an interface or interface feature is. However, usability testing can fail to fully address the variable of aaesthetic appeal within the usability context of how well the site functions. As Donald A. Norman says, "life…if ruled by usability, it might be more comfortable but uglier" (1988, p. 151). His point is not that aaesthetic considerations are more important than usability, or vice versa, but that they both have their place and that "trouble occurs when one dominates" (ibid.) North American academic libraries are not exempt from the risk of giving usability considerations primacy over other considerations. It is appropriate that the presentation of information is considered alongside the organization of information in our academic libraries. The truth is that students of academic institutions do not "have" to use their libraries. They can and they do go without using library resources and services when they find them difficult and/or sufficiently unappealing to use. The affective aspect of graphics is closely tied to their aaesthetic appeal, as well as their ease of use and understandability (Janiszewski, 2007).

Design Criteria, Guidelines and Standards

International Standardization Organization

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form a system for worldwide standardization (International Standardization Organization, 2000). National bodies that are members of ISO or IEC participate in the development and approval of international standards. Canada's national body is called the Canadian Standards Association (CSA). The CSA is a non-profit organization comprised of industry volunteers and is responsible for contributing to and approving standards for Canada. CSA is accredited by the Standards Council of Canada whose purpose is to;

> "foster and promote voluntary standardization as a means of advancing the national economy, benefiting the health, safety, and welfare of the public, assisting and protecting the consumer, facilitating domestic and international trade, and furthering international cooperation in the field of standards" (International Standardization Organization, 2003).

This study considered ISO standards because they are the only official industry standards regarding web icons. This means that the icons contained in the standards, as well as the requirements and recommendations for new icons that are to be included in future standards, are agreed upon by industry experts to represent industry standards. Although the ISO does not have any authority over software developers, ISO standards represent professional community consensus. For example, if a web browser was designed with operational icons that did not meet the standards then it would be rejected by the developer community and would likely be difficult for users to operate; in the end, this browser would fail due to a lack of developer and user community support.

ISO standards are only available on a fee basis and their icon standards are not well known or widely used by the average web designer; however, they are well known and well used by interface and software designers, especially those designing operating, web browsing or multimedia software.

World Wide Web Consortium

The W3C (World Wide Web Consortium) is an international consortium of member organizations whose mission is:

"To lead the World Wide Web to its full potential by developing protocols and guidelines that ensure long-term growth for the Web" (World Wide Web Consortium, 2008).

The W3C is led by Tim Berners-Lee who has served as the director since the W3C was founded in 1989. According to the W3C website (2008), "Tim Berners-Lee invented the World Wide Web in 1989 while working at the European Organization for Nuclear Research (CERN)." The W3C has become well known and well respected as a source of industry-agreed guidelines for technology. The W3C's Web Content Accessibility Guidelines (WCAG) (2008) are recommended to make web content more accessible to people with disabilities, as well as more useful to users in general. W3C guidelines are freely available on the web. These guidelines are well known among web designers, and are generally applicable to most interface contexts.

Design Criteria

Research into icon design and the specific criteria that, if satisfied, would ensure a clear and effective icon is extensive; however there is little agreement on exactly what the best way is to measure an icon's effectiveness. Typically, responses to an icon are measured in terms of their "fit" with the concept that they represent (e.g., Passini et. al, 2008; Cheng & Patterson, 2007). Simplicity has been a key quality of effective icons, as reduced complexity has been related to reduced uncertainty (see Passini et. al, 2008; Huang, 2002). In addition, factors such as meaningfulness, style, and locatability (Huang et. al., 2002) have been shown to be important. Huang et. al., (2002) conducted a study which employed two experienced professional graphic designers to distill fifty design principles, criteria and guidelines collected from seven sources into a single list of important icon design elements (p. 212). After extensive discussion, a nineteen

item questionnaire was developed by the designers and sent to forty-three computer Graphic User Interface (GUI) designers asking them to rate the elements in terms of importance to computer icon design. Factors of style, message quality, meaningfulness, locatability and metaphor were rated as the most important (p. 214). These factor categories, their definitions and their components, informed the assessment criteria for this study. These factors were fleshed out and supplemented with more detailed explanations from Horton (1994), which allowed for their application by the researcher, who is a non-designer.

Context for IM/chat Reference Icons

The world's information is increasing at an exponential rate; the result is an increasing need for ways to clearly present this information in meaningful ways. The presentation of information in meaningful ways, including visually (which has always been a concern of design scholars and professionals), has become a growing concern of library and information science scholars and professionals, whose goal is to organize and make accessible the world's information.

Scott Warren (2001) discussed the importance of visual information display to the "future of libraries" (p.135) in his book *Visual Displays of Information: a Conceptual Taxonomy*. He makes reference to the "increasingly vibrant field of research and practice that holds great promise and opportunity for the future of libraries" (ibid). Here, Warren applied the term "visual information display" to the widest possible range of activities, from visually representing data to digital library interface design. Warren recognized that visual display research had important implications for the library profession. Around the same time as Warren, another author in the LIS field, James W. Marcum, spoke about the same topic with an even more direct message: "The library profession remains grounded in textual, print media, creating vulnerability amidst a culture increasingly characterized as visual," (2002, p. 189). Since 2002, LIS literature has discussed the application of information visualization techniques for retrieval systems of visual data and for visualizing data (Given et al., 2007).The concept

of visual literacy, which “focuses on our ability to interpret, appreciate, gather, and create images” (Visocky O’Grady and Visocky O’Grady, 2008, p. 213) has been incorporated into the LIS information literacy discourse (e.g., Marcum, 2002; Snavely, 2005). Whether the concepts of information visualization and visual literacy have percolated into the curriculum and training of library professionals is unknown. Research in this area would be a logical follow up to these discussions in the literature. This study, focusing directly on application of visual literacy and visual communication know-how in the form of library website icons, will inform what we know about applying visual intelligence in academic library web design today.

Why is it Important to Study Icons on Academic Library Websites?

From a library and information studies perspective, it is important to understand how to quickly and easily evaluate icons without investing a great deal of resources. There are at least two reasons for this; often, libraries do not have a significant amount of staff time to dedicate to such a small part of a service and, like other service providers, libraries are constantly upgrading their modes of electronic service delivery as new modes of communication become available. IM/chat is a relatively new mode of communication, which means that it does not yet have an established icon to represent it. However, most academic libraries are using IM/chat to deliver their reference services; therefore, a sizable sample of IM/chat icons was available for review in this study. Modes of communication can quickly fall into disuse as newer more appealing ones are invented. This quick turnover rate makes it even more important to have a way of quickly assessing visual symbols that represent these modes. McDougall and Isherwood (2009) state that “Communication using icons is now commonplace” (p. 325). The use of icons on the World Wide Web and in other environments is pervasive. However, in a preliminary survey of academic library websites in Canada and the United States in preparation for this research, icons were not as common on library websites as they were elsewhere on the web. Also, it was noted that some of the icons seemed quite unique or different than icons seen elsewhere. These observations prompted this investigation into this aspect of web design in academic libraries because of the importance of icons as a

component of web interfaces. Another factor that contributed to the timeliness of this study was the explosion of mobile web technology which has encouraged web developers to create websites that function well on the small screen (e.g., smartphone screens). Icons will no doubt play an integral role in maximizing functionality with minimal space.

Icons in the Library and Information Science Literature

Virtual Reference Marketing

"Library Web sites are frequently highlighted as an important resource for marketing virtual reference programs" (MacDonald et. al., 2008 p. 376). Using post-chat surveys Dennison et al. discovered that most library users learn about chat reference services from library websites (2003). Some libraries have chosen to represent the various modes of access to their reference services in a visual manner, online. Visual communication is effective online in an environment where there is so much is competing for viewers' attention; images stand out.

In their review of the literature on virtual reference, MacDonald et al. (2007) reported the following regarding evaluation of branding and logos:

"Branding and logos are usually part of Web presence, and libraries go to various degrees of effort and expense to create them. But there are no reports of any attempt to evaluate the impact of the logo itself on the awareness and use of the chat service." (p. 376)

The data from this study will contribute to the information available on library icons. This study gives an overview of a sample of academic libraries and contributes to the discussion regarding standardization of visual communication among libraries and current design trends in library icons.

There is much professional literature reporting on the implementation of IM/chat reference (e.g. MacDonald et. al, 2008; Naylor et. al, 2008; Taddeo, 2008) services at academic libraries. Within this category of literature, discussion of icons used to represent reference services are commonly mentioned only in

passing (e.g., Dennison et. al, 2003). The representative logo or icon is usually characterized as serving three functions: letting students know that the service is available, letting students know where it is found and, presenting this information in a way that is aaesthetically pleasing. Sometimes the use of institutional colours is mentioned as a positive point (e.g., Dennison et al, 2004, Taddeo, 2008). Often the desire to have a unique logo tailored to appeal to students is stated (e.g., Taddeo, 2008 p. 232-233). However, how this desire is fulfilled or how this was determined, is omitted. In the case of the University of Buffalo (Taddeo, 2008), she reports that "while there have been no statistics gathered on the likeability of the icon, the service has definitely attracted more users since the logo change" (p. 333). Further investigation of effective icon qualities is called for in order to understand how icons affect users' experiences with virtual reference services and to ensure that this success can be carried over and applied to other instances of visual representation. This study provides detailed information regarding the elements of the VR icons which are examined to provide specific information regarding the impact of these elements and illustrates how icons can be assessed to determine how well they are working.

A further example of the lack of detailed discussion regarding icons and icon evaluation techniques is found in Luke Vilelle's (2005) article titled, "Marketing Virtual Reference: What Academic Libraries Have Done." In a section of the article titled, "Website placement," Vilelle emphasizes the importance of icons: "Perhaps the most important aspect of ongoing marketing is the design and placement of the virtual reference icon on the library web site" (p. 71). Although the previous statement recognizes that design ***and*** placement are important aspects of marketing reference services, only placement is discussed in detail in this section. Discussion of best practices for designing the icon is absent from this section. In addition, there is no further mention of the design process or any presentation of research on the effectiveness or ineffectiveness of designs used in the rest of the article. Vilelle's article is representative of the LIS literature that evaluates the effectiveness of marketing virtual reference services in that it lacks the application of icon evaluation and testing methods.

One example of a more detailed discussion of virtual reference icons is King County Library System Library System and University of Washington's *Virtual Reference Services Marketing Guidelines* (2002). These guidelines give a very good overview of aspects to think about when considering an icon or logo for a library IM/chat reference service. However, these guidelines are still very general and fail to discuss specific design techniques or styles. Further, although they do address testing the effectiveness of marketing initiatives, they do not discuss evaluation of icons themselves. There is also no mention of including user input in the development of virtual reference icons and logos. The failure to discuss icon/logo design effectiveness in evaluating marketing strategies for virtual reference services is an oversight because the logo plays an important role in the identity and promotion of the service. Danesi (2008) uses the case of the McDonald's arches, which tell a story beyond food, a story of allegiance to family values, which is linked with the symbol of historic cities; the arches, to illustrate that "a modern-day logo does much more than identify products [& services] or differentiate them from others" (p. 79). In the case of an umbrella logo representing library reference services in general, the logo can do more than identify the service; it can tell a story of what values the library is upholding with this service, namely the values of freedom of access and education which are supported via provision of expert guides to collections. Communication of these values to students would enhance the image of reference services as more than just "help finding things." At the most basic level, in order to attract new users to a service it is essential to communicate what service is available (including how it is delivered) and how it benefits users (Sugars, 2009). After-all, would you use a service if it wasn't clear what was on offer and how you could use it?

An example of a library that created its own logo for their chat reference service is The Louisiana State University (LSU) Library (Dennison, 2004). The library seemed to want to take ownership in their chat reference logo, as they recognized its importance; this is positive, but information on how effectively the logo communicated the nature of the service is lacking.

In 2006, Minnesota State University embarked on designing a logo for their academic library. They debated the merits of using in-library expertise vs. contacting with the university's graphic design services.

> "To have the logo designed by a staff member would be the most cost-effective and would allow a library employee to showcase his or her artistic ability. After frank consideration of the interest and qualifications of the library staff, we concluded that no one was truly qualified to design a logo" (Kapoun, 2006, p. 3).

The Minnesota State library decided to contract with the university design department and were satisfied that their logo represented the library well. However, although they felt that the logo generally supported their library goals (e.g. access to information) and included their "design" requirements such as inclusion of the term "library services," they did not discuss how the design elements specifically communicated their library's messages. In addition, although there was discussion of promoting the logo, there was no discussion of how the effectiveness of the logo would be assessed. This is an example of where library staff with some basic design knowledge could have ensured that proper design requirements were communicated and been able to provide a bridge between the designer and the library logo committee to better ensure their communication and identity needs were met by the logo designed. As discussed in the introduction to this study (see Chapter 1), it is possible that information professionals consider graphic design to be a specialized area beyond their expertise. However, if libraries are going to contract with graphic designers or use in-house expertise to develop materials for their websites on a regular basis then it would be beneficial for them to be able to evaluate the effectiveness of this work.

Conclusion

In conclusion, this study applies graphic design knowledge and theories to public information icons in the specific context of library websites. The perspectives of neutrality, universality, metaphor, abstraction and simplification informed the analysis of library virtual reference icons. In terms of its relationship to the debate over the expansion of design, this project focuses on contributing

knowledge to solve a traditional graphic design problem: “how best to visually identify and represent library virtual reference service?” The narrow scope of this investigation allows for meaningful contribution to the larger questions, which as the expansion of design continues will not be *how* questions but *what* questions and will be informed by the answers to the smaller questions that are provided here.

This thesis project gathers and presents data that can inform library evaluation of the effectiveness of their icons. There is a gap in the literature on marketing of virtual reference where design and evaluation of icons is not discussed and this study contributes to filling that gap. In addition, this study examines professional graphic design standards, guidelines and best practices from a layman’s point of view and asks the question, “how useful are these standards and guidelines to consumers of graphic design products and services who wish to evaluate what has been created?” A person who hires someone to re-wire their house can hire an inspector to check if the work is “up to code,” however, those who contract with designers currently have only very indirect ways of assessing how well their icon is designed. This study contributes a unique perspective to the discussion of standards in design literature.

CHAPTER 3

Methods

Introduction

This study includes three different phases that employ two different data collection methods. The purpose of this three-pronged approach was to gain a more holistic understanding of the topic from a number of different perspectives. The first phase of the study used purposive sampling to gain a maximum variation sample of icons for assessment. Comparative analysis was performed on this sample of icons to examine the variety of icon types, styles and symbols employed by academic libraries. For the second phase of the study, nine icons were selected from the larger sample and their creators/selectors were interviewed in order to gain insight into their intentions. In order to further examine these nine icons from the potential user perspective eight students were interviewed. It is common for academic libraries to conduct usability testing on their websites with students, but examining questions of standardization requires consideration of library staff processes of decision making regarding websites in addition to users' perspectives and a global examination of the current trends in icon design in both the academic and graphic design communities.

The comparative analysis allows for an evaluation of whether library icons are conforming to icon design standards and guidelines. The student interviews were conducted not only to gather feedback on specific icons but to look for information regarding the basic elements of icon design which confirmed or disproved the applicability of standards in the library setting. Libraries consider staff opinion, usability data, web trends literature and surveys of other sites among other things when making decisions about their websites. However it is rare for libraries to conduct in depth evaluation of their icons specifically using design checklists, user interviews or by isolating the effect of the icon on user statistics, etc. In this study design heuristics were combined with user interviews to provide a more holistic evaluation and understanding of reference service icons.

This study is an example of applied social research, which is defined by Bickman and Rog (1998) as "[research that] strives to improve our understanding of a 'problem,' with the intent of contributing to the solution of that problem" (p. x). "Applied qualitative research is concerned, first and foremost with the usefulness and application of knowledge" (Brodsky & Welsh, 2008, p. 17). This research is concerned with the production of practical knowledge that can be applied by academic libraries to their selection and use of icons on their website. Described as "field based" and designed to solve "real problems," sometimes called "action research, many would argue that applied research has the most utility when done in consort with decision makers and stakeholder" (Brodsky & Welsh, 2008, p. 18). This research has been a part of the icon evaluation process at the University of Alberta and has been considered in the re-design of UA Library website that took place in August 2009. In addition, summarized student feedback regarding icon design at the academic libraries has been communicated to staff who were involved with the creation/selection of the icons, and staff have expressed interest in reading this thesis.

Research Ethics

This study was approved through the University of Alberta's ethics review process under the Faculty of Education. The ethics application included background information on the topic drawn from the literature, the study research questions, a description of the methods, and a description of how human subjects would be involved in the research. For the purposes of this study, ethics clearance was needed for the interview portions of the study. The steps taken by the researcher to ensure confidentiality and anonymity were described, such as the removal of identifying information from the transcripts and the generalized reporting of results. Details of how participants would be informed of their rights, including their right to withdraw from the interview process were given.

Assessment

Sampling Method

The sample of library websites was chosen from the total number of websites of Association of Research Libraries (ARL) members. The reason the ARL members were chosen as the starting pool of institutions was that in order to become an ARL member libraries must demonstrate a certain collection and budget size which are associated with student full time equivalent numbers. This membership criteria means that members of ARL are peers in terms of size and capability and allows for comparison between libraries of similar means and scope. It also means that the student participants drawn from the UA student body are ARL students and part of the potential audience for all of these libraries.

The decision to limit this project to academic libraries was based on an observation of the level of icon use across the public, special and academic library sectors. A preliminary partial survey of icon use on library websites across the three sectors revealed that the use of icons to represent reference services online was highest among academic libraries. Focusing the project on academic libraries, therefore, would benefit the project by providing a larger initial sample from which to draw the study sample. In addition, the student user group would be more likely to have had direct experience with viewing reference icons in the course of their academic library use than those who used primarily public or special libraries.

Sites for the survey were selected from the pool of ARL members using purposeful sampling. “Engaging in purposive sampling signifies that one sees sampling as a series of strategic choices about with whom, where and how one does one’s research” (Palys, 2008, p. 697). This was the case with this study. For example, the decision to limit the sample of icons to those used by academic institutions was based strategically on the observation that that, proportionately, more academic libraries had icons on their websites. Also, there was a greater degree of consistency in how academic libraries were using icons and what they were using them for (e.g., to represent VR services). This meant that by limiting

the study to icons being used for a specific purpose on a large number of ARL member websites, something meaningful could be learned about this specific icon situation.

The ARL has a total of 123 members. This includes members that are private, government, or public libraries not directly serving post secondary academic institutions and their communities. These members were not considered eligible for this study because the focus of the study is on those directly serving an academic community as their main audience. This initial selection criterion limited the population to 114 libraries. These libraries' websites were viewed and their VR icons were assessed for eligibility. For example, libraries that used a generic virtual reference icon to represent all virtual modes of access were excluded because the scope of this study only included icons dedicated to representing chat or IM reference services.

Of the 114 libraries, almost fifty American libraries were found to have eligible chat or IM reference icons. Every sampling decision made for this study was tied to the research objectives. For example, one of the sampling objectives was to include a large variety of icon symbols. This was to satisfy the research objective of gathering information regarding the effectiveness of these symbols. This contributed to the study objective of illustrating a non exhaustive overview of the symbols, styles and types of VR icon in use by North American academic libraries in 2009. To achieve this objective, maximum variation sampling was employed. Maximum variation sampling is defined as "… searching for cases or individuals who cover the spectrum of positions and perspectives in relation to the phenomenon one is studying. [It] would include…both extreme and typical cases plus any other positions that can be identified" (Palys, 2008, p. 697). The objective of the purposeful sampling was to include examples from each of the observed types of icons (see Appendix A for a visual overview of these types). In addition, icons representing a wide variety of styles and symbols were included. Typical or representative icons were selected as well as unique examples to achieve a maximum variation sample containing a wide variety of icons.

Other factors that affected the purposeful sampling of websites for assessment include:

- Geographic – The American Library Association (ALA) is the accreditation body for both American and Canadian schools of library and information studies. In other words, librarians that graduate from ALA-accredited schools in North America receive comparable training. Since the majority of ALA-accredited graduates continue to work in the United States and Canada it makes sense to include both these countries to the exclusion of others. In many cases the ALA and the Canadian Library Association (CLA) work together to create polices and guidelines that are complementary. This project is restricted to Canadian and American libraries in order to compare practices of librarians who receive comparable training at ALA accredited institutions and because their student audiences flow back and forth across the border.
- Variety of icon types, symbols, and styles (see Appendix A) – this allowed for a more inclusive picture of the design and use of these icons.
- Variety of online experience and sophistication levels in online environments - it is important to gather a sample that includes libraries that span the technological spectrum from cutting edge to behind the times. In order to span this continuum icons that looked older (in style) as well as those that looked newer (possibly on a current looking site or icons which looked newer in comparison to the rest of their site) were included.

This purposeful sampling method resulted in a sample of thirty IM/chat icons (see Appendix B for a list of institutions associated with the icons) that were assessed using the parameters outlined in Appendix C. The results of the assessment (see Chapter 4) are discussed as a group but also by using examples of both typical and unique libraries to illustrate information gathered from the assessment.

Description of Icon Sample

Of the total number of thirty libraries included in the sample, nine were from Canadian libraries and twenty-one were from American Libraries. All of the

eligible icons from Canadian ARL members were included because the total pool of Canadian ARL members is very small in comparison to American members. It was a goal of this study to examine a meaningful amount of icons from institutions in both countries so that if there were any commonalities and differences between icons from each country they could be identified.

The twenty-one icons from American institutions represented a balance of typical and unique symbols and well as kinds of icons. The types of icons included in this study are wordmarks, graphics, photographs, and combination icons using one or more of the text, graphic or photographic. For the purpose of this study a wordmark describes an icon which uses the name of the service with a proprietary distinctive text. Graphics are understood to be any kind of pictorial representation, created using computer graphic design software. Icons that are photographs are created using a digital camera. There were significantly more icons which were using primarily graphics and/or text than there were using photographs. This is represented in the sample, as there are twenty-four icons which have graphical or text characters (or both) and only six that use photographs, some of which also include text.

Data Collection Methods

Questions were developed that corresponded to defined categories and criteria aggregated from the ISO standards, W3C guidelines, icon design research and LIS marketing best practices literature. See Appendicies C & D for a list of criteria and definitions. Common categories used in icon design research were considered and amalgamated where they overlapped. For example, Huang et. al (2002) and Huang & Lai (2008) tested icons with designers, and users respectively and both listed and ranked a number of important factors of icon design such as contrast, operation, meaning, etc. These were used to create the assessment categories. See Table 1 for a list of the assessment categories and their sources. The questions asked regarding the icons were formulated in order to address research question number 1: How, and to what extent, does the sample of library icons conform to standards, guidelines and best practices for icon design? To manage the data during the assessment, these questions were

loaded into an online survey software package (SurveyMonkey.com) and an account was created for each icon. As part of the assessment process these questions were asked of each icon and the answer was recorded in the software. As the researcher did not have any visual design training, the definitions that supported the categories and assessment questions were consulted regularly. An effort was made to maintain consistency via methods such as: recording decisions regarding the boundaries of conformance and non-conformance in each category; assessing all the icons for one category at a time, only; and, regularly reviewing the data looking for inconsistencies, thereby maintaining consistency of treatment.

Assessment Categories and their Sources	
Category	**Source**
Contrast	ISO +W3C
Boundary	GD BP*
Colour	GD BP
Style	GD BP
Comprehension	ISO +W3C
Interaction/Selection	ISO + W3C
State Change/Feedback	ISO
Alternate Text	W3C
Consistency of Icon Set	ISO
Consistent Visual Appearance on Website	ISO + W3C
Discriminabilty	ISO
Placement on Website	LIS BP**
Typeface	ISO
Extensible	ISO LIS + GD BP

*GD BP = Graphic design best practices found in literature

**LIS BP = LIS VR marketing best practices found in literature

Table 1– Assessment Categories and their Sources.

These categories were drawn from a variety of sources and combined to form the assessment criteria for evaluating the icon sample in this study.

Data Analysis Methods

Categorical assessment is a common research method used by graphic design researchers to assess icons (see Huang et.al, 2002; Cheng and Patterson, 2007; Passini et. al et. al., 2008; Huang & Lai, 2008). In these types of projects, "the underlying goal of comparative research is to search for similarity and variation between the entities that are the object of comparison" (Mills, 2008, p. 100). Icons were compared to address research question 1 regarding their conformance to the standards and also to address research question number 2: What are some of the common and unique features among this group of icons. Comparing the icons in categories helped to tease out some of the commonalities and differences among icons in this group in specific areas important to icon design.

The raw assessment data were viewed in a summary level which showed results for all of the icons by category, allowing for an understanding of the levels of conformity for the whole group category by category. For a better understanding of the proportions of results, the data were also viewed in percentages. Then cross-categorical analysis was employed to further understand the interaction between categories. Observations were made based on these two techniques and contributed to the formation of further questions that were asked of the data. Icon performance across categories was compared to see how they differed and to identify common and unique features among this group of icons.

Use of an Emergent Design Approach

As the sampling and assessment process evolved, researcher awareness and understanding of the variety of symbols in use as well as the design styles and techniques grew. This called for changes to the sample and to the assessment criteria. This process was facilitated by an emergent design approach to the application of the assessment criteria. Memo writing was used to

aid analysis and reevaluation of the icon sample and assessment categories at all stages of data collection. The adjustments made to the sample were minor, such as adding the icon from the University of Sandiego California because it had a unique 3D aspect. These minor adjustments sought to increase maximum variation in the areas of style and symbol. The adjustments to the assessment categories were also minor, such as expanding the placement category to specifically note if an icon appeared on the homepage in addition to other website pages beyond the reference page. These changes helped to make the categories more cohesive and led to a more consistent assessment.

Bias

The researcher was aware that her own personal aaesthetic preferences could affect the judgment of icons in more subjective categories such as colour. In order to compensate for this the assessment criteria definitions and series of questions were consulted and used to assess each icon. This helped to standardize assessment in these categories.

Interviews

Two sets of interviews were conducted in this study: one with students and one with library staff. A sub-sample of the original thirty icons was selected to be investigated in the interviews. Nine icons were selected representing seven library websites. The selection was made purposefully to ensure that key symbols and styles were represented. The purpose of the student interviews was to answer research question number 4: Which representative symbols and design techniques are most appealing to students? The student interview data were also used to identify areas of weakness and strength in the assessment tool in answer to research question number 8: How well do the icon assessment criteria identify potential difficulties or causes of confusion for users viewing these icons? The staff interviews provided answers to research questions number 5: What processes are library staff engaging in to obtain their icons?; 6: Are design standards considered by library staff in the selection/creation or evaluation processes?; and 7: What is the level of design and or marketing training of library

staff involved in the selection/creation of icons, and how is this expertise being used in the icon selection/creation process? These two sets of interview data were also compared to answer research question number 3: What are the similarities and differences between the perceptions and understand of library icons by library staff and potential student users? Examples of design are often understood in terms of their designer's intentions and the clients' needs (in this case the library's) (e.g., Visocky O'Grady and Visocky O'Grady, 2008; Capsule, 2007; Macnab, 2008). In this study, the icons are examined from the perspective of the creator/selector as well as the intended audience in order to fully understand the intended message and its reception. It was especially important to include the designer/selector's perspective in this study because of the varying levels of design expertise held by and available to library staff.

Sampling Method - Description of Icon Sample for Interviews

A smaller sample was selected from the original sample of thirty ARL library icons on which to base the interviews with students and library staff. A purposeful sampling strategy was used to select icons that represented the main symbols observed in the larger sample, as well as a variety of styles and types. The size of this sample was restricted by the structure of the student interviews. Students would have to look at each of the nine icons three times, in different contexts, so there were only so many they could view and comment on in the space of one hour to ninety minutes. Other considerations in selection included the icon's relationship with the rest of the set and its level of accessibility as determined by the criteria-based assessment. Another consideration was to include icons that looked like they were newly designed and some which looked like they had been in use for a while in order to include institutions at different stages in their web design processes. A variety of terms used in icons and to name services, such as "talk", "chat" and "IM," were included to test students' reactions.

Nine icons were chosen from seven different institutions (Table 2). A couple of the institutions had the advantage of using more than one of the main symbols. This meant that staff could be asked about their approaches to both

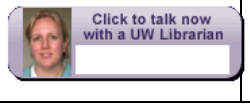
Summary of Icon Sub-Sample used for Interviews				
Institution	**Icon**	**Type**	**Symbol**	**Style**
University of Alberta (UA)		Graphic	Speech bubble Pac men	Simplified Drawing 3D
University of California Irvine (UCI)		Graphic	Question Mark Exclamation Mark Double Chat bubble	Lichtenstein / Comic book
University of Guelph (UG)		Graphic +Text	Speech bubble	Silhouette + Text
Kent State University (KSU)		Graphic	Librarian coming out of computer monitor	Illustration
Penn State University (PS)		Graphic	Cat + Laptop	Illustration
University of Pennsylvania (UP)IM/chat		Graphic + Text	Speech bubble	Silhouette + Text
University of Pennsylvania (UP) Laptop		Photo	Laptop	Photorealism
University of Washington (UW)		Photo + Text	Person	Simplified Drawing 3D
University of Washington (UW)Chat Bubble		Graphic	Speech bubble	Photorealism + Text

Table 2- Summary of Icon Sub-Sample used for Interviews. Includes type, symbol and style. Cited under university name. Used with permission.

and students could see two different icons on one library website. This subset of icons represented most of the symbols in use from the larger sample. For example, although components such as a keyboard or a mouse were not included, they were represented by full pictures of laptops. This sample represented a variety of styles and included photographic, textual and graphic elements.

Staff Interviews

Staff members at all seven of the library institutions connected with the sub-set of icons were contacted for interviews. First an invitation letter was sent to a likely staff member (e.g., library or technology department head) via email requesting an interview with a staff member involved with the creation/selection of the VR icon. The stated focus of the interview was icon creation/selection processes; interviewees were told questions regarding goals for the IM/chat reference service would be asked. To view the interview questions see Appendix E. All of the institutions responded positively and most suggested a second person to address the questions about their reference services. At this point more information was sent, including the information/consent letter and a selection of available interview times. A great deal of flexibility was offered on the part of the researcher in terms of dates and times available for interviews. In total the window open for interviews lasted two months. Even as this was the case there were two libraries where an interview with staff was not able to be scheduled. Interviews were conducted with staff from five institutions. In all but one case, two staff members were interviewed; one from the technology department and one from the reference department.

This purposefully selected sample contained volunteers who were most willing and able to participate and was not meant to be representative of the larger group of ARL staff involved with icons but to be exploratory and act as a starting place for future research. There is no current body of work specifically studying academic library staff that perform or inform graphic design work. Often professional literature reporting on academic library's experiences with marketing

of VR services does not discuss the design process in detail, only the resulting logos and marketing products (e.g., Dennison et al, 2004, Taddeo, 2008).

Student Interviews

Due to ease of access the student sample was drawn from the University of Alberta student body. The study was open to full and part-time undergraduate and graduate students. Recruitment posters were posted on the UA campus and sent out via email to graduate and undergraduate list serves. Recruiting in both electronic and print media was intended to reach students of varying degrees of comfort with technology. However, all volunteer respondents did so via email regardless of whether they saw the print or electronic materials and none were uncomfortable with using technology such as computers and the internet.

It was a goal of this study to discover the perspective of students who were not overly familiar with using the IM/chat services at UA. The only students considered ineligible for this study were those from the School of Library and Information Studies (LIS students). LIS students were specifically excluded because of their in-depth understanding of library reference services; this informed point of view is unique to LIS students and therefore their perceptions of the VR icons would also be unique (they would see the library website through "insider" librarian eyes) and this would not be representative of typical students. Students familiar with art and design or computer science were not excluded. This was because their knowledge in these areas, while not common to all students, could only inform their understanding of the icons and their web contexts. Showing the icon to students familiar with web design resulted in an informed student perspective. In addition, their understanding of VR services is comparable to the general student body. The goal was to interview students who were not working at a library and who did not have specialized training or knowledge of library work and therefore who would not be interpreting the icons through an "insider" lens. Eight full-time UA students were interviewed: four undergraduate and four graduate, including one PhD student. For a more detailed description of the student sample please see the results and discussion chapter.

This sample can be considered a convenience sample as defined in the *The Sage Encyclopedia of Qualitative Research Methods* (Saumure & Given, 2008, p. 124) because the participants were selected based on their willingness and ability to participate in the study. One of the drawbacks of this sampling method is that participants who represent certain characteristics (e.g., not being familiar with IM) do not always present themselves. Another is that it is difficult to know if the students' motivation for looking at the icons in the study will mirror their motivation for looking at them in their web contexts. For instance, they might be more critical if their motivation for participation is to provide critical feedback rather than to get research help. In addition because all of the students were viewing the icons from the perspective of UA students they did not necessarily reflect the larger ARL population. For instance, students from Penn State would have immediately recognized the cat as their mascot and might have had more positive feelings towards it and been less confused. Convenience sampling results can lack external validity or transferability (Saumure & Given, 2008, p. 124). In this case this sample was not meant to be representative and was meant to be exploratory in an area which has not garnered much focused research in LIS.

Data Collection Methods

Staff Interviews

The interviews with staff took approximately one hour and were conducted in a semi-structured conversational style over the phone. The interviews were audio recorded. Telephone interviews have been shown to be effective where rapport between the researcher and participant(s) is less important (Hughes, 2008). In this case, the topic was not one that was personal or sensitive and did not require the building of much rapport as the interview was couched in terms of a professional exchange of information. Use of the telephone (vs. video conferencing or in person) for these interviews may have provided an extra level of anonymity which made participants feel more comfortable. The use of open-ended questions along with a conversational interview style was helpful in generating data about this specific topic in an informal way and worked

especially well when two staff members were participating at the same time. Participants benefited from an in-depth discussion of their icons which was shared with their co-worker. It is possible that if staff were interviewed separately they would have felt more comfortable voicing conflicting opinions. However, as it was, the staff members still discussed diverging opinions quite openly and frequently. Interviewing staff together vs. separately, led to a deeper understanding of the relationship between staff members and their represented departments.

The flexible structure of the interview began with background questions regarding staff education, training and experience; the interview then moved on to a discussion of the IM/chat reference service and its iconic representation online. Topics covered included icon creation/selection process, web design processes, testing processes and icon standards. Please see Appendix E for the interview questions. At the end of the interview it was common for the researcher to discuss specific issues regarding that institution's icons that emerged via student interviews in an effort to share information with the library staff as part of the applied research approach of this study. Library staff members were very receptive to this information and commented that it enriched and expanded their thinking about their icons. It should be noted that several of the staff commented that they would like to make changes to their icons based on this research and at the time of writing some of them have implemented changes based on the results of this project. For example, the University of Guelph has updated the style of the reference icons that accompany their IM/chat icon in the set.

Student Interviews

Student participants volunteered in response to the recruiting materials. Interested students were sent an information/consent sheet and told that they would be participating in a study where they would be viewing and using web icons and describing their reactions to them. As little information as possible was given to students ahead of time so that when they initially viewed the icons out of context they would be free to give their opinions as to what they thought the icons represented without already knowing they were supposed to represent

library IM/chat help services. The consent forms were signed before the interviews and the rights of participants to confidentiality, anonymity and withdrawal from the study were explained. The researcher took steps to ensure anonymity such as removing all identifying information from transcripts and generalizing results.

The interviews took place in meeting space in Cameron Library on the UA campus and lasted from one hour to ninety minutes. The interviews were audio recorded and were conducted in a semi-structured, conversational style. The intent of using this style was to encourage participants to speak freely and to discuss at length any related topic that they would like to share their impressions on in order to enhance and strengthen the understandings of the roots of their perceptions of the icons and what emotions and experiences and ways of thinking might affect these. This style was very effective in eliciting not just what the students thought and felt, but why. Some of the hazards associated with this style of interview regarding this topic are that by asking questions related to certain elements the researcher may focus interviewees' attention on an element that was initially unnoticed. The researcher noted this effect in the transcription and took this into consideration when performing analysis. For example, it would be recorded that an element did not draw student's visual attention, but when they were asked about it their response was considered in light of the fact that their attention had to be drawn to it.

Student interviews were structured in three parts. In the first part students were shown each of the nine icons out of context, either printed on a white piece of paper or shown on a white background online. Five students were shown paper versions and three were shown online versions. These two formats were used to see if there would be any differences in students' perceptions. However, there were no differences observed in the kinds of associations students made or the amount of attention the icons were paid. Students were asked questions such as "what do you think you would get if you clicked on this online?" and "what does this icon mean to you?" Each question was followed with a probing question such as "can you tell me what it is about the icon that makes you think that?" To see the list of interview questions asked of the students see Appendix F.

In the second part of the interview students were again shown each icon and its icon set, out of context. The icons were arranged in a standard way so that this would be consistent for each set. Icons were represented in their original online size according to their display on their library websites. This was important to discover how the size might affect student perception of the icon. The purpose of this part of the interview was to examine the icon set only and to discover how this set might affect or enhance student perceptions of the IM/chat icon. If there was any difficulty distinguishing them then this could affect perceptions of the IM/chat icon and the icon set as a whole.

In the third part of the interview students were again shown all nine icons in their web contexts. Students were asked questions about meaning and how their understanding and feelings about the icon might have changed with the addition of the natural web context. Time was made for students to comment on aspects of the web context they found helpful or appealing or not. Students were encouraged to give their first reaction to things and to feel free to give any opinion, no matter how “correct” or “incorrect” they felt it was. Once students had seen the reference page, they were taken to the library home page and asked to find their way back. This was to observe their visual attention to any familiar titles or symbols that were used on the home page to direct students to the reference page. Students were also asked to activate the IM/chat reference software as if they were going to ask a question. Student actions were observed, and noted verbally. They were also asked questions about these experiences. In future, screen capture software could also be used to enhance this data collection method. This would allow for more in depth analysis of the students’ actions online after the interviews.

Showing the icons to students three times allowed for an observation of how their perceptions changed according to the increasing addition of context. This represented a mini-learning process that could be compared to what a student might go through on revisiting a web page and viewing and learning the meaning of an icon over time. One of the effects of this process was that students who were less familiar with the idea of library IM/chat reference service learned about it as they reviewed the icons and this changed their perceptual

lens as they started to realize the commonalities between all the icons. In order to adjust for this and to make sure that certain icons were not always seen after learning had occurred (as some icons were more easily-identifiable than others), the order in which the icons were shown varied with each interview.

Data Analysis Methods

When the interviews were transcribed, both staff and student interview data were tagged with categorical titles relating to the kind of data; many of these categories corresponded to the assessment criteria. For example, if a question to students was meant to collect information on the visual appeal of an icon, the students' transcribed comments were tagged with the category that they were relevant to. If they said "I like the way it is drawn," then this comment would be tagged with "style." Other categories were more topical, and associated with the study's research questions. For instance, staff comments regarding icon standards were simply tagged "standards" so that all the comments on this topic could be compared across transcripts. Data in these categories were compared across both interview sets. For example, staff comments regarding intended messages of their icons were compared to student perceptions. Data from the student interviews regarding each icon were also aggregated and compared to the results of the icon assessment. As transcription was completed data were gathered under these titles and analyzed for any commonalities and differences and trends were observed and recorded in keeping with the grounded theory approach. "Grounded theory refers simultaneously to a method of qualitative inquiry and the products of that inquiry" (Charmaz & Bryant, 2009, p. 374). In this case, theories grew out of and were developed, based on the data.

Horton's Theory of Meaning

The student interview data were evaluated using the concepts associated with the assessment criteria such as visible appeal, comprehensibility, discriminability and accessibility. Students' perceptions of icon meaning in each stage of the interview were also analyzed using Horton's (1994) relationship of icon, viewer and context:

$Icon_i + context_j + viewer_k = meaning_{ijk}$ (p. 27)

Use of this model with the interview structure allowed for an understanding of the contributions of each webpage context to students' understanding of the icon's meaning. It also identified when unintended icon messages were the result of a particular viewer's opinion, or if there was something inherently confusing in the icon, or its context.

Bias

The researcher was aware that UA students might have been biased towards the icons that their institution was considering. The researcher was careful to point out to students that this icon set was something that UA was *considering* and *testing* but not yet approved or accepted by UA staff. In addition the icon was viewed for the first two parts of the interview out of context which allowed for an unbiased look at the text IM/chat icon before it was associated with UA. However this was an icon set which was highly integrated and dependent on its context which made it hard to tell if students' positive views of the icon in context were due to UA bias or the use of supportive enablers (titles, format etc.) in context. After viewing the UA icon set in context students were asked if they thought that they were viewing the UA icon more favorably due to school allegiance. Only one student thought that they were biased towards the icon set because it was associated with the UA. Researcher observation of students did not detect a trend of students being more generous toward this icon set because of school affiliation.

Conclusion

This study used categorical assessment and interviews to examine a sample of VR icon on ARL member websites. Although many icon design studies do test icons with students and designers using surveys and questionnaires, it was decided that a more in-depth, conversational interview with staff (in most cases not professional designers) and students was required as VR icons do not exist in a controlled environment (e.g. computer system) and are as much logo as they are icon (as discussed in Chapter 2). The combination of these interviews along with a criteria-based assessment grounded in international standards was deemed the best way to gain a holistic understanding of the VR icon phenomenon within the academic library context.

CHAPTER 4

Results & Discussion

Assessment Results

The criteria-based assessment was completed simultaneously with the interviews with students and staff. As more design literature was reviewed and data from the interviews were collected and analyzed, adjustments were made both to the sample and to the assessment categories. Three essential requirements of icon design that were prominent in the literature (e.g., Huang et. al. 2001) were confirmed to be important by the results of the assessment and the student interviews. These three main predictors of icon success were, visual appeal; message clarity; and, accessibility. The discussion of the assessment results examines these three important areas among others.

The results from those assessment categories in which the majority of icons were not in compliance with published standards, guidelines and recommendations will be discussed at greater length than those in which the results were evenly split or the vast majority of icons were in compliance. This approach will discuss briefly the strengths of the icons as identified by the standards and guidelines and leave more room for discussion of areas with mixed results or where most of the icons were weak. It is the goal of this study to explore the weaknesses of the current icons in order to gain an understanding of these which can inform and strengthen future library icons.

Visual Appeal

Contrast

Contrast is the difference in value (light or dark) between an object and its background. In this case the assessment considered the difference between the main symbol of the icon and its background, which in some cases was part of the icon and in some cases was the web page itself. ISO recommends that icons be "sufficiently prominent in comparison with other information on the screen" (ISO

18036:2003 sec. 5.2.2). This refers to the visual prominence of an icon, which is served by a high level of contrast, and makes an icon more visible. For further definition of ‘contrast’ and other assessment criteria see Appendix A .

There are best practices that recommend specific levels of contrast. For example, The Americans with Disabilities Act (ADA) recommends a 70% contrast between an object and its background (Visocky O’Grady and Visocky O’Grady, 2008, p. 115). This was intended to apply to public signage, not in an online context. The W3C recommends a contrast ratio of “at least 4.5:1” or 22% (2008, sec 1.4.3). There is a variation of 48% between the ADA signage contrast recommendation and the minimum contrast recommended by the W3C for websites this must be owing to the closer proximity to monitors vs. signs. The contrast levels of the icons against their backgrounds can be measured when designing an icon or by examining a pre-built icon with software such as Adobe Illustrator. This measurement was not applied in this study because the researcher did not have access to the proper file formats of all of the icons which would be required to accurately test the contrast levels. The goal of the assessment was to provide criteria that library staff could apply to quickly and easily assess icons as an initial step; as a result, it was decided that it was not practical to use graphic design software, which staff may be unfamiliar with, to assess the icon’s contrast level.

In this study, contrast was judged to be sufficient or insufficient based on a subjective measurement of whether it was easy to discern the main symbol with the naked eye. It was important to evaluate contrast using this method so that icons which were difficult to see by the average viewer (i.e. the researcher) were identified rather than taking a microscopic approach which might identify some icons as failing to meet the contrast level which were, to the eye, quite visible. An icon was considered to have low contrast if the colours of the foreground and background were of similar tone and value (e.g., beige on light grey). It was also considered low contrast if there was a faded effect which similarly leveled the value of the foreground and background. Overall, if particular attention had to be paid to “read” the icon and the main symbol did not “pop” into view at first consideration then it was considered low contrast.

Seventeen icons (57%) were observed to have a high contrast between their primary object (foreground) and the background of the icon. Eleven (37%) were observed to have low contrast and two (6 %) had variable levels of contrast due to changing icon background colours. These were considered low contrast because they did have areas of low contrast. Contrast results are shown inTable1 alongside boundary and colour results because these categories are interrelated for reasons discussed above and throughout these sections.

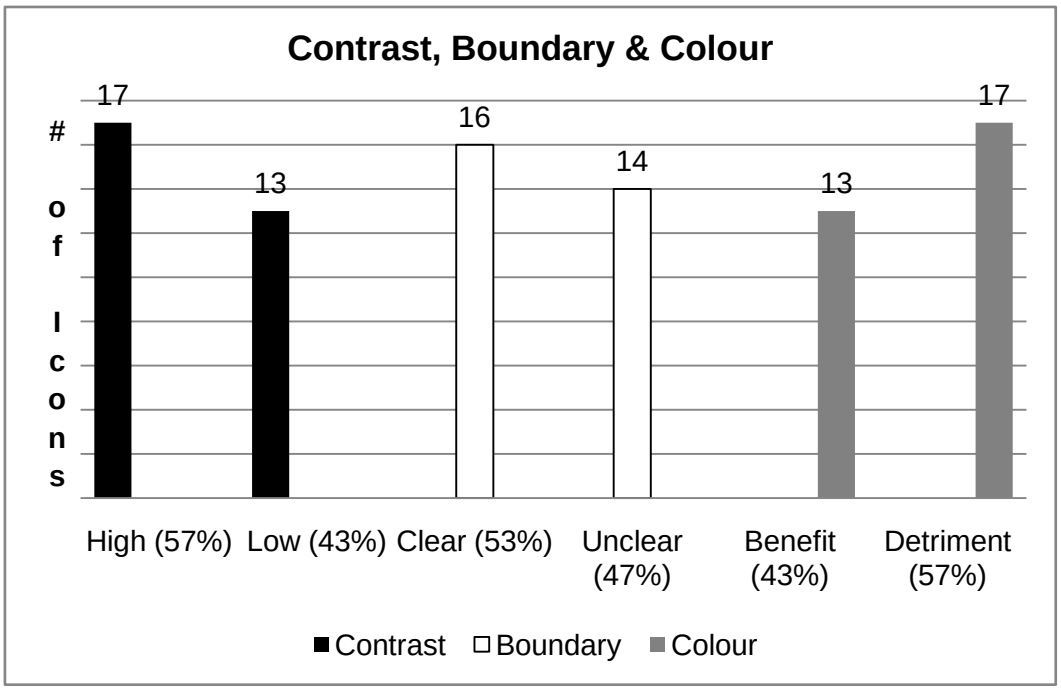


Table 3 – Results for Contrast, Coundary & Colour. Displays the number of icons assessed to be successful and unsuccessful in three different assessment categories.

Pittsburgh University's IM icon is example of an icon with high contrast (see http://www.library.pitt.edu/reference/index.html). The blue screen in the center is clearly seen against the white background and is of a significantly different light value from the dark blue outline of the icon. The University of Notre Dame icon (Figure 4) has light blue outlines on a slightly darker blue background. The figures in the foreground are not sufficiently different in value from the background to stand out and the viewer has to look closely to make them out.

The majority of icons conformed to the design recommendation that the foreground should be in high contrast to the background of the icon.

Figure 4 – Low Contrast. University of Notre Dame's IM reference icon. (University of Notre Dame, 2008). Used with permission.

Boundary

The boundary refers to the border or outline between the icon and its web page background. A clear and uniform boundary is consistent in thickness and strength of value. A clear and uniform boundary will also be in high contrast with a web-page background. This contributes to satisfying the ISO recommendation regarding prominence of icons which was mentioned above in the contrast section (International Standardization Organization, 2003, sec. 5.2.2).

Sixteen icons (53%) were observed to have a clear and uniform boundary. Fourteen (47%) icons were found not to have clear or uniform boundaries (see Table 1). Some of the reasons that they had unclear and non-uniform boundaries were because of poor implementation of features such as shadow or background, or a lack of a defining outline. In this case, approximately half the sample conformed to the recommendations. This means that half of the icons were easily visible on their web-pages because they were clearly separated by a clear and uniform boundary; and half of them were not as visible as they could have been. A clear boundary allows the viewer's eye to more easily focus on an icon. It can also draw visual attention to an icon. In this case just under half of the icons were not providing a boundary to draw and focus viewers' visual attention.

Colour

Good use of colour is subjective, context dependant and difficult to evaluate. In this category, colour was evaluated as either being a benefit or a

detriment to the icon. This was determined by asking if the icon was breaking any of the suggested guidelines as recorded in *The Icon Book* (Horton, 1994, p. 163-182). These guidelines cover gestalt qualities as applied to colour such as balance (warm with cool colours), along with established artistic practices of complement (colours that do not clash or overwhelm each other), and contrast (of colour value). See Appendix B for definitions of criteria. These guidelines are supported by other design how-to books (Adams & Morioka, 2004; Evans & Thomas, 2008; Visocky O'Grady and Visocky O'Grady, 2008).

Thirteen icons (43%) were observed to contain colour that was beneficial to the icon in terms of visual appeal and supporting (or, at least, not distracting from) the visibility and message clarity of the icon (see Chart 1). The University of Waterloo's icon (Figure 5) is an example of colour used well. The white and red contrast well and the red is not detracted from by the use of any other bright colours. In addition the red is used to highlight the bubbles and so does not inhabit a large area such as a rectangular background which could overwhelm a foreground. Use of colour in seventeen icons (56.7%) was observed to contradict the colour guidelines and best practices outlined for icons. A narrow majority of icons were assessed to have poor use of colour.

Figure 5 – Good use of Colour. IM = white, Bubbles = red - supports contrast and draws attention- University of Waterloo's IM reference icon. (University of Waterloo, 2008). Used with permission.

Rice University's icon is an example of poor use of colour (Figure 6). This icon does not have a high contrast of value, "the most basic colour relationship," between the two main elements of the icon (Evans & Thomas, 2008, p. 124). The light yellow of the smiley face, made lighter by the shine effect, and the light blue of the chat bubble are too close in value. This gives the icon a washed out look and makes it hard to see. In cases where colour was deemed to be detrimental, it could be because colour is an especially nuanced area, and if library staff

manipulating the graphics are doing so without much training or experience in visual arts, this could account for shortcomings in this area.

Figure 6– Low Contrast Colour. Rice University's IM reference icon. (Rice University, 2009) Used with permission.

Style

The style categories were also drawn from *The Icon Book* (Horton, 1994, p. 138-143). The style categories represent a continuum of simplification, one of the defining characteristics of icons. The most complex style category is 'Photographic Realism,' which contains the most amount of detail. Followed by 'Illustration,' which describes a drawn style which includes less detail than a photograph but is still quite detailed. 'Simplified Drawing,' the most common icon style and excludes non essential detail (e.g. a yellow smiley face does not include ears or hair). 'Outline' is a kind of simplified drawing, which is simpler yet because it can only describe the outer edge of each feature of an object. 'Silhouette' is next which contains no internal detail. Text is the most simple style category because text is a basic symbol system using outline or silhouette (see Appendix D for definitions). Table 2 illustrates how many icons were classified to be each style type.

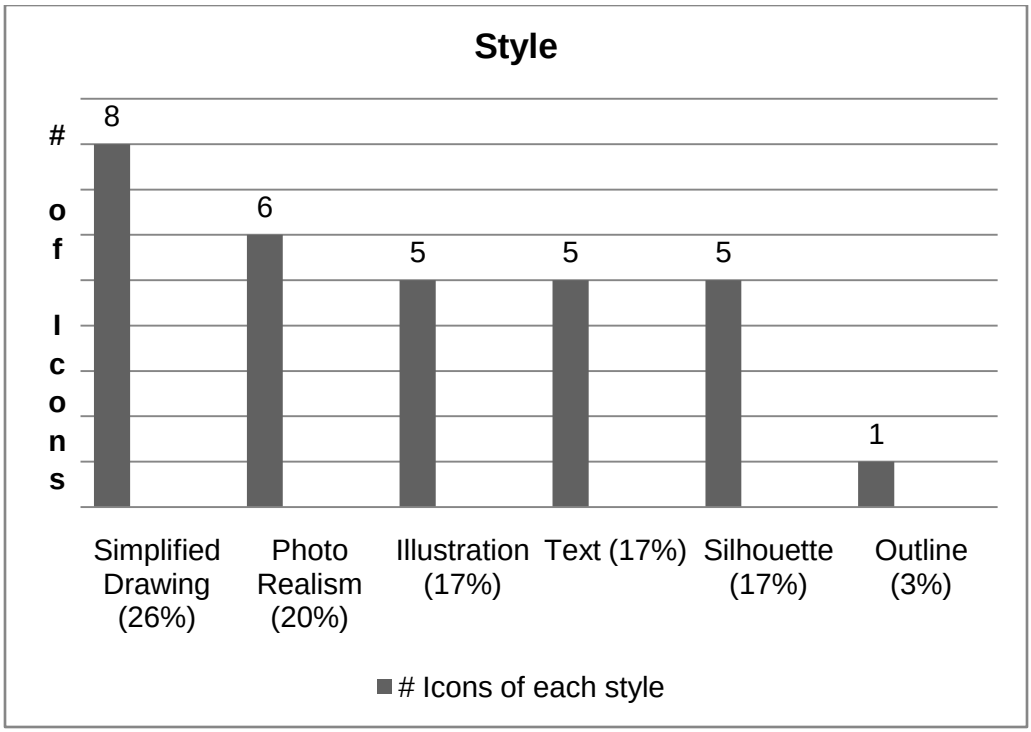


Table 4 – Results for Style. Displaying the number of icons assessed to be each style type.

There was no style found to be in the majority. Eight icons (26%) were identified as simplified drawing, the most common style for icons (*The Icon Book*). Six (20%) icons were photographs (photographic realism) Five icons (17%) were illustrations; both these styles are generally considered too detailed for icons (*The Icon Book*). Five (17%) were silhouette style, which is one of the most simplified styles. Five (17%) were considered to be word marks or predominantly text. The category of wordmark was added to contain the icons whose defining characteristic was that they were textual. One icon (3%) was considered to be outline style.

Taken together (all categories other than photo realism and illustration) there were 19 (63%) icons in compliance with design best practices and 11 (37%) that did not comply (Chart 2). What this means is that these icons used styles that did not aide the goals of communicating clearly, quickly and easily. For example, the illustrative cartoon style of the PSU cat on a computer icon

(Figure 7) was too detailed for its size which caused students difficulty seeing it clearly (they had to get close to it) and many remarked that it was too small. In addition, students were distracted from the main message of the icon – “online reference” – by details such as the cat’s sunglasses,(students wondered why he/she was wearing them) and what kind of animal it was, which should have been clear from the shape, but was distracted from by the details.

Figure 7 – Illustrative Style. Penn State University’s IM reference icon. (Penn State University, 2008). Used with permission.

As with all categorical systems there were icons that contained more than one style. For example, the UA chat symbol (Figure 8) was considered to be in the simplified drawing category because of the inclusion of the detail in the chat bubble (i.e., the text), to clarify the speech bubble symbol. It also uses outline and silhouette styles; however, in order to get a picture of trends within the sample it was necessary to assign each icon to only one category, the one it fit best. The majority of icons are using recommended styles.

Figure 8 – Multiple Styles. University of Alberta’s beta IM reference icon. (Balcombe et. al, 2009). Used with permission.

Visibility/Visual Appeal Summary

The above four categories are related and do impact each other. For instance, use of a colour that does not contrast enough with the foreground or background is also detrimental to the visibility of the icon. Cross tabulation of those icons which had high contrast (17) showed high numbers of this group also had clear and uniform boundaries (11 or 65% of the 17) and beneficial use of

colour (12 or 71% of the 17). Conversely those with low contrast (11) also had unclear boundaries (7 or 64% of 12) and detrimental use of colour (11 or 100%). These results indicate that there was a significant number of icons which were not considered to be either highly visible or visually appealing. What this could mean in a practical sense is that these icons would not get the attention of users or would not invite them to use the service they represent. A summary of the overall results for all for categories of visual appeal (contrast, boundary, colour, style) is presented inTable 3.

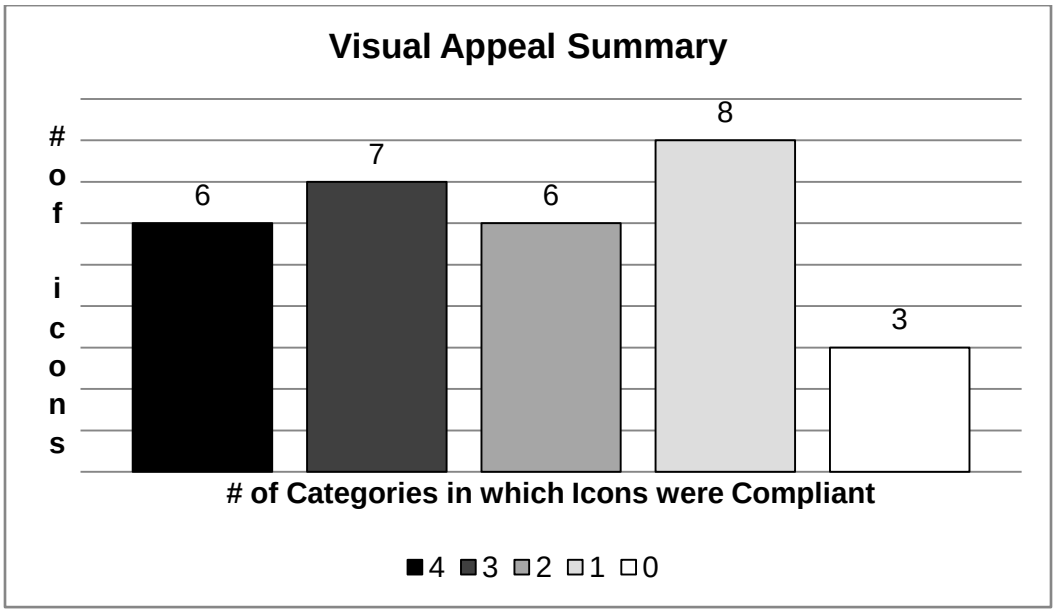


Table 5- Visual Appeal Summary. Shows how many icons were compliant across a number of visual appeal categories.

Taken together, the results indicate the majority of icons (19 or 63%) in the sample are compliant with two (50%) or more of the visual appeal standards and guidelines (Table 5). However, there was a significant number (11 or 37%) of icons in this sample that were only following standards in one out of the four categories (24% or less). These icons were not considered to be either highly visible or visually appealing. What this could mean in a practical sense is that these icons would not get the attention of users or would not invite them to use the service they represent.

Comprehensibility

According to ISO documents the standard testing process to assess comprehensibility of an icon before it is included in any standard includes questions regarding the meaning of the symbol and what people think it indicates in certain settings (International Standardization Organization, 2007). ISO considers responses which are outside the designer's intended meaning to indicate a lack of comprehensibility. In this case, the researcher could not remove the lens of personal perspective which included knowledge of library reference services. This meant that the researcher's ability to "see" through the eyes of an average student and imagine possible meanings for the icons other than the intended meaning was impaired. Therefore, it was necessary to evaluate the comprehensibility of each icon in a more quantitative manner. In order to assess the comprehensibility of the icon, the amount of information presented was examined. The purpose of this was to evaluate the icons according to the design principle of "less is more" (Ludwig Miles van der Rohe, 1974 in Bowers, 2008, p. 72). "Simplicity equals strength. The less convoluted and more direct a concept, the more memorable and effective it is" (Capsule, 2007, p. 59). More specifically, the icons were assessed according to the idea that multiple messages, if they are not arranged in a strong visual hierarchical relationship, run the risk of interfering with each other and becoming lost to the viewer (Sudick, 2006; Bowers, 2008).

Three categories of information were used to collect information on the icons; What, Who and How. The category of "what" included information regarding what students could do or receive, such as ask a question, get help, research assistance, etc. The category of "who" included information regarding whom students would be chatting with, such as an expert, a librarian, someone who could help them, etc. The category of "how" included information regarding how students could access the service such as: chat, IM, real-time, instant, now. Icons were considered to contain a message in a particular category if they contained an element that could be clearly identified as providing information falling into that category. For example, the inclusion of a chat box would be considered an attempt to provide information relating to "how" the service is

delivered, and can be accessed: via IM. How well these messages were communicated by the visual elements was not something evaluated in the assessment, but was examined with students in the interviews.

As an example, the University of Manitoba's VR Icon (Figure 9) contains the visual elements of a book case, a person wearing a headset and the text "Ask a Librarian" and "ON LINE" during "open" hours. There are two or three "what" messages, books and the word "Ask" along with a person with a headset – usually symbolizing "customer service." There are also two "how" messages, the headset indicating over the phone and "online" meaning using the internet. There is also a "who" message "a Librarian." None of these is shown with more emphasis than the others. You could say that "Librarian" is emphasized because it is red and is upper case, but "ASK US" and "ON LINE" are also in upper case and the white contrasts more with the blue, so these words stand out more. There is not one thing that draws the user's attention and sends a strong primary message. Therefore it may be hard for a viewer to select a clear meaning for the icon, and there are conflicting messages about how so they will likely not be able to reconcile these because neither one is visually singled out as more important. "Capturing, maintaining, and focusing attention are important considerations in strengthening appearance of meaning" (Bowers, 2008, p. 76)

Figure 9. Many messages of equal strength. University of Manitoba's IM reference icon. (University of Manitoba, 2009) Used with permission.

Icons are intended to have one, clear, primary message, which is emphasized above all others. As Bowers (2008) describes, "When some elements are presented as dominant over others, it is easier to understand the whole form. That is what the ISO is looking for when they conduct their user

testing, a meaning that does not vary greatly among viewers. Information on the composition of the icons and how this impacts comprehension was gathered during the student interviews. The assessment was the first step in determining if icons were at risk of having too many messages which could potentially detract from their clarity. SeeTable4 below for a summary of how many icons contained more than one message.

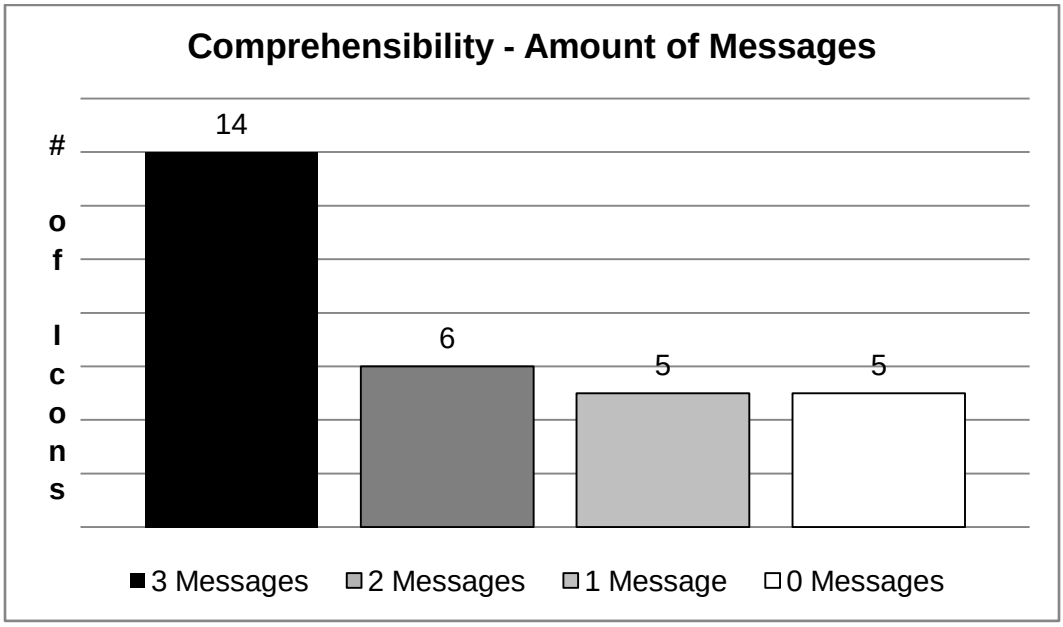


Table 6 – Comprehensibility. Shows the number of icons containing 0-3 messages.

Almost half of the icons (14) contained only one message. Six contained two messages (Table 6). There were only five icons which included three messages, and these were all text icons because it is very difficult to communicate this much information effectively in graphic form. There were 5 icons which were considered not to contain messages in any of the three categories because the symbols they used were not specific enough. For example, Yale University had a computer as its IM icon (Figure 10). A computer indicates that the service can be accessed via a computer. This was not specific enough to be considered a “how” especially since there are other modes of accessing reference through a computer such as email.

Figure 10 – Non-Specific Message. Yale University's IM reference icon. (Yale University, 2007-2009). Used with permission[1].

The kind of messages represented in this icon set says something about their context, and about what library staff are trying to communicate. See Table 7 for the total number each kind of message was represented.

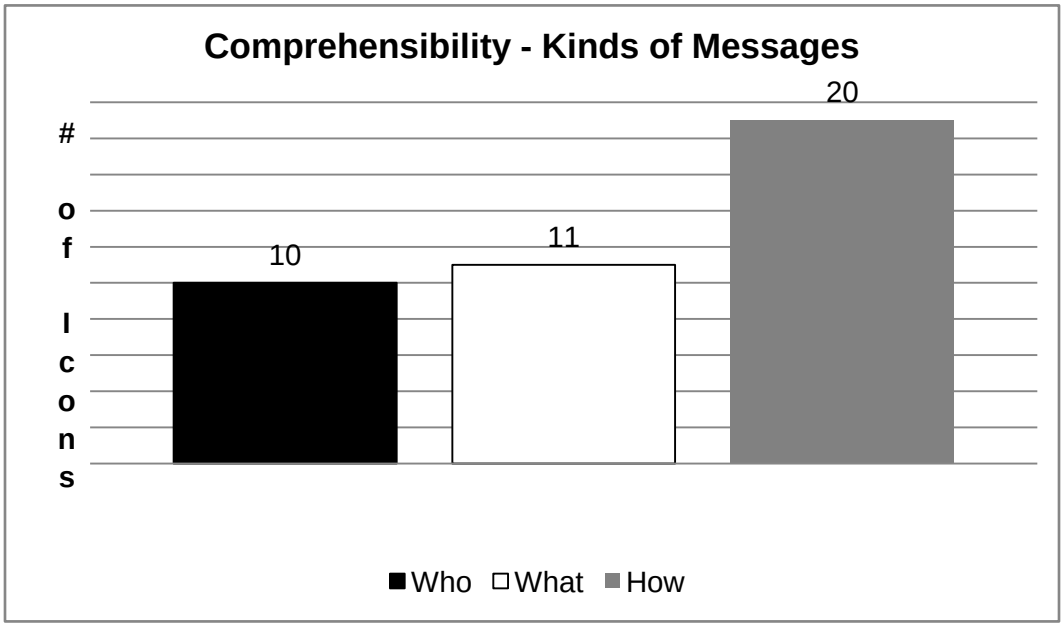


Table 7 – Comprehensibility. Shows the total number of times a message type was represented by icons.

[1] Yale has since updated their "Ask! A Librarian Services" page (http://www.library.yale.edu/reference/asklive/index.html) and replaced the outdated photographs with more modern graphics.

The majority of the icons (20) included information on how to access the service (Table 7). Eleven icons contained information regarding what users could do with the service. Ten icons included information communicating who users would be contacting. It was not surprising that most of the icons included information on how to access the service because most of these icons were part of an icon set where each was primarily referring to a mode of access. This informs research question number two: what are some of the common and unique features of current library icons? In this sample it was most common for IM icons to include a message of "how" the reference service would be delivered. This reveals that these libraries are using the delivery method to characterize and differentiate between their reference services and raises the question, is the communication technology used to deliver the service the most important thing for a user to know about the service? A possible assumption that could explain the dominant number of "how" messages in these icons is that other information about the service is communicated elsewhere and that in the webpage context the method of delivery is considered the most important message.

Most of the icons had information regarding the "who" and the "what" present on their webpages in the form of titles or explanatory text (these are called enablers by Horton, 1994, p. 30), so it was redundant to have this information within the icon. Redundancy in design is sometimes called "noise" (Horton, 1994, p. 30). This is akin to the concept of noise in many communication models. If there is redundant visual information it slows down the recognition and decoding processes of viewers, leading to less direct communication of the primary message.

Comprehensibility Summary

Comprehension is a very complex concept which is difficult to measure. In the assessment only two small aspects of comprehensibility were measured in the assessment of this category, the type and amount of information present in the icon. Presence of information in a particular category was assessed with consideration of potential users' perspectives and ability to perceive these

messages. More information was gathered regarding comprehension in the interviews with students.

What was found by this analysis was that the majority of icons (20 or 67%) contained messages communicating how to access the service, which is appropriate. Approximately half (14 or 47%) of the icons contained only one message, which follows the principle of simplicity. Approximately one third of the icons (11 or 37%) contained more than one message, and five of them did not contain any clear message. Therefore, overall, the majority of icons in the sample were employing good design practices that assist comprehension.

Accessibility

Interaction

The ISO standards assume that web icons will be active and can be selected (International Standardization Organization, 2003, sec. 5.1.3). The most common method of selection is using the mouse pointer and clicking. Eighteen icons (60%) were clickable, meaning that they led to where users could type in a question and start chatting. Twelve (40%) were not interactive, or clickable (Table 8). Although the majority of icons were clickable, 40% is quite a high number considering that it is a very common, almost defining aspect of icons. Non functioning icons are not able to act as a gateway to the service and software they represent. This means that they are not as useful to users and will

not be as closely associated with the service.

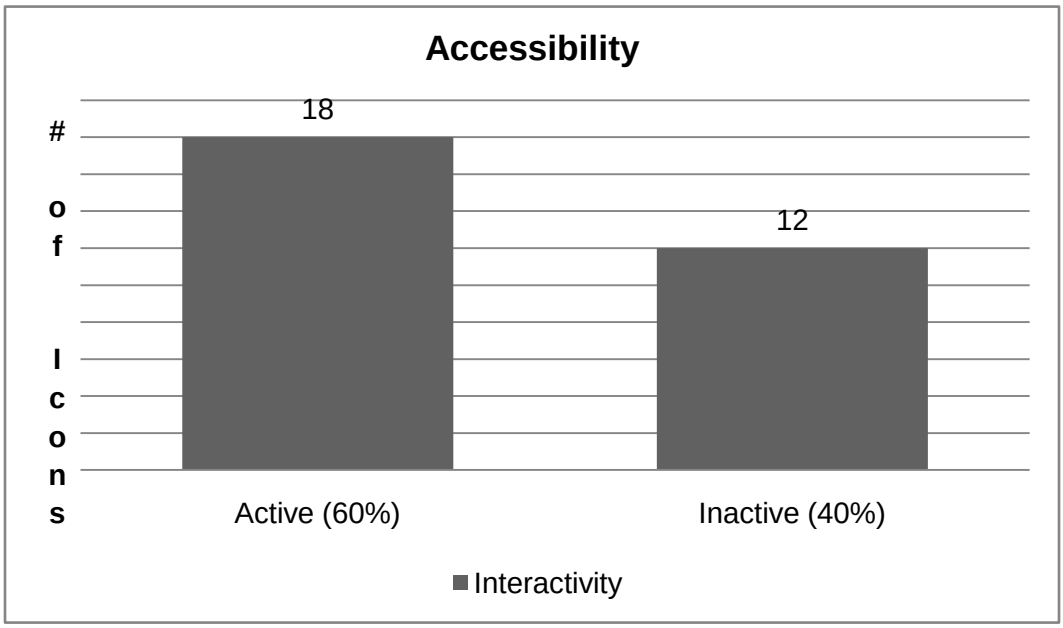


Table 8 – Accessibility. Number of active and inactive icons.

State Change

State change is when an icon's appearance changes to demonstrate that it has been selected or activated. For example, when a blue link changes to purple by default to signify that the URL has been visited. State change is also called visual feedback, and it is an ISO standard. "There shall be visual feedback when a function has been invoked…" (International Standardization Organization, 2003, sec. 5.1.4).

Out of the 18 (69%) icons which were interactive 16 (53%) of them showed state change or visual feedback when selected. Only 2 icons did not.

Accessibility Summary

Accessibility is not an option; it is essential that icons provide quick and easy access to the services they represent. Results in this category show that 40% of the icons in this sample are not active. Not only are these icons not in compliance with web icon standards and best practices, they are possibly posing

a real barrier to students accessing the services they represent. This possibility is based on the general confusion users felt when there was more than one way to access the service and no primary way made obvious. The icon is usually the most visually obvious object on the page and if it is not interactive and the service has to be accessed some other way, such as through a link or a non-obvious chat box, then this takes closer investigation of the part of students. All this to say, non-active icons make access more difficult and point to a lack of web design knowledge or non standard application of that knowledge, because this is such a well known convention.

Alternative Text

Only 4 (13%) out of 30 icons had alternative text, 26 (87%) did not. This indicates that libraries are not following the W3C guidelines for accessibility, as this is one of the most basic and measurable ways listed by the guidelines to ensure that icons are readable by those who are using assistive technologies to view the web. Without alternative text these icons may not be perceivable by those viewing the web who cannot see images and need text translated into other forms such as large print, braille or speech (WCAG, 2008, guideline 1.1.1).

This is an important and easy to implement principle of the WCAG guidelines. The large number of libraries not in compliance with this guideline indicates that there may be a large problem regarding use of visuals and accessibility on academic library websites.

For possible explanations for such low compliance with this important standard see the staff results section.

Placement

This category specifically addresses placement of the chat icon on the library website in locations other than the reference page. This was investigated, after design literature (Horton, 1994) and LIS visual marketing literature (King County Library System and University of Washington, 2002) suggested that this

was an important aspect for users to learn to recognize the icon and its associated function.

Investigation of icon placement was divided into two areas, the home page and the rest of the site. It was found that only 8 icons (26.7%) were found on the home page. A large majority of sites (22 or 73.3%) did not have the chat icon on the home page. Of those that did not have their chat icon on the home page, 12 of them did have some kind of umbrella or general wordmark or graphic on the home page pointing to the reference page. The other ten only had regular text links to their reference page. Only a minority of icons were found on their home pages; this might be due to limited space available on these important pages. There is evidence for this in the interviews where web design staff at Guelph and Washington specifically expressed a limitation in the amount of space a reference icon was afforded on the home page.

There were some cases where the chat icons under investigation were only found on the home pages and not on the reference pages (where often there was a different chat icon). University of Washington was one such case where the button (Figure 11) was on the home page and then the chat bubble symbol was found on the reference page. Use of two different symbols to represent one service can be very confusing to users in terms of their recognition and recall of the icon and its meaning.

Home Page **Ask Us Page**

Figure 11 – Different IM Reference Icons on One Site. University of Washington (2008). Used with permission

Occurrence of the icons on pages other than the reference and home pages was even lower than the rate of occurrence on the home page. Only 4 (13%) icons were found on other pages on the website; Twenty-six (87%) were

not found beyond the home and reference pages. It should be noted that sites that had embedded chat box widgets where students could immediately type in their question on the page that they were on did often have these on more than one page of their site; however, none of these chat boxes included a chat icon.

Cross tabulation of the home page and other page categories shows that half of the icons which were found on the homepage (4) also were found on other pages on the website. Often this was because the icon was made a part of the header or menu that appeared on every page. This is one easy way to make sure that students become familiar with the chat icon and the service and that it is always at their fingertips for quick use when they are on the library website.

Consistency

Consistency refers to a number of aspects that are recommended to be consistent across icons within an icon set. ISO standards specifically require consistency among icons in their manner of selection and visual feedback (International Standardization Organization, 2003, sec. 5.1. 3 -4). Consistency of style is also recommended by ISO (International Standardization Organization, 2003, sec. 5.2.2). It is considered good practice when designing an icon set to have a high level of consistency among the icons. This creates a visual unity which can be explained by the gestalt principle of similarity. According to Visocky O'Grady and Visocky O'Grady (2008) "The principle of similarity states that objects which share similar attributes – such as size, colour, shape, direction, orientation, weight and texture - are perceptually and cognitively grouped together" (p. 64). Consistency refers to the style, line weight, shape and colour, among other aspects. This does not mean, for example, that the background has to be the same colour or shape for every icon, but that the background of each icon fits within a systematic, cohesive plan for that set. This assists the viewer in recognizing them as part of a cohesive group.

The aspects of consistency for which the sets were examined included:

- Contrast
- Border/boundary/background
- Style
- Shape
- Size
- Colour
- Viewpoint
- Dimensionality
- Shadow
- Typeface
- Interaction
- State change

These criteria were only applied to icons which came in sets, where the other ways of accessing the reference service also had icons and they were displayed together on the reference page. See Table 9 for a summary of the consistency of icon sets by aspect. There were twenty-two (73%) icons that had sets. None of those icons were consistent in all aspects listed above. Most sets (16 or 73%) were consistent in their interactions (Table 9). Icon sets were found to be most inconsistent in the areas of dimensionality and style. Seventeen (77%) icon sets were inconsistent in their dimensionality. This usually meant that one icon was three dimensional while the rest were two dimensional. Fifteen (64%) icon sets were inconsistent in their style. When icon sets were inconsistent in style it often meant the use of more than one style of symbol such as silhouette and outline or illustration and simplified drawing. Many of the sets were inconsistent in a number of areas. The rest of the aspects showed between 5 (23%) and 13 (59%) icon sets as inconsistent.

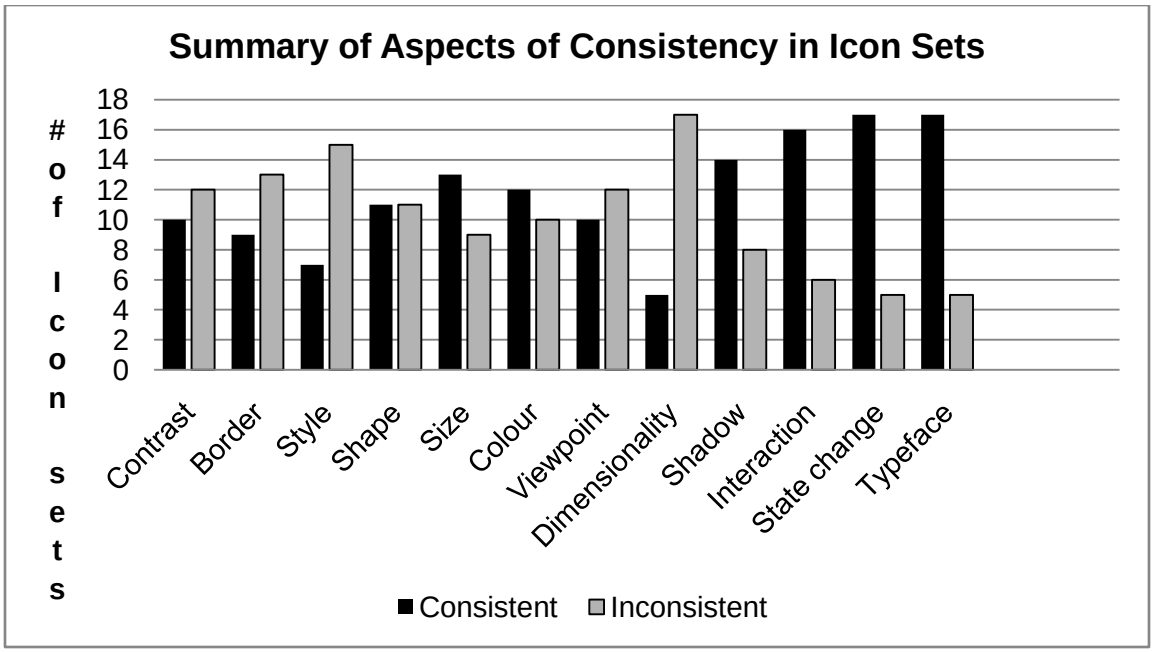


Table 9 – Consistency of Icon Sets by Aspect. Illustrates the number of icons sets that were consistent and inconsistent in each area where consistency was evaluated[2].

The University of Washington (UW) icon set on their "ask us!" page (Figure 12) is a good example of a number of different inconsistencies. The chat, phone and mail icons are simplified drawings while the email is an outline and the in-person is a silhouette. This icon set also happens to be inconsistent in terms of dimension as some are three dimensional and some are two dimensional. This inconsistency evolved organically over time as new icons were added to old ones.

[2] All of these numbers are out of 22 icon sets, eight only had an icon for their IM reference service and not other modes of access.

Figure 12 – Inconsistent in Size, Style, Contrast, Boundary, and Dimension. University of Washington's icon set. (University of Washington Libraries, 1998-2009). Used with permission.

McMaster University (Figure 13) and Purdue University (Figure 14) icon sets were the closest to being consistent in all categories. Both sets were inconsistent in their activation (not all icons were active) and style (both mixed silhouette and outline in an inconsistent manner). For example Purdue only used an outline for their face-to-face icon; McMaster only for their email.

Figure 13 – Inconsistent in style and activation. McMaster University's icon set (McMaster University and Amanda Etches-Johnson, 2009). Used with permission.

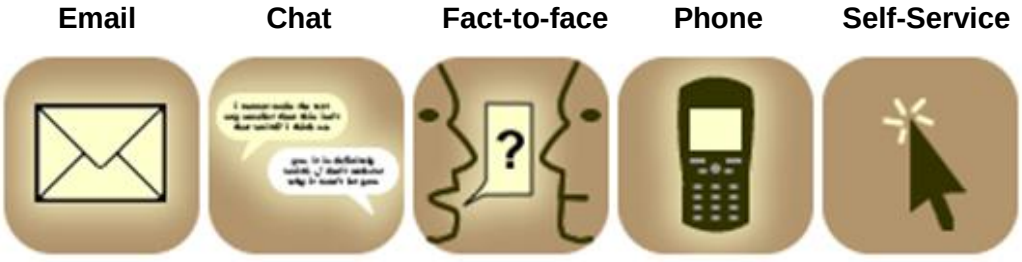


Figure 14 – Inconsistent Style and Activation. University of Purdue's icon set (Purdue University, 2008). Used with permission.

Dimensionality and style are two complicated design aspects to standardize, in comparison to more straightforward aspects such as size; therefore it is possible that the higher level of inconsistency in these areas indicates that library staff in charge of these icon sets may be either designing the sets themselves or putting the sets together themselves from available icons. In addition, as they are not professional designers, they may lack the training or the time to devote to the minute details of visual consistency..Alternatively, design expertise may be blocked from being applied by a collaborative process which does not favour the design voice above others. Overall the observed lack of icon set consistency is a substantial indicator that the majority of these sets were not professionally designed.

Less Significant Assessment Categories

The results of some of the categories were less meaningful or interesting either because they showed an overwhelming conformance to a standard or because there was not a significant number of the sample, over one third of which did not conform. Typeface was a category, for example, in which every single icon met the standard of being visible and legible (Table 10). A variety of fonts were used, though these were not recorded. Therefore discussion of this section is limited.

Other categories with less significant results are; Discriminability, Consistent Visual Appearance on Website, and Extensibility. Discriminability, allows icons in a set to be distinguished from one another, and of the twenty-two icon sets, thirteen (59%) of the icons were easily distinguishable. In other words, there were no two icons which could be mistaken for each other visually, or in meaning. Lack of discriminability in an icon set causes confusion for the viewer because they know that there would not be two icons for the same thing in the same interface. It casts doubts about what the real signified or represented meaning of certain icons is. These results (Table 8) only suggest that the difficulties the IM icons have in terms of comprehensiveness extends to the other icons in a set in nine (41%) cases.

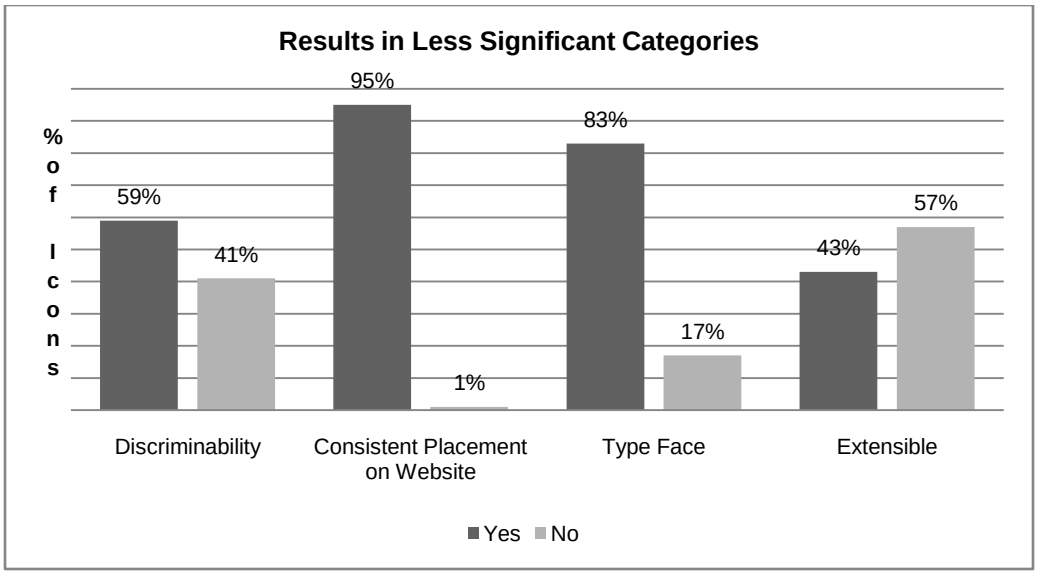


Table 10 –Results in Less Significant Categories. Shows the number of icons which conformed (yes) and did not conform (no) to standards in these categories.

Consistent visual appearance on the website refers to the IM icon being displayed in different locations on the library website. The W3C (2008) guidelines recommend consistent identification of “components that have the same functionality within a set of web pages” (sec. 3.2.4). In this case, websites were examined to determine if the IM chat reference service was represented using a consistent icon or multiple and inconsistent icons. Of twenty-two icon sets, twenty-one (95%) were represented consistently on the site; however, fourteen (67%) of those icons were technically consistently represented because they were only found once on the website. Seven (33%) icons were found more than once and consistently represented. This is much too small a portion of the original sample to draw any meaningful conclusions. However, it does reveal that the majority of the icon sets were only used in one place, on the reference page. This does not follow the marketing best practices of using the icon repeatedly in context so that the user becomes familiar with it and its associated service.

Extensibility refers to the idea found in marketing and graphic design literature that a good logo can be used in many different contexts. Specifically icons were evaluated for whether they would be readable in different sizes and in black and white. If icons would not scale or would not be easily visible in black

and white they were considered not to be extensible. A slight majority, seventeen (57%) icons were found not to be extensible without modification. This is a common logo design and marketing consideration which could support the theory that there is a lack of professional designer involvement with the creation of these icons; however, it could also indicate that libraries may not view these icons as logos for their services. Both of these lines of thinking require further investigation before anything can be known conclusively.

Icons were found to be mostly in compliance with these categories and the standards they represent. Unfortunately, these are less basic design principles and more best practices. This indicates that libraries may be more successful applying marketing than design principles to their icons. The application of marketing principles seems to follow general acceptance of and support for the importance of these in LIS literature (see King County Library System & University of Washington, 2002; MacDonald et. al, 2008).

Summary of Three Main Category Overall Results

Sixteen (53%) icons out of thirty were 100% successful in more than one of the three essential categories. Four (13%) of those sixteen were successful in all three. That means that there were 14 icons which were successful in none or only one category.

Only one icon (University of Pittsburg) was 100% successful in all of the three essential categories (see http://www.library.pitt.edu/reference/index.html). This means that the majority of icons did not fully satisfy more than one essential category. This indicates that as a whole over half of the sample of icons is not in compliance with the most essential criteria for effective icons.

Icon Results in Ten Categories that Applied to All Icons

Criteria	Yes	No
contrast	17	13
boundary	16	14
colour	13	17
style	19	11
comprehension	14	16
clickable	18	12
placement other than reference	12	18
type face	25	5
extensible	13	17
alternative text	4	26
Totals	**151**	**149**
Out of a Possible Total of		**300**

Table 11 – Summary of Icon Success and Failure in Categories that Applied to all Icons. "Yes" means those icons did satisfy the criteria, "No" means they did not.

As a group, the icons satisfied close to half of the criteria they were assessed on (Table 11). Further analysis of the successes and failures within each category and among meaningful groups of categories reveals some of the common areas where this group of icons failed.

Summary of Assessment Results

As a group the icons only satisfied approximately half of the assessment criteria. In terms of the three most important areas for icons to be successful, only one was successful in all three categories and a minority were successful in two out of three of the categories. This indicates that for this sample the majority of icons did not meet the most essential icon design criteria. This raises a need for more research investigating the causes of this gap between library icons and icon best practices.

Areas where a significant number of icons did not conform to recommendations were, placement and alternative text. In addition, the majority

of icon sets were visually inconsistent. These are areas where this group of academic libraries could improve the effectiveness of their icons.

Student Interview Results

Introduction

The student interview data were first considered on their own to discover emergent themes in keeping with the grounded theory methodology. Students' impressions of the icons were grouped and a picture of how the students as a group responded to each icon was formed. The results of the interviews taken together were then considered in comparison with the assessment results in order to see where they agreed and disagreed. From this, conclusions about the assessment and its effectiveness in certain areas were drawn.

The interviews provided evidence in support of the importance of icons to establishing a positive identity for a service and its institution. There are risks associated with using visuals to represent a service or organization because they do evoke strong reactions in people, which can be in a library's favor, or not. One student, while trying to navigate to the reference page commented, "Library websites are notoriously confusing." This is a decidedly negative association. Another expressed disappointment with an institution for what he saw as a breaking of copyright law. "Their site just went down in my eyes...it seems like they are stealing icons form MSN and Yahoo." Again, this is an unintended negative association. Another just felt confused by the thinking that the icons represented to him. "I wonder why the mascot is chatting with the librarians. I think the mascot should generally be limited to the sporting events" He did not identify school mascots with the academic aspects of a university.

One student felt that the icon was targeted at a much younger audience than it should have been and that made him feel like the library had missed the mark ".It makes me automatically disrespect the site that I am at if it is meant for adults." The same student felt that the connotations of an icon style were

inappropriate for their institutional setting. “I think the crazy background is enough to indicate that something nutty is about to happen here.”

The above comments came from three different students. One student in particular felt that if the icons were too cute and cartoonish that the library was trying to “dumb down” their site or trying to be “cool” and that it made him feel “talked down to.” This same student, when asked what kind of style he associated with the library responded that he felt that a more professional style would be more in line with a university that is striving for “excellence in research” and which would have a lot of international visitors. This was a fourth year undergraduate student who also worked for the university and who possessed, by his own admission, some UA pride.

As we can see there are significant consequences, in terms of student perception, for the decisions institutions make regarding their icons. This is motivation for libraries to consider carefully the images they use and to make use of user-centered design processes to ensure that their icons say what they want them to say.

Description of Student Participants

The student participants who volunteered for the study were all full-time graduate and undergraduate students at the University of Alberta. Individual profiles will not be given and quotes will not be attributed to specific participants (unless their background is relevant) because the focus of the interviews was to explore some general impressions of library icons, not to discover perceptual differences among students of different programs or genders. In addition, no obvious perceptual differences between student groups was found. The participants are described in the following section as a group.

The participant group consisted of four undergraduate and four graduate (three Masters and one Doctoral) students. The undergraduate students came from the Faculty of Arts with the exception of one from the Faculty of Science. Students belonged to the following departments: psychology, classics, political science, and drama. Graduate students came from the Faculties of Arts and

Rehabilitation Medicine and were in the departments of Linguistics, Humanities Computing and Speech Pathology. They had undergraduate degrees in Computing Science (x2), Education, and Linguistics. An effort was made to recruit students who did not have formal training or work experience in library and information science. However, two of the students did have close personal relationships with librarians and it was discovered that one student had worked as a student assistant on a library project a few years prior to this study.

Background

In addition to educational background, students were asked about any training or experience they had with marketing, visual design or web design. They were also asked about their comfort level with technology, their use of IM and their use of libraries. The results of these background questions are discussed in the sections that follow.

Marketing, Visual Design or Web Design Experience

Both of the graduate students with computing science undergraduate degrees did have training and experience with web design. However, neither claimed any visual design training or experience and one, in particular, did not consider him self a designer, because he did not create designs; although he said he could and did modify existing designs in the course of his web development work. One undergraduate student had some experience creating web pages and a flash application as part of his part time job as a student Instructional Technology Assistant.

None of the other participants claimed training in marketing, visual design or web design beyond a general understanding of marketing practices gained in undergraduate psychology classes. However several students mentioned that they occasionally had created posters using Photoshop for their school and part-time work.

Comfort with Technology

Students were asked how comfortable they felt using technology in their daily lives. A few of them were obviously quite advanced technology users due to their training (Computer Science) or their natural inclinations and work (Instructional Technology Assistant). All of them said they felt “very comfortable” or “quite comfortable” with using computers for the “basics” or the “normal things.” One student expressed that although he was quite good at using computers he did not “get new technology very often. For example, I still don’t have an iPod.” Another felt that although she was very competent at the day–to-day use of technology, she relied on her technology savvy spouse for anything beyond what she considered “normal” use. Overall, the students in this group were very comfortable using computers and the internet in their daily lives.

Use of IM

Students were asked if they use instant messaging (IM) and how often. All of the students responded that they had used some form of IM in the past and were currently making use of some type of IM. The majority of students only used IM for personal communication. Two students said that they had, or currently were using it for work communication.

The IM clients mentioned were MSN, ichat, Gchat, AIM and Facebook IM. Six students mentioned using MSN as their chat client. Two of those six were still using MSN on a regular basis. The other four were no longer using MSN and were exclusively using Facebook chat to keep in touch with friends. One student had only used IM in Facebook. Another student was currently only using Gchat. It is worth noting that within this group, there was a trend towards exclusive use of IM in Facebook. One student said that “Facebook has made [other forms of IM] obsolete, at least in my world.” This trend is both a testament to the popularity of this social networking site and an indicator that these students tend to use IM technology where they “live” rather than using an external client. This supports the use of site hosted chat software on sites that want to provide IM, as it seems

the majority of this group of students will use IM within environments where they are doing other things rather than using a stand alone IM software.

All of the students were familiar with IM, knew what it was, and had some level of experience using IM. Three of the students made frequent use of IM and four students made occasional use of IM. One student said he only used it for work as a requirement and expressed a dislike for the mode of communication. He found it “annoying” because he often would get lost in the other computer activities and forget about the chat conversation. The rest generally felt it was a good way to communicate with friends who were both geographically near and distant.

Use of Libraries

All of the students reported that they used the library website for online resources as well as the building to take out books. All but one student (in Rehabilitation Medicine) used library resources regularly for their coursework. Two undergraduates said that they use the library for studying and printing. Five students (2 undergraduate, 3 graduate) said that they preferred to use online resources to paper ones for writing their papers.

Awareness and Use of Library Help Services

All of the students were aware that library staff could be asked for assistance with using the library and research. Four students said that they had asked library staff at the desk for help. Two of them said they just asked the librarian they knew personally, if they had a question.

Six students were aware of the library chat help service at the UA. Two of them found out about the service from the librarians they knew, two of them saw it on the library website and two of them heard about it from their peers. Of those who were aware of the chat help only two used the service. One intended to use it, but it was closed, and he never went back.

That only two of eight students (25%) had sought library help via the library website is relatively close to other findings. For example, The University of Ohio conducted a survey of graduate and undergraduate students regarding their interest/use of emerging library technologies. They received 5, 299 student responses, and of those only 15% had asked for librarian assistance via the website (Booth, 2009, p. 68).

Overall, the group was mostly aware that assistance is available in the library and via phone, email and chat. All of the students had accessed assistance from library staff in one form or another. This is a relatively high rate of use of library help compared to other studies.

General Opinions of Chat Assistance Offered by Libraries

The student group does use IM, mostly for personal communication. Students were asked what they thought about using IM to get help from the library. Three students who had not used the library service before thought that it would not be something they would try out. A student with a close association with a librarian said that she would just ask that person rather than use the IM service. Another said, “I never thought of doing anything but talking to them in person, I wouldn’t be tempted to do that [IM].” A third seemed more open to trying the IM service, he said, “It [library chat help] seems like not a bad idea. I don’t know how often it would be used. I don’t know how much I would use it personally or if it would be a waste of time to have someone sitting there all day and they would only get a couple of questions.” This student did not think that the service would be popular enough to warrant staffing it, even though they did not seem to feel the same way about the help desk in the library.

Two other students felt that they would use a chat help service to get quick answers. One student said, “If I need it immediately I do chat, otherwise I prefer email because I can sequence it myself.” This was consistent with this student’s preference for email over IM in general because he preferred to come back to his messages rather than be tied up while the person is finding the answer. Another student said, “If I was in a hurry I would go to chat, but

personally I would use email more and visit." This student was often looking for books rather than online articles so he did not see the point of IM when he would have to go into the library to pick up the book anyway.

The two students who had used the IM service told of their experience. Said one, "I've done instant messaging with the librarian once or twice to get some information. Once I was having trouble accessing an article through Blackwell synergy, so I had a technical question that I asked." This student was an undergraduate and said he would use IM again but it was not something that he did often. One graduate student had only recently used IM; his experience is relatedbelow.

> "I used live chat a month ago. It was a methodological question and the reason I haven't used them thus far is that I am not looking up stuff people know about. You know what I mean? It is unreasonable that a person would know. I recognize that general knowledge in research would help but I generally think I am a good enough researcher that I am catching most of those things. She was able to suggest a tweak to existing searching. I will use it again and probably earlier so that they can inform my first queries. It blew my mind there was a person I could talk to and hash it out with. You can use your supervisor, but their fields of study are so different from mine it is not always useful."

This student felt that the service would be most useful in the formulation of his search. He also was pleased to have someone to work with in the process.

The students who had used the service generally felt that it was of use to them. Students who had access to library help through a person in their lives were not interested in using the service. Those who were not aware of the service prior to the interview were not particularly interested in using the service, and did not think that others would be aware/interested in using the service either.

Discussion of Student Preference Results

Favorites

Throughout the interview, students were asked to choose the icons that they preferred in general. They were usually asked which ones they liked the best or if they were offering a chat help service which ones they would consider using on their website, and also if they were to choose one to go on the UA's website which one they would choose. After each stage of the interview (icon out of context, icon in the context of its set, icon in its web context) they were asked to reconsider all of the icons and if their preferences had changed and why. Table 12 displays the results of the students' final choices.

Student's Favourite Icons			
Institutions	**Icons**	**First**	**Second**
University of Alberta (UA)Libraries (beta)		4	3
University of Guelph (UG)Libraries		3	2
University of Washington (UW) Libraries		1	1
University of California Irvine (UCI) Libraries		0	1

Table 12 – Results of Student Selections of Preferred Icons. (Balcombe et. al, 2009; University of Guelph, 2008; University of Washington, 1998- 2009; University of California Irvine, 2009). Used with permission. Note: Not every student chose a second favorite.

Visual Appeal & Message Clarity

The students mainly gave reasons related to visual appeal and message clarity when explaining why they chose certain icons as their favorites. This student referred to both when asked to explain his choice: "…it got across its intent quite easily. It is not that visually appealing. But it is quick and to the point, that is probably what I like about it". Factors contributing to visual appeal were visibility, colour and style. For example, this student felt that the colours appealed to her, "I like how the colours kinda go together and it looks cheerier and newer and more inviting cause it's yellow and that's happy." Factors contributing to clarity of message were how easily the students understood what the icon stood for and how sure they were of the primary message. One student chose one icon over another because out of context the meaning was clearer to her. She said, "Alone the [UA] icon makes more sense than [UCI] to me." She also felt the [UA] icon was her favorite in context because it was easy to comprehend and use, which for her, was tied to the visual simplicity. She said, "I felt it was all very clear and easy online. I liked it visually…"

Conversely, icons that were not chosen as favourites were identified as "ugly," "boring," "dull," "ambiguous" and/or "confusing". One student quite liked the UW icon out of context but felt that it was visually unappealing in context and so discarded it as her favourite. She said, "I thought I would like [UW] but at the end I didn't like it that much. I don't think it fits in the webpage. Aesthetically it didn't appeal." Students felt strong dislike for icons that they found particularly vague or confusing. For example, one of the icons which students did not understand well was the PSU IM icon of the cat on the laptop. Four students went out of their way to say that they did not like this icon because it did not make sense to them. For example when asked, "Which icon did you like the best?" a student replied, "Not the cat!"

It became clear that visual appeal and message clarity were two of the most important factors to consider when designing icons. This is consistent with icon design research. For example, Huang et. al., (2002), in their study of the main factors involved in the design of computer icons, identified "styling quality"

and “message quality” (p. 241) as two of the five top factors. Huang et. al.’s “styling quality” corresponds very closely to what we call “visual appeal.” However, what we call “message clarity” actually includes a third factor mentioned by Huang et. al.: “Meaningfullness,” which has to do with recognizability of the symbols used in the icon. Huang et. al. found that meaningfulness and another factor, “locatability,” which they define as including the familiarity and the discriminability of the icon, were the most important. If we examine Huang et. al.’s results in the context of this study then our findings do support the importance of their main factors. However, message clarity and factors of discriminability were not found to be any more important than factors of visual appeal. This may be because of the lack of statistical analysis performed on the data in this study. More in-depth quantitative data from a similar study may confirm Huang et. al.’s finding that message clarity is statistically more important than visual appeal.

Web Context

When students discussed their reasons for rejecting earlier favorites in favor of others and for changing their minds from earlier stages of the interview the reasons they gave generally related to the web context and the consistency and quality of the icon set. In this example, “I think the UA trial one isn’t bad as long as they change their [chat] icon. It stood out because it [the design/layout] is more compact and no repetition,” the student did not feel the UA IM icon was clear in its meaning by itself, but felt that in context, and with some changes, that this icon set was his favourite. To see the UA icon in context see Figure 15. A similar response was provided by another student: “I think [UW] would still be my first choice, but after I saw those green ones online …they looked really good in context.” One student who initially liked the UG IM icon rejected it as their favourite in the end, “because [UG] was so boring in context” (see Figure 15) Note that the comments on the context were also focused on the visual appeal, and the contribution to message clarity.

University of Alberta

University of Guelph

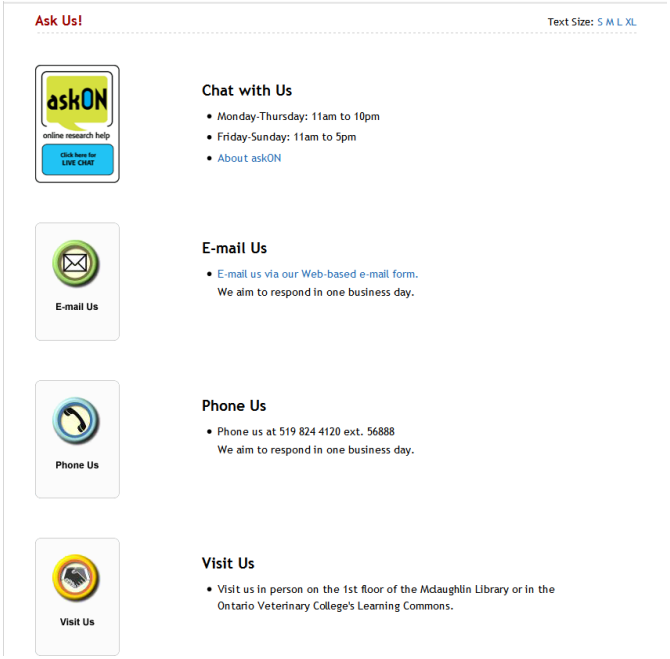


Figure 15 – Web context. University of Alberta vs. University of Guelph. (Balcombe et. al, 2009; University of Guelph, 2009). Used with permission[3].

[3] The University of Guelph has since updated their non IM reference icons and changed their reference page context as well (http://www.lib.uoguelph.ca/assistance/ask_us/).

Icon Set

These comments are related to consistency of icon set. It was clear that consistency in terms of style was an important factor contributing to the visual appeal of the icons. One student said, “I like [UG] by itself but I like [UA] better as a set. I like it better because the set goes together better and it goes with the site too.” Another felt that the lack of consistency in one set made them not like the IM icon as much. He said, “the circles look cheap. It is not consistent. If I could make these ones [in the set] as good as the first one [chat icon] then I would like it.”

Students definitely noticed the inconsistencies in style among icons and they felt strongly about these inconsistencies. Sometimes they assumed a lack of effort on the designer’s part, such as when a student referred to the non-chat icons in the Guelph set as “cheap.” Another said that they felt that the designer could have put more “effort” into one icon in a set that was not 3D. Another student commented on a set where she liked the first one but not the rest, “I think they did a good job with the first one and just got lazy.”

Students also felt that the inconsistency might have meaning; for example, that the Kent State chat icon might indicate a staff preference for students to use the chat mode of access because it looked “newer” and “more designed.” This speaks to the importance of carefully considering visual choices so as to avoid unintended messages.

It was clear that students preferred visually consistent icon sets and that this contributed to the overall visual appeal of the web pages we viewed. The visual appeal of the UA set may have been the deciding factor for students who chose this as one of their favorites. Conversely, the UG would have been chosen first rather than second in at least one case, maybe more if they had a more visually consistent and appealing icon set.

Use of Photos

The UW button and the UP laptop icons (Figure 16) were the only two included in the group of icons shown to students which contained photographic elements. In addition there were photographs in the UA context associated with the chat icon (Figure 17). In the case of UP, as has been discussed, the photograph of the laptop reminded almost all students of a catalogue for a store selling technology (e.g., Future Shop). However, student reactions to the photographs featuring people in the UW and UA contexts offered a great deal of insight into the mindset with which students might approach library chat help services. Two themes emerged; first that all photographs were not equally appealing to students. Second, that six out of the eight students said that they would have preferred not to have photos that they felt were of actual library reference staff. These themes and student reasons for their preferences will be discussed in the following sections.

UP Laptop **UW Button**

Figure 16 – Icons containing photos. University of Pennsylvania and University of Washington. (University of Pennsylvania, 2009; University of Washington, 1998-2009) Used with permission.

Figure 17- Reference Page Photos of People. University of Alberta. (Balcombe et. al, 2009). Used with permission. These flip between yellow/her to green/him on mouse over.

All Photographs Are Not Equally Appealing

A few students commented that the UW photo was “ugly” or did not look professionally done. When asked what made them think that they identified the grey background as well as the small size and the unflattering treatment of the subjects as factors that made them think the photo was not professionally done. When asked why she did not like the UW photo one student said, “It is a small picture and the profile pictures are not that great. I think the person would even think it was a bad picture.” Another felt that it was unappealing because of the lack of background. She said, “Aesthetically it didn’t appeal. For example the UA pictures were pretty and they had a background, those pictures were pretty but I don’t think these ones [UW] are appealing.” In addition, this student felt that she would be more likely to use a service if the associated picture was of a person with a smiling, warm or welcoming expression who “looked nicer.” One student felt that if he saw a photo of a person with a serious expression that he would assume they were high level expert in their field. This would cause the student to only ask them really hard, very academic questions that he considered worthy of their expert attention.

Show Me a Representation of a Person But Not a Real Person

When students viewed the photographs on the UW and UA sites they felt that these photographs indicated they would be getting help from a "real person" as opposed to a database or an automated response. Several of them expressed that getting help from a real person was their preference. "Obviously it is way easier when you can give your question or inquiry to a person. It is easier to communicate than browsing through and FAQ." However, the majority of students voiced a preference for seeing an icon or an illustration of a person vs. a photograph of an actual library staff member. They felt that these other representations still indicated "person" but did not make them uncomfortable. One student even said that a photograph of a person that she could tell was "stock" and therefore some model or person in the universe but not a library staff member was preferable because it felt more comfortable to her to be communicating with a faceless person. This idea that students felt more at ease with a representation of a help person, as opposed to a picture of a person who could actually be chatting with them, came up repeatedly.

When asked to explain these feelings of dislike for the photos or why they would prefer a stock photo or graphic representation of a person one student explained, "I don't need the picture of the person there. Because if I want to speak to a librarian I don't really care who that librarian is, I just need help." Another felt that the "real" element of the photos was not attention getting. He said, "to me this doesn't look as appealing because it has pictures of real people. Real people aren't necessarily that exciting to look at on the internet. They don't stand out where as a cartoon would probably more so, or some type of, even ambiguous, logo." This sentiment was echoed by another student, who said, "I think it would be just as clear if I saw a drawing of a person I don't know what else I would expect. It just means person to me. I think the drawing would look better on a website than an icon like this."

The same student felt that the photo of a real staff person sent a strong message. "It is not encouraging me to ask a question it is encouraging me to start a conversation. I don't want to say, "Hey librarian what's happening?" I

want to say, “Where is the book that I need?” Another student interpreted the message in a similar manner; he assumed the intent of the photo was to personalize the service. Of the photos, he said, “they’re lame. I don’t understand why they’ve done that, maybe to personalize it. The pictures aren’t interesting and I feel like they are put there to put a human face on the library and I think they have failed. If you want to put a personal face on it say “Ask Jim the librarian.”

Many students understood that they might not be chatting with the librarian pictured on the UW site because of practical reasons and their experience with randomly rotating images on other sites. However a few students did think it would be strange to be talking with someone who identified themselves with a name of the opposite gender to the photo they were looking at.

One of the more interesting perspectives stated by all four students was that it made them uncomfortable to see a photo of the person who might be helping them. One student commented directly on how uncomfortable the ‘real’ photo made them. She said, “the other one [UA] looked like a photo shoot and it was not actually a person and this looks like it possibly is the person you are talking to and that is kind of creepy.” She elaborated, “technically, it should be nice to see the person you are chatting to, but it creeps me out and I don’t know why. I don’t enjoy seeing the person that I am going to talk with.” This student could not explain why she did not like the UW photo, however, she was very adamant that she did not like the photo and felt it was creepy. She finally offered “I grew up in the digital age, we don’t contact ‘people’.”

Other students were able to express why they did not like the picture of a “real person.” One student said; “I guess I think when you start getting into images of people…it kind of implies more of a personal interaction, whereas, when I’m accessing information, I see that as more of a business interaction, you know? Like I’m sure you might meet some really cool librarians and stuff but my primary goal in going there is just to get some information and I don’t want it to turn into a long interaction with somebody. Usually if I am going to the library, I am doing homework and I’m stressed out of my mind trying to find some papers

or something, so I guess in my mind the idea of library interaction is to get in and get out and very quickly be able to have it. But once you start having faces and stuff there, its like 'oh I should talk to this person, they might have a really cool story or something.' I guess it would just kind of contradict my purposes for using the website."

This student is articulating what some others expressed as well. For these students who expressed discomfort with the library staff images it went beyond an aaesthetic preference. Putting a "real" face on the service meant that it could potentially interfere with how they wanted to use the service. How they wanted to use the service was to get information quickly. As one student said, "the whole reason why I use IM is that somebody is going to pump out an answer right away."

The same student elaborated further on his concerns. He spoke about his experiences using chat help services in general, not just the libraries, where he could tell after a few exchanges that the person was new or would not be able to help him with his question in the way he wanted to be helped. He said that his normal behavior in this kind of situation would be to end the conversation, to "disengage" as he put it and to seek another route to get what he was looking for. He felt that seeing a photo that potentially was of a person that he was talking to would not allow him to disengage as quickly as he would like, because he would not want to offend the person. He also mentioned that he had encountered some inexperienced but "well intentioned" chat help providers who wanted to follow up with emails when they couldn't help him right away and that this was more of a burden than a help because he usually needed an answer right away and would go through other channels and find his answer before the "helpful" emails would arrive.

Understanding how students and other library users view and use library chat help services is the first step in designing an effective icon or logo for such a service. User-Centered design is philosophy that "places the end user at the center of the design process" (Visocky O'Grady and Visocky O'Grady, 2008, p. 25).The LIS literature has an expanding body of knowledge about how students

use virtual reference services at academic institutions (e.g. Naylor et. al, 2008; Booth 2009). The next step, of incorporating the findings of these LIS studies into the design processes for virtual services would result in a more user-centered design process. This would produce interfaces and icons for these services that would take into account how students want to use the services.

Access

Although the students did not often comment on the degree of difficulty they experienced when trying to access the chat services on the library websites, their actions showed that certain things made it harder for them to identify where they should go and what they should do to access these services. In addition, it is worth noting that the sites where the students had the most difficulty accessing the chat service were also not selected as favorites by any of the students.

Two sites where a number of students experienced a significant degree of difficulty accessing the chat help service were Kent State University (KSU) and University of Pennsylvania (UP). The difficulty on these sites was caused by two different layout and design approaches that contributed to the same difficulty. The students could not identify the easiest path to access the chat box. The term “chat box” refers to a widget which is placed on a page and displays an area for entering questions and receiving answers via IM. See Figure 20 for an example.

In the case of Kent State (Figure 18) the students could not see the chat box which is camouflaged, because it is the same colour as the right navigation bar in which it is situated. The low contrast and surrounding text make it invisible. In addition, the placement of the chat box in the right menu underneath a photograph gave students the impression that the column contained news. Students said that they generally would look for a chat box in the middle of the page.

Figure 18 – The Path Students Took. Students first went to the image (1) then adjacent links (2 & 3) then scanned down the page (4) then up to the image at the top (5), often then did not see the chat box. Kent State University reference page. (Kent State University, 2003-2009). Used with permission.

A pattern emerged when students were asked to show how they would use the chat service on this site. They first tried to click the image, which is not clickable, followed by the blue link closest to the image (they did not notice it said, “Click here for hours and more information”), the red text (IMaKSULibrarian), thinking it might be a link, the “ICQ users” link. Finally, still not seeing the chat box, they would scroll down the page and return to the top, sometimes click on the “Ask a Librarian” button, which only reloads the page.

The Kent State page is an example of how failing to heed several of the web icon standards and guidelines can negatively affect student ability to use a service. In this case, the lack of direct access to a service through an icon (the icon was not clickable), combined with spatial disassociation (result of the hidden and uncommon placement of the chat box) of the primary access device (chat box) and the icon, contributes to unfocused clicking by the user. This led to a very frustrating user experience.

On the University of Pennsylvania reference page (Figure 19) students became fixated on what was in the middle of the page (Titled “Already have IM?”) because of its prominent placement to the exclusion of the other, more direct ways of accessing the service, which were made invisible by their lack of contrast with the background and peripheral placement. Many students did not see the most direct routes to accessing the service. The entire section with the title “Penn Libraries Chat” was missed by four of the students. Of those four one eventually saw the “ONLINE now” link on his own but the others did not see it until eventually it was pointed out.

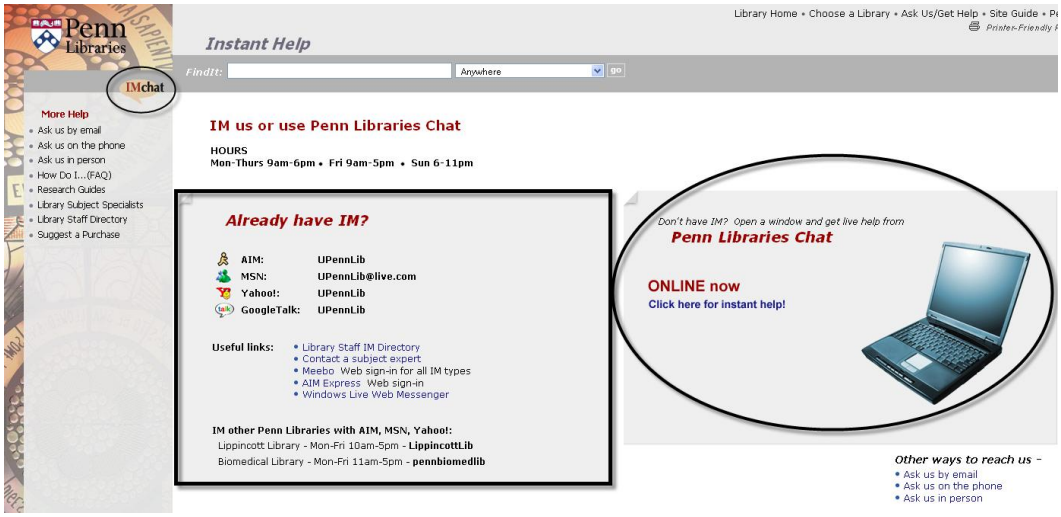


Figure 19 – Areas of student attention. University of Pennsylvania’s reference page. Center left (rectangle) = lots of attention, right side (circle) = little attention. (University of Pennsylvania, 2009). Used with permission.

These are one student’s thoughts while trying to access the IM/chat service:

“Now I have to add them to my MSN. I am looking to see if there is a different way to chat or to call or email or those hidden Meebo boxes. I think that [MSN] is the only way I could chat. I did not see the “IM/chat,” I also did not notice the box with the laptop at all. Now that I see it I would try to click…oh yeah, that makes sense. Why don’t they let that be one of your first options? This box [on the left] is more noticeable.” This student’s conclusion that her only option for accessing the service was via MSN illustrates a significant

consequence of icons with poor visibility for ease of access. This perception was expressed by other students as well; for example, “I would use the MSN, but I wouldn’t really want to install a program. From here I am not sure how to access it, none of their stuff seems to be links.” This student not only felt that MSN was their only choice but that he would prefer not to have to download the MSN client. In addition, this student felt that his next step would be to choose another mode of access. “I might just find a phone number at this point.”

Chat software available on the library website vs. external IM providers

There emerged a preference among this group of students for using a chat service provided by the library site instead of adding a name to a buddy list in some other IM account. This could be because the five students with this preference were no longer using an IM client other than in Facebook. The Facebook chat is restricted to chatting with Facebook friends only. Therefore it seemed like more work to reactivate their now unfamiliar chat accounts or to sign up for new ones than to use readily available software on the library site. There were three students that did not seem to mind adding the library to their accounts if it was the only way or if they thought it would be faster and more direct. Two of these students were regular MSN users.

Overall, this group of students seemed to have a preference for a pop up or embedded chat box that did not require the input of any information. They felt this was easier for them than adding the library to an external chat client.

Barriers to Using the Service

Some of the websites required input of user information prior to the user being able to ask their question. Some students did not understand the reasoning behind having to put in their email or other identifying information. There were also varying theories as to why this information was required and what it would be used for. One student commented, “I guess they ask for email to make sure you are a Penn student. I like it better when they don’t ask for information and you can just start typing. If they ask for email then I kind of wonder if it is actually

going to be instantaneous." This student felt that having to put his email in made it seem more likely that it would be an email service rather than real-time. Another student commented that he did not want email follow up and would not want to put their email in for this reason. Another student also thought that the information was required to make sure that a person was eligible to use the service. "I assume this is for security reasons. It's a lot of extra stuff…it would be really nice if you could just do it. I don't know why you would have to do this, unless they have had a problem with arbitrary people coming on to their website and asking questions of librarians." That the last part was said in a sarcastic manner that implied that the people who worked at the library were crazy if they thought that their chat help service would get popular enough to be crashed by non-students.

Overall, students preferred to not have to enter any information and to be able to ask their question right away. Some students did say that they would not use a service because they felt that there was too much information required before they could ask a question and that this would deter them from using the service. However, the majority felt that although it was not their preference they would go through with putting in their information in order to use the service. This is a case where requiring information prior to access will usually not prevent use of the service but it detracts from the user's experience of the service.

As was demonstrated by the examples of KSU and PSU, lack of visibility due to poor contrast or placement can present a significant barrier to students finding and access to chat services. In addition when icons or images do not look like they are meant to be clickable, in other words, do not look like a way to access the service they are representing they do not do their job of guiding users towards the service. As one student said, "I might just be going to the wrong kind of websites but I never kind of see stuff like this on websites that are used for navigation." In this case he meant both that the icon was too detailed and that it did not look like a clickable feature.

Navigation

When students viewed the icons in context they were also asked to find the “AskUs” or reference page from the home page. The purpose of this was to see if students would notice and recognize any of the visual cues that libraries were using on their home pages to direct students to their reference pages. The results were that the majority of students, with the exception of the PhD student, had some problems finding these pages on some of the sites. When viewing the home pages the students could not identify the links to the reference pages due to poor visibility or placement.

The PhD student had no difficulty finding any of the reference pages. This student did mention that he has ordered materials from other institutions through the UA Libraries in order to gather materials for his doctoral thesis. One explanation for his success may be that he has become better attuned to using these kinds of websites and did not have to rely on visual search but understood the categorical organization system favored by these institutions. A few common causes of student difficulty finding these reference pages presented themselves. The largest problems identified were lack of visibility due to low contrast between links/visual cues and their web pages and placement of these visual cues in non-prominent locations on the home page.

For example, the PSU homepage (Figure 20) has a graphic button on their homepage that says “Ask” which links to their reference page. Five out of eight students did not see this graphic when asked to find the reference page. One of the reasons they gave included, that it was on the far right side. Most of the students saw the “Ask! a librarian” link first because they were scanning the page from left to right and got into the “flow” of the text menus. In addition, the button contains a light blue background which has a low contrast with the light blue background of the box it sits in. The boundary of the button is inconsistent, only highlighting one side of the button and the text “ASK” is white, which does not sharply contrast with the light blue background. All of these contribute to a graphic which did not grab students visual attention.

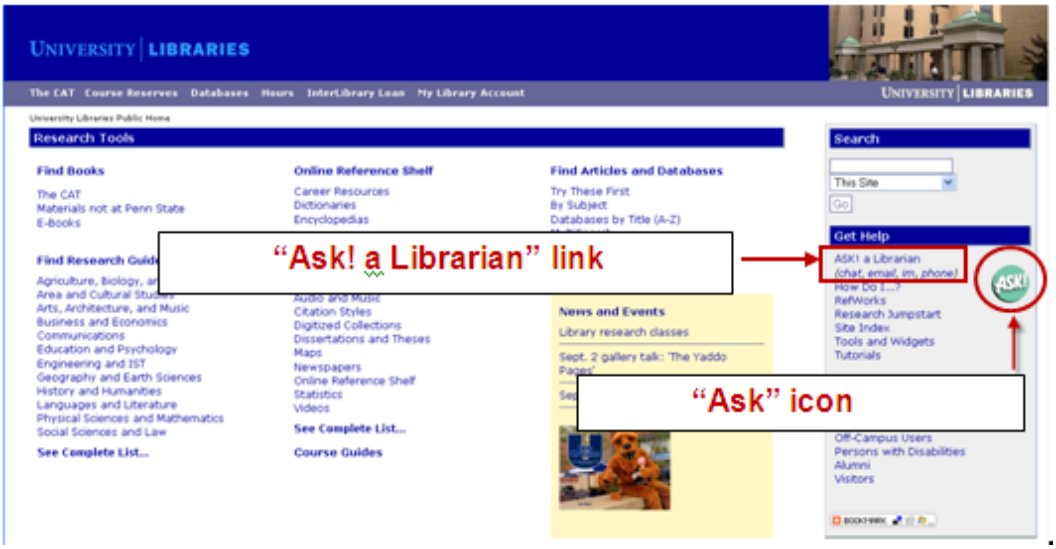


Figure 20 – Navigation Difficulty. In this case students had trouble seeing the "ASK!" icon because of its position on the page (far right) and low contrast. Penn State University's home page. (Penn State University, 2008) Used with permission.

One of the more serious problems which was observed in six of the interviews was that students would often click on the "contact us" links in order to find the reference services pages. They felt that chat, email, phone and in person were ways to contact library staff and so it made sense to them that these would be linked to from the contact us page. As one student said, "I didn't know that there was a difference between the contact page and the page with the chat." Many students made no distinction between contacting library staff for research help and for other reasons. They just thought of the reference options as a variety of ways to contact library staff. When they discovered that the reference page could not be found via "contact us" they were confused, frustrated, and did not understand why it was not there. If students do not distinguish between contacting library staff for research help and for other reasons, then libraries should take that into consideration when designing and labeling their websites. This is a case where libraries have failed to implement user-centered design.

Two students attempted to search library websites for the reference page by entering the title of the page such as "Ask US" into what they thought was the

site search box, but which was in fact the catalogue search. It took a minute in each case for them to realize that the results looked more like books than links to the website. At this point each of them felt that they were “hopelessly lost” or did not know where they were. The students experienced this on institutional sites other than the UA where they did not recognize the catalogue search box.

Results of Symbol Effectiveness

When the students viewed the icons in their web contexts, they understood the meaning the chat icon in each case. That is to say that the students understood these icons represented a service whereby they could contact library staff via IM technology and ask them a question. However, there were a few icons that employed certain symbols and imagery that students found ambiguous without context. In some cases, the students still felt that these symbols did not communicate their intended message even once they understood what that intended message was. In this section, we will discuss these icons and some of the reasons that they were ambiguous to the students.

Ambiguous Icons out of Context

University of Alberta beta

This icon consisted of two pac- man faces with a chat bubble between them contained in a circle/spherical-shaped background. There were many interpretations of this icon when viewed without context. The icon was viewed in a relatively small size (32x32px) (Figure 21), consistent with its size in the original context.

Figure 21 – Ambiguous Relationship of Symbols. University of Alberta’s beta IM reference icon. (Balcombe et. al, 2009). Used with permission.

These are some of the answers to the questions “What do you see when you look at this icon?” and “What does it mean to you?” A common interpretation was that the icon looked like a face. One student said, “that is really puzzling; it seems like an upside down face. When I look at it more closely, I see that it is two people talking. The first impression is that it is a weird smiley face.” It was common for students to mention a face, but when they looked closer and saw the chat bubble, most associated that symbol with chatting via IM. For example; “Two pac men chatting. If you look at it a little further away, it looks like a face.” Two other students were not sure of the meaning, even after multiple close inspections. One said, “I see a talking period. It seems like a speech balloon but it is kind of unclear. My first reaction is that I want it to be bigger. It doesn’t mean anything to me, it is just cutesy. It should tell me something about what is happening, maybe it’s a globe it just seems kind of cartoony.” Another made an association based on his experience with comic books. “It looks like a cross between an alien head and the punisher symbol if you have ever seen that movie. So I’m not sure, I don’t really get a library association from it, I would expect to see that more on a games website or something. It looks like a skull with some sort of a circular outline. I just can’t get past skull.”

Five students mentioned that, at some point, they thought the whole icon looked like some kind of face. Due to the large number of students who saw this icon as a face we know that it is not a viewer-dependant perception and that there is something about the icon that is making the students see a face/head or skull. It is plausible that the round background combined with the round pac-man heads is just too suggestive of a face. The pac-men and the shape of the background are the most prominent elements because they are solid silhouettes. The chat bubble is an outline and so is visually less prominent. Changing the shape of the background to a square may eliminate the visual similarity to a face. In addition, filling in the chat bubble so it is a silhouette might also make the main message of “chat” more clear.

Three students also commented on the size and clarity of the image. They suggested that it should be larger and sharper to increase recognition. The students who commented on the clarity pointed out that when the background

fades from green to yellow the contrast between the yellow background and the white foreground is low.

The same student who felt the icon looked like a green skull also felt that it could be a halo (chat bubble) and angel wings (pac-men) or a symbol for head phones (combining the top arch of the chat bubble with the pac-men below). This particular student could see so many possible meanings and really felt that they still didn't get "chat" from this symbol even after seeing it online, "When that says "Online Chat" I can *kinda* get some faces and a talk bubble out of that." According to Horton (1994), when one viewer produces multiple meanings in a single context and is unsure of what the intended meaning is, then an icon is ambiguous (p. 28). This, coupled with the interview results showing so many students first saw this symbol as a face, an unintended representation, tells us that without context the relationship of the symbols is not correctly perceived. This means that it does not contribute to the viewer's understanding in the web context. We can tell that the symbols are recognizable themselves because they were eventually identified by all of the students as "pac men" or "people" and a "chat bubble." Therefore, it is the context of these symbols (e.g. the background shape and colour) as well as their relationship with one another (e.g. placement) that confuses viewers.

University of Washington Chat Bubble

The speech bubble was widely used in library chat reference icons and was an important symbol to test as an emerging symbol for IM technology.

The UW icon only contained one symbol, the speech bubble (Figure 22). So the purpose of including this icon was to see how closely the students associated the bubble with chat or IM. The majority of students (five out of eight) thought that the speech bubble symbol in an online context meant IM, and they were pretty sure about that. One student said that he thought the speech bubble was a "standard" icon for chat and he "would expect a chat window if I clicked this." Two others recognized the bubble because it was associated with chatting online in other contexts. They felt that it was a familiar symbol they recognized

from other IM contexts. One replied to him it meant “instant message because I have seen that icon a lot in MSN and other places.” The remaining students were aware that this symbol was also used sometimes to mean “forum” or “comment” or to indicate some other kind of communication online. Two students felt that it did not necessarily mean talking via IM and that it could indicate some other kind of verbal communication.

Figure 22. Speech Bubble as a Symbol for IM/chat. University of Washington’s speech bubble IM reference icon. (University of Washington, 1998-2009). Used with permission.

Penn State

This icon was illustrated in a detailed style and some students felt that it was too detailed for its size (see Figure 23). As one student said, “It is also too much detail for an icon. In my understanding they should be much simpler.” As with the UA beta chat icon, there was some variation in what students saw and understood the icon to mean out of context and some found it ambiguous. One student said, “I don’t really know…this might mean that it’s an entrance to a chat room.” Another could draw no specific meaning from it. “It’s a cat on a computer, it took me a little while to figure that one out. It looks like a cat on a computer but it kinda looks like a dog on the other end. Kinda small. Some type of electronic thing, you can do something on a computer here.” Another thought it illustrated searching, and another, typing. “This is kind of funny, is that a cat or some sort of fox? It could stand for typing…generally confusing.”

Figure 23 – Ambiguous Icon. Penn State University IM reference icon. (Penn State University, 2008). Used with permission[4].

There were some common interpretations. Two students saw a question mark in the cat's tail, "the cat's tail is like a question mark so it is like help. Online help I guess because there is a laptop there." And "I don't really know what it means. There is a tiger with a computer, so what does that mean? If they wanted to show there is a question mark in the tail it is not very obvious. Whatever the author wanted to show by this is not very clear." There were also some unintended interpretations such as perceiving the cat's feet as the face of a dog. See figure 25, can you see it?

The fact that some students perceived a question mark in the tail, or a dog face on the back end and others did not, in addition to the fact that the kind of animal varied (fox, tiger, and cat) indicates that there are some visual elements of this icon which are not clear. The students did not find there was enough information available in the icon for them to be able to tell what the icon stood for because neither the cat nor the laptop provided specific information. As one said, "I don't really know what kind of information they are trying to convey." One student referred to this icon as "vague." The frustration of students who did not know which meaning to believe (searching, chatting, etc.) was proof of the ambiguous nature of this icon out of context. Again, if an icon is ambiguous out of context then it does not contribute anything but "noise" to its web page context.

This finding was supported by students' reactions to the PS icon in context. One student threw up his hands when shown the PS website and remarked, "the cat! I'm biased against this cat already. Why is this cat sitting at a computer and why does that mean I'm talking to a librarian?" Others remarked of

[4] This is the original size of the icon as a scalable version was not available.

their own accord that they did not like the PS icon. One student, felt in more than one case, that the icons were not adding anything and that the text links alone would have been sufficient. He said, “the context is helpful, but then you don’t need the icons.”[5]

University of Pennsylvania Laptop

All student participants felt that this laptop (Figure 24) looked like it was out of an electronics store magazine and that the intent of the image was to sell the laptop. In addition, many students felt that the laptop did not “mean” anything to them in terms of indicating what kind of functions it might represent. Many students also felt that the picture was too large and did not look like a button or an icon. In this case, the laptop actually was an illustrative picture as opposed to an icon and was included purely to test the symbol of “laptop.” Student responses confirmed what was learned with Penn State, which included a laptop as the only symbol beyond the “cat,” that a computer or laptop by itself is too broad a symbol and simply means “computer” or possibly “internet” or “online” but does not indicate IM or chat.

Figure 24 – Ambiguous Symbol. University of Pennsylvania Laptop IM reference icon. (Pennsylvania University, 2009). Used with permission.

[5] If students were familiar with the Penn State Wild Cat mascot then they might have understood the use of the cat in the icon better; however, when the comparison to the UA Bear was made, students still felt that using a school mascot still did not clarify the message of the icon.

University of California Irvine

The UCI chat icon employed the use of two chat bubbles in the foreground coming from opposite directions, containing a question mark and an exclamation mark (Figure 25). The background of the icon was a yellow square with black polka dots which students found distracting and did not like. It was clear that the exclamation mark was an ambiguous element as more than one student expressed uncertainty about what the icon represented. For example, “I couldn’t guess what that would be. It is the fact that there is both there. If it was just the question mark, I would think that maybe my question could be answered here.” This student’s comment illustrates how the exclamation mark modified the associated meaning of the question mark and caused uncertainty. Students suggested that the icon may stand for, an FAQ, a post-it-note logo (due to the yellow square background), a forum or a debate. Three students thought the question mark and the exclamation mark might be separate and link to two different things. Two of those students thought that the exclamation mark might represent somewhere where users could voice concerns and/or complains. More than one student associated the exclamation mark with a negative emphasis. For example, one student said, “Is this an opportunity for me to express vehemence or anger or is someone going to be yelling at me?”

Figure 25 – Ambiguous Punctuation. University of California Irvine’s IM reference icon. (University of California Irvine, 2009). Used with permission.

The exclamation mark seemed to provide unnecessary noise or confusion. The grammar may also have drawn student attention away from the chat bubbles because students more often mentioned the question component than the IM or chat mode of communication. Regarding the question mark, many of them associated it with the ability to ask a question, while some associated it with an FAQ or more information. One student in particular felt that the question

mark was a vague symbol that he had seen used to mean a variety of nuanced things online. He gave examples of websites using question marks beside specific features to link to specific help information as well as to link to their "about us" page, their FAQ. Overall, the UCI icon did seem to communicate that questions could be asked but it was not getting the message across that this is a service where questions can be asked and answers received via IM technology.

Kent State

Kent State's chat icon uses a very unique symbol (Figure 26) that was only observed in one other library included in the larger assessment sample. That symbol is a figure coming out of a computer screen with some written material. In this case the icon is very detailed and those details actually suggested to students that the figure is a female (because of the hair) librarian (because of the glasses and book) and that the material in her hands is indeed a book but could represent other forms of written material. One of the research questions regarding this icon was, "Will students be able to grasp the concept of reference being presented? In other words will this symbol be interpreted to mean "through the computer, in real-time, I can receive information from a librarian?"

Figure 26. Ambiguous Symbol. Kent State University's IM reference icon. (Kent State University, 2003-2009). Used with permission.

All but one student recognized the figure as a librarian and most of them identified it as a way to get help from or to communicate with this librarian. As one student said, "It looks like a librarian crawling out of the screen because they are holding a book and wearing glasses. It could be a way of getting assistance - to get help." It is interesting to note that the staff at Kent State explained that when this icon was developed years ago, it was intended to reassure library web

site visitors that there was a real person available to help them via the website. This message of reassurance that someone was there was picked up by some students. For example, one student said, “I like this one a lot, because even if you are getting online help…they’re assuring you that you are getting help from somebody, like from a real person, you are not getting help from a database that you have to look into it.”

A few students were unsure about the form that that help would take whether it would be a list of resources or an instructional video or lecture. One student said, “the person coming out of the monitor I would think it was a way you could communicate with a librarian or some kind of help documentation.” Students were also mixed on whether this would be talking to a librarian in real time or not. This student, for example, was not sure and mentions several options, “It looks like an online help resource… like an information database resource thing. Like the librarian could answer or respond to questions or there might be a lot of resources like e journals.”

These results show that this icon was effective at showing students they could get help from a librarian online but was not specific enough to tell them what kind of help was available. This icon also failed to consistently communicate that it would be in real time using IM technology. Since this icon is part of a set of icons illustrating different ways to contact library staff, in this case the icon failed to specifically signify the mode of access as IM.

Unambiguous Icons

The unambiguous icons (UG, UW & UPENN IM/chat) all included text. However, two of these otherwise unambiguous icons contained ambiguous elements within them. The UG and the UW icons will be discussed here.

University of Guelph

The UG “AskON” icon included the most text of all the icons (Figure 29). Most of the text was understood by all students, however, the title was not. Half of the students expressed that the title was confusing. In one student’s words, “I

don't really understand what AskON means, especially if the service is closed…if it is off then why is it AskOn?" Another said, "it is confusing to have AskON on the one where it is off, I would be waiting for AskOFF." Students were shown both the available and unavailable versions (Figure 27) of the icon. They recognized the word "Ask" in the title and associated it with asking questions. However, several students felt "ON" could mean the service was online and felt that this was sending mixed messages when used on the "offline" or unavailable version of the icon. One student also felt that AskON could indicate a phrase, that meant something similar to "ask away" in his words indicating "Go ahead and ask as many questions as you want." The "ON" was intended to stand for Ontario as in, "Ask Ontario" because AskON is a provincial wide consortial reference service. The title was ambiguous because several students felt that this title could have multiple meanings and were unsure which was primary.

Figure 27 – Mostly Unambiguous Icon. University of Guelph's "ASKON" IM reference icon. (University of Guelph, 2009). Used with permission.

Four of the students suggested the same solution to rectify the problem, they suggested that the title be removed from its prominent location and that instead of using black and white backgrounds to distinguish "on" from "off" the colour of the chat bubble at the top could be green for online or available or red for offline or unavailable. This colour system is in use on other IM software and seems to be quite universal as it is also related to traffic lights. Green means go, red means stop. This is an example of how borrowing a metaphor or a recognizable symbol from other contexts can assist viewers with recognizing and

decoding an icon. This would not be an effective way of signaling to colour blind people and so they would have to rely on the verbal indication “closed.”

University of Washington

The UW icon (Figure 28) contained a photograph and the phrase “click now to talk to a UW librarian.” Even in context students were unsure if the person photographed would be the person to whom they were talking. Some felt it would be, some felt it wouldn’t be and some were unsure. The word “talk” also proved to be an ambiguous element. Some students said that they were unsure if they would get a list of phone numbers or a chat box when they clicked on the button. They pointed to the word “talk” as the element that was causing uncertainty. In every case but one, students felt that the word “chat,” when used online, referred to using IM technology to communicate in real time with someone via typing. There was only one student who felt that “chat” when seen online could mean some kind of verbal communication. In this case using the word “chat” could have made UW’s icon less ambiguous.

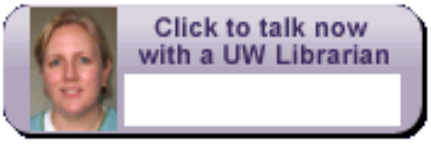


Figure 28 – Mostly Unambiguous Icon. University of Washington’s IM reference icon. (University of Washington, 1998-2009). Used with permission.

Summary of Student Results

The interviews confirmed that the three essential categories identified in design literature for icon effectiveness, visual appeal, message clarity and accessibility, were the factors that most impacted student selection of their favourite icons. Visual appeal and message clarity were found to be more consciously factored into student decisions than accessibility. This may be the result of the study’s design which focused students’ attention primarily on the IM/chat icon itself rather than how it functioned in context. In the assessment the UG icon came out ahead of the UA icon in the area of visual appeal because it

did not have an area of low contrast and similar colours like the UA did. The UW icon lost points for having too many messages.

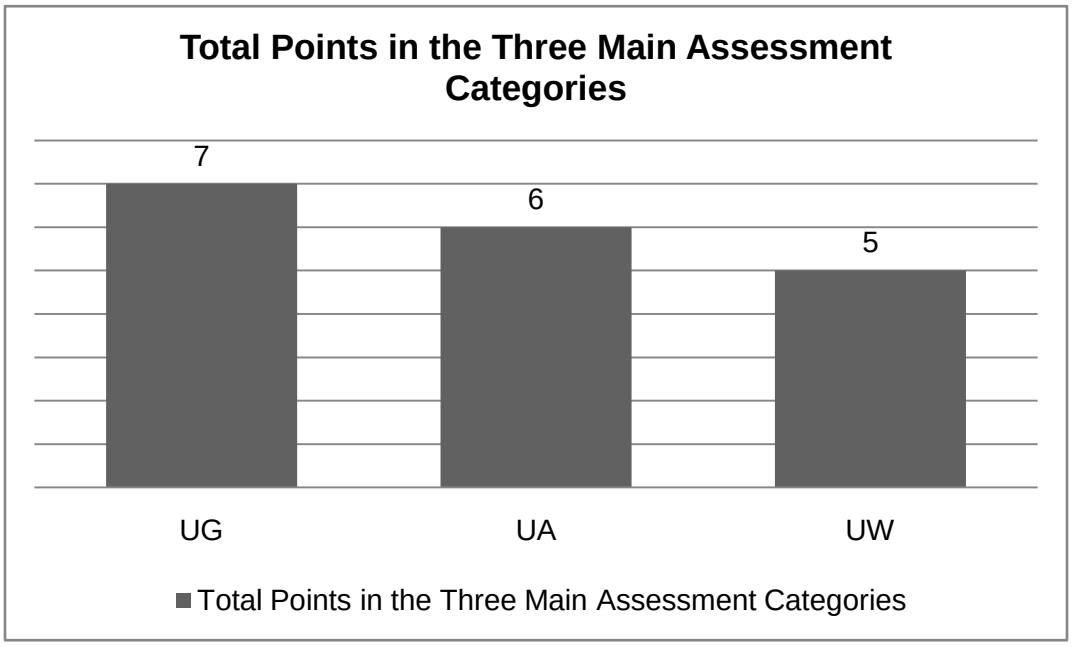


Table 13. Results of Assessment. Total points in the three main categories of visual appeal, comprehensibility, and accessibility. There were four categories in visual appeal (contrast, boundary, colour & style) = 4 possible points. In comprehensibility (out of 3) a point was taken away for each additional message after 1 (i.e. 1 message = 3 points, 2=2, and 3=1). Accessibility was treated as single point, each icon could receive a possible total of 8 points.

As a group the students selected the same three icons that the assessment rated most highly (Table 13), based on the three essential categories, as their favorites (Table 32).

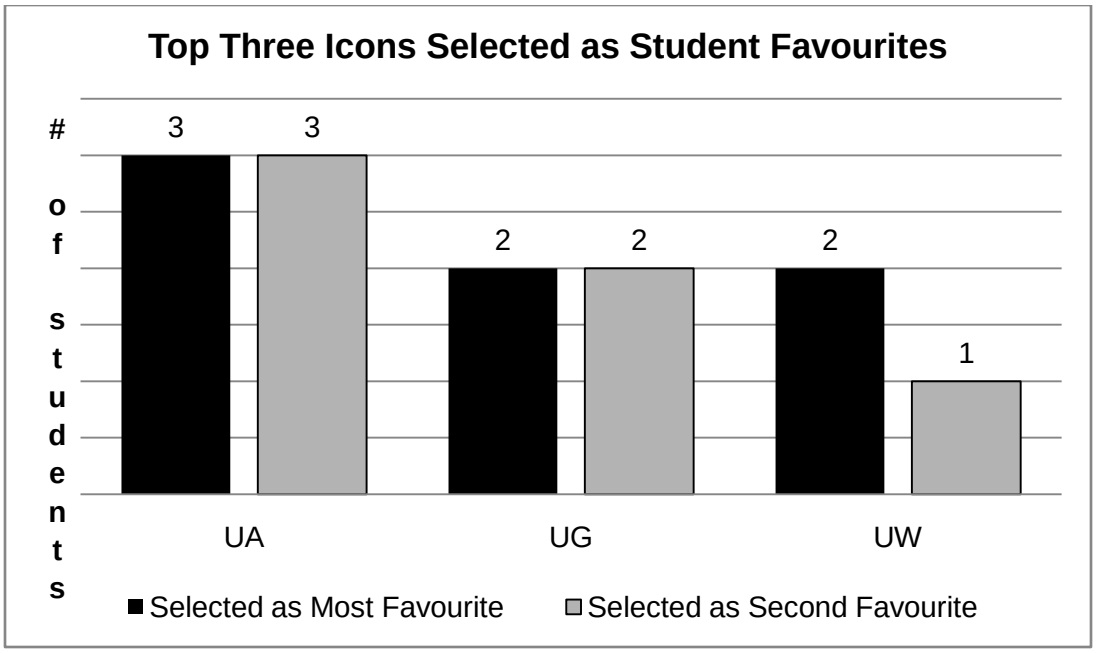


Table 14. Results of Student Selections of Favourite Icons. Student were asked to select an icon they most preferred and to name their second and third preferred icons. One student felt that he did not prefer any icon above the others.

This indicates that these three categories can be used to indicate whether an icon is likely to be more or less effective. Students ranked the three most favourite icons in a different order than the assessment, which indicates that the assessment should not be used in isolation but as part of a larger process, including user-testing and user feedback. One possible explanation as to why students preferred the UA icon to the UG in spite of its low contrast/colour area might be its type. It is purely graphic, whereas the UG is purely text. It may be that students expect to see graphic icons instead of text, which is more similar to a regular link.

The interviews provided compelling evidence for the potential risk for unintended negative impressions when using icons. This reaffirms the importance of following design standards and guidelines and the need for proper design processes to be followed when considering icons. In addition the interviews provided some food-for-thought regarding some aspects of IM/chat service which are related to how the service is experienced by the user but not

directly related to the VR icon. Namely, the students preferred library site hosted IM software and that they preferred not to have to input any information prior to asking their question. These findings could be the basis for further investigation into this area which could confirm or deny these preferences on a wider scale.

The interviews confirmed the power of photographs and that they are best used to represent specific, well known objects, places and people. The interviews revealed that these students were more comfortable with professional photos of representative “people” than they were with snapshots of actual service providers. The motivations and preconceived notions that lay beneath this surface discomfort would be worth considering in terms of the contribution to the continued relevance of library reference services.

The results of the interviews showed that the symbol the students most strongly associated with IM with the chat bubble. This symbol was not seen by students as an exclusive symbol for IM. The speech bubble symbol was best recognized when in a simple silhouette style without any other markings inside (e.g., lines, letters, or punctuation). In terms of comprehension, the icons which were best understood had one recognizable object with strong association. This supports the assessment results of the most preferred icons which were limited in their graphic symbols.

Staff Interview Results

Participant Description

Staff at seven libraries were contacted for interviews regarding the nine icons chosen for the sub-sample. In total, staff at five ARL institutions were interviewed. Staff at two of the institutions, (University of Pennsylvania & Penn State University) were willing to be interviewed but could not be reached within the available time due to a leave of absence and staff availability.

A person involved with the design or selection of the icon (often a member of the technical services staff that worked on web development), was interviewed at each of the five libraries. In addition, a representative of the

reference staff (often a reference manager) was interviewed at all of the institutions except the University of Guelph, where the web development interviewee felt their knowledge of the reference service at their institution was sufficient to answer questions regarding the reference service. In cases where there were two staff members they were interviewed together. This proved beneficial as staff were able to discuss the topic with each other, since the web and reference staff often represented two sides of issues related to the design and selection of the icons; their interaction provided insight into the relationship of these two departments .

Web Staff Background

Staff were asked to describe their training and experience in the areas of web development, visual design and marketing. Table 15 below is a summary of their answers.

Web Staff Background			
Library	**Web Development**	**Visual Design**	**Marketing**
UA	12.5 years of exp.	No training	No training
UCI	25 years of exp.	Batchelor of Fine Art	Experience designing materials
UG	9.5 years of exp.	No training	No training
KSU	12 years of exp.	Some training and 10 yrs exp.	No Training
UW	5 years of exp.	No training; on the job experience.	No training

Table 15 –Web Staff Background. In the areas of web development, visual design and marketing background.

The staff were very experienced in their fields of web design and development. Most of the web staff said that they learned the majority of their web development knowledge and skills on the job. Only two (UCI & KSU) of the web staff had training in visual or graphic design. Two (KSU & UW) had specific on-the-job experience with graphic design. The staff member at UCI was the

head of a design department responsible for all marketing materials, published documents, and the look of the website. None of the other interviewees had training or specific experience with marketing .

In the course of the interviews the staff were asked how they might access expertise in the fields of visual design or marketing to contribute to their work. UA and UG rely on consultants or staff graphic design experts who are part of their web redesign teams. All of the libraries had marketing staff, which were present on committees that had input into the websites.

Web Staff Background Summary

Web Design

Web development staff interviewed had between 5 and 25 years of experience in web design.

Visual Design

Web staff either had training and experience in graphic design or made use of consultants or staff graphic design experts on their web redesign teams.

Marketing

None of the web staff had marketing training although the majority did have input from a marketing expert on aspects of their websites.

Standards

All aware of W3C accessibility and coding standards, most were aware of general design best practices (e.g. consistency). Most were not aware of ISO standards.

Icon Design Processes

Most were collaborative involving the reference and web departments.

Testing

All did focus groups and usability testing on websites which peripherally gathered feedback on graphics, images and styles.

Table 16 - Web Staff Background Summary

Discussion of Interview Results and Themes

Staff Goals and Thoughts on their Icons

Library staff were asked about their goals for their IM/chat reference services and their responses shared some similarities. All the staff expressed a desire to provide different access options to suit different learning and communication styles. A staff member at UW said that their IM service was particularly well used by those with hearing or speech difficulties. She said she personally had helped one student using IM who said they used the service because they were not able to make themselves understood by library staff at the library due to their accent.

One common theme was that the staff intended for these services to serve library users who rarely visit the library. Another common goal was to extend reference service beyond the regular work day by using consortial arrangements to cover different time zones or by incorporating different levels of staff with different hours. One interviewee expressed this common idea as, "…our goal is to provide anytime, anywhere service, to provide options."

Overall the libraries felt that IM/chat service should be available to receive any kind of question, directional or reference. "I don't want to create barriers" said one interviewee. However, a few staff members did express that really in-depth research questions might better be served via an in-person or email interaction. One interviewee said that their institutional emphasis was currently on promoting the subject specialist or liaison librarian channel for people to get in-depth research help.

All of the IM/chat reference services were open to any user, however, in one case (UW) the staff indicated that faculty did not use the service very often and would instead contact their liaison librarian directly. In another case (UG) staff and students were encouraged to go through their liaison librarian who could provide more specialized service. Research giving an overview of faculty vs. student use of IM/chat reference services in ARL libraries may reveal that

students are the primary users of this mode of access and therefore it may be appropriate for libraries to tailor the IM/chat reference experience to students.

Following discussion of the goals of the IM/chat reference service, staff were asked about what kind of messages they thought their IM/chat icons communicated, or what goals the icons were meant to achieve. Surprisingly, (considering of the visual variety of icons) there were a lot of commonalities in what library staff thought, or hoped their icons would communicate. Most of the staff mentioned that they would like those seeking help to know that there is help available, “that we are *here* to help them,” as one said. Another said, “we’re open, we’re here, pay attention to us! Just letting people know these services exist.” UCI staff were unique in their desire to express an element of “fun” via their icons. In addition, several interviewees mentioned that the purpose of their icons was to “catch people’s eye” or draw attention to the service.

The UA staff were more specific in expressing their goals and intended messages. One of those goals was increased usage of their service; “e want to drive more people to the service” said one staff member. Another was to provide a “human face” to the service in order to make it “welcoming and accessible.” This staff member felt that, “Overall, I don’t think students truly understand what the libraries can provide to them in terms of support for their work, and that is always kind of a sorrow because we are not just here to dust the books.” Of interest was testing that showed that users knew where to find the reference services on the website, however the use level of this service was still declining.

Staff had varying degrees of satisfaction with their icons. The UW and UCI staff felt the icons were doing their job, KSU and UG staff felt that improvements and changes were needed. The UA staff still were waiting to see how implementation of the beta icons would be received by students. Although staff objectives for their icons were loosely tied to their icon design decisions (e.g., using colours that would stand out to get viewers attention) these connections were generally more implicitly observed than explicitly stated by the staff. When prompted, those involved with design and selection were knowledgeable regarding aspects of the icon which did or did not achieve their

goals. However in some cases it seemed as though the staff had not critically considered this kind of connection in any detail. A KSU staff member commented that in the course of the interview he considered the icons more than he had “in a long time.”

Some staff expressed their ideas regarding how users of the service viewed the service. One staff person felt that it was seen as a convenience, “they want a quick answer.” Staff at two different institutions felt that the complicated nature of the website and library system drove users to ask directional questions via IM such as “how do I log in from off campus.” The majority of students interviewed did express that what they desired from the service was a quick answer. None of the library staff mentioned trying to appeal to student expectations regarding the speed of the IM/chat services with their icons, and none of the icons contained any reference to speed. This is one example of staff knowledge of their users that is not being applied to the design of icons or logos for their service.

Collaborative Design Decision Making processes

At UCI, where they have a design department, the designer had the final say regarding any icons and also regarding the look of the website. The designer was grateful to have this level of decision making when it came to the icons. “That part of it isn’t done so much by committee, which I am pretty grateful for, they do leave that kind of decision making to me. I do consult though…” In the rest of the libraries decisions regarding the icons were made collaboratively. For example, the web staff would meet with the reference staff or a group of other library staff throughout the design phase to gather staff feedback until a general consensus was reached. The interviews provided evidence that the web staff at more than one institution felt these collaborative processes were hindering icon design and selection work.

These comments echo a common problem that designers have when working with stakeholders to define their needs. Jim Berney works for xDesign – a software user experience design group at Sun Microsystems Inc. He writes,

“Although you often hear designers complain when there isn't enough input from the sponsors to do their work, it can be just as bad when there's too much input from potentially the wrong stakeholders” (May 19, 2008). He describes the situation of “design thrashing,” where concept after concept is put forward, but none seem to strike the target of what the customer is looking for. According to Berney design thrashing can result from having “someone in a role of authority, but the wrong role to provide the information, override the information you have already received” (ibid.) In this situation he recommends getting back to a basic set of priorities, ideally provided by stakeholders, ideally lead by an appropriate stakeholder who takes responsibility for the outcome. Essentially Berney is saying that there has to be one appropriate stakeholder ultimately responsible, and that this will discourage others from derailing the process.

One staff member echoed the idea that too many cooks in the kitchen can spoil the outcome. He said, “I think when you are talking design and making decisions in a group it’s hopeless. Because you get ten different opinions on what is good design and what is not.” He has found that it is hard to get a group of people to agree when it comes to matters that are subjective such as visual appeal of icons. In some cases, this decision making process can lead to trying to satisfy all points of view to gain consensus. Jeremiah Owyang, describes the situation as when stakeholders needs overwhelm web experience design (SNOW), the result of too many masters to serve, and serving none. Owyang says that a SNOW situation can been spotted by a resulting website, “where there’s such a jumbled mess of content on a webpage, you know it’s a battle from internal stakeholders” (June 2, 2009). According to Owyang it is common to see “this jumble of information” on large corporate websites.

Do library websites suffer from SNOW? This is a larger issue in library web design, however we can consider the impact of SNOW situations on icon design. In terms of making decisions regarding icon elements such as symbol, colour and shape, the pursuit of consensus can lead to including a hodge-podge of elements that do not complement one another or, which taken as a whole, are misleading. For example, the UA IM/chat icon looked like a head due to the combination of the circular background and the use of the pac-men. These

elements were included as the result of stakeholder's opinion, some of whom liked the pac-man idea, some the chat bubble, and some the spherical shape. It is possible that SNOW situations in icon design are contributing to library websites where, as Owyang puts it, users are forced "to trudge through a confusing experience, where each laborious step results in frustration then abandonment" (ibid.). Certainly this would explain why at one university, the reference staff have received feedback from students that they would rather IM reference staff send a link to what they seek on the library website than attempt to find it themselves. This is an appalling situation where staff time is not properly used and users are not well served by their library's website.

At another institution, a staff member felt that the opinions of staff involved with the service were considered grounds for action in place of evidence supplied by research. He said, "I think part of the issue is that our [reference staff and management] tend to come to conclusions when it comes to stuff and want to change [things] before we can actually investigate why there is a problem." This illustrates the concern that staff input will supersede user research which is the core of user-centered design (Visocky O'Grady and Visocky O'Grady, 2008, p. 25). This could also be an example of inappropriate stakeholder input overriding other input (Berney, 2008). In addition, some examples were provided by staff that indicated that these processes might provide some barriers to the best design decisions being made. Two of those examples are discussed below, the photograph, and historic icons.

The Photograph

At UW, the web staff commented, "At first we just wanted to use stock photography but [Reference Staff Member] was pushing to have actual people on there."

When the reference staff person from UW was asked why she wanted to use photos of real library staff, she responded:

"Well I just thought it was important for the people who staff the service, they put a lot of time and energy into it so I thought it was a good way to highlight

our own librarians and staff who put a lot of time into the service. One of the nice things about it is that sometimes faculty will see the photo and it reminds them that they need to contact their librarian."

This is an example of interested parties who had strong feelings about a design aspect which translated into a decision, but were they the appropriate stakeholders to provide this input? It is interesting to note that the reference staff member's primary reasons for wanting to use real photos was to provide an element of recognition and ownership directed at the reference staff and secondarily, to aid faculty in remembering to contact library staff. There was no mention of what students might think. As we have seen, these "real" photos were not popular with the students who viewed this icon as part of this study for aesthetic and social reasons.

User-centered design employs cycles of testing, analysis and refinement which consider user feedback for the purpose of producing a solution that suits users' needs and preferences (Visocky O'Grady and Visocky O'Grady, 2008). The UW web staff did conduct informal testing with students while in the process of designing the icon. However, the manner in which this informal testing was conducted may not have leant itself to negative comments about the photographs. Regarding the process, one UW staff member said, "If we ever had questions about things we would take it to students in the library and ask them what they preferred." It is possible that these students, approached by library staff at UW did not feel as comfortable commenting on these photos of actual staff at their institution as did the UA students who had no connection to the UW staff. More formal usability testing was done after the button was installed on the home page. The testing on the button showed that "A lot of people noticed it because they noticed the face." Usability testing is generally asking the questions, "Can people find what they are looking for?" and "Are people able to use the site to accomplish tasks?" These questions do not leave a lot of room for unsolicited comments about how a photograph might make a student *feel* about using a service.

The decision to use a photograph of a real person was made based on staff input, not user input. Although user-centered design does consider the organizational requirements (Visocky O'Grady and Visocky O'Grady, 2008, p. 26), those requirements should not extend to specific aspects of the icon. An example of an institutional requirement would be the need for an icon to represent their VR service. The institution does not require its school colours to be used, or a photo to be included in the icon. These preferences should be considered; however they should not be valued above the user's experience. In effect, the way that user testing was carried out in this case as well as the manner in which staff preference was incorporated into the design process led to a circumvention of user input on the matter of the photograph.

Historic Icons

The reference staff member at KSU said, "We felt like we had already branded our virtual reference service…so we didn't have a lot of latitude. We could have changed the branding, but we wanted it to look more seamless…" This library was using a reference icon which originated more than five years earlier with the dawn of chat reference (Figure 29). At the time, they wanted to provide continuity when switching chat service providers; however, the icon has remained, even though the reference manager does not feel that it particularly fits with the way that clients use the service today. Their other reference icons were done in an older style and one depicted an "ancient" computer as one of the students called it. The icons were originally pulled from an image database at the time of the last website redesign (four years ago) by an unknown staff member who worked on the page. This collaborative approach to putting content on the website was clearly detrimental, as both the web and reference staff felt that they did not think the icons were doing a particularly good job of either looking good or representing the services. Originally, these images were more integrated into the library website, and used throughout the site; however, the rest of the site had changed and now these images were only shown on the reference page. This piecemeal approach to updating the site resulted in these relic icons being essentially grandfathered on the reference page. As the web staff said "These [icons] are probably more of a legacy thing than anything." In this case it seemed

that the collaborative approach to populating the website along with the piecemeal approach to updating it contributed to the icons falling through the cracks.

Figure 29. Historic Icons. Kent State University Icon Set. (Kent State University, 2003-2009). Used with permission.

At another institution (UG) the reference icons pre-dated the web developer who had been there for two and a half years. Their origins were unknown to the web developer: “I suspect that they were grabbed from the web, I am not sure. Up to two years ago we didn’t have a graphic artist, so to get something like that created would have been more difficult.” Since then the library has had access to a graphic designer who dedicates 40% of their time to the library. When this web developer led a redesign of the library website one year ago he wanted the graphic designer to look at redesigning the reference icons. According to the web developer, “At that point the reference department did not want those icons changed, they were afraid that if we changed too many things within the website then users may get lost.” The result was that the possibility of new icons designed by a graphic designer on staff to match the new site were put aside in favor of years-old icons which were suspected to be “grabbed from the web.”

These icons were seen by the students as not matching the newer IM icon as well as looking “cheap” and “hard to see.” In several cases students remarked that the set would have been much more appealing if the other icons were designed to match the new IM icon. The web developer stated that the library staff web committee was “purely advisory” and that “they’ll make recommendations… they don’t hold the web design team to that…” but in this

case clearly the desires of the reference team won out over the developer's initial desire to get the graphic designer to redesign the web icons. It could be that there are other pressures present in these collaborative structures that trump the official mandate of a committee to "advise." The collaborative processes that contribute to academic libraries' web environments is an area that warrants further study. Further study of this topic would benefit from conditions where staff can be assured anonymity and speak one on one with an investigator. Studies conducted over time in this area could also increase understanding of how changes to these processes might affect outcomes.

Inconsistent Icon Design and Use

More than one of the library websites had multiple icons on their website representing their IM/chat services. On one of the sites (UW) it was clear that the two icons were the responsibility of two different web developers. One handled the home page and the other handled other pages, including the reference page. This is an example of a non-holistic approach to web and icon design that contributed to breaking a web icon design standard which calls for icons to be consistent in their appearance when they are meant to represent one thing.

On another site (UCI), there were two different icons, which were the result of a consortial symbol, incorporated into the chat input form, and another on the reference page. There were no plans to align the icon on the reference page with the icon on the consortial software. When one reference staff member was asked why their reference icons were not present on their "How to Start Research" tutorial pages they responded "I don't even look at those, those are handled through another department." These are two examples of design being limited to a particular section of the web based on divisions that users are probably not aware of. Unfortunately this divisive approach could lead to a disjointed user experience of a library's website.

One interviewee addressed the issue of holistic design directly; "It is safe to say we haven't taken a very holistic design approach to the whole site. It has been a much more piecemeal approach to design which I don't think frankly, has

served us well." This interviewee described how in the past, designers hired to work on the website were given strict parameters, which amounted to giving the website a "face lift" but not "critically looking" at the design of icons. This prioritization of the big picture design of the site to the exclusion of individual pieces was attributed to time restrictions and pressures.

Redesign Processes

Web staff gave varying lengths, from six months to five years, as how long they felt it could, or would, take for redesign cycles of the website. Some staff made a distinction between a redesign, which involved a restructuring of the site, and a facelift, which just gave the site a new look; however, most staff referred to both of these as a redesign. Two web staff members mentioned that they did not think constantly (more than once a year) changing the architecture of the site was in the users' best interest. In contrast, two other web staff mentioned they were in favour of a constant flow of incremental changes to the design or the look of the websites. In addition, these two thought that this model of change would allow solutions to identified problems to be implemented faster and not get "bogged down for years."

For all of the library staff interviewed the redesign process involved a web advisory committee comprised of library staff representing different departments in addition to web staff. Usability testing played a large part in the redesign process at all of the institutions. All of the libraries conducted usability testing on their old sites prior to redesign, during the design phase, and in the beta phase of their newly designed site.

When asked, the majority of web staff expressed a desire to change their icons, in light of various problems they were aware of. For example, the web developer at KSU recognized that the icon set was inconsistent. At UG the web developer recognized that the older icons were outdated. At UCI the designer and reference staff were both "tired" of the Lichtenstein style of the icons on the reference page. In UCI's case they were making changes as part of the redesign. At UG they did update the old icons. At KSU they seemed committed to change.

The staff gave different reasons for why the short comings they observed in their icons had not been addressed. Redesign time constraints and a lack of human resources were cited by staff as preventing them from examining, evaluating, and updating or replacing their icons regularly.

Evaluation and Testing of Icons

Library staff were asked if and how they evaluated and tested their website icons. Only KSU and UW mentioned testing that focused on icons. However, KSU did not test their reference icons, only their home page icons. The rest of the interviewees mentioned asking questions regarding overall colours and images on their sites as part of general usability testing, but there was no testing conducted that centered on icons. Usability testing focuses on how easy the site is for users to navigate, to find functions and services, and to access them. This kind of testing, if conducted regarding the reference services should reveal problems with the visibility, comprehensibility and accessibility of the icon representing the service. However, the targeted approach and structure of usability testing does not lend itself to encouraging opinions of the user regarding less solid aspects of icons. For instance, how appealing is the icon vs. how well it can be seen, or how easy the icon is understood vs. can it be understood. Usability testing should not only address *if* an icon "works" but how *well* it works. Usability testing is uniquely suited to assess how well an icon functions but might miss the aesthetic aspect of a users' experience. Libraries need to know if students *can* use their icons but also if they *want* to use them.

Some of the library staff said that they would like to conduct testing specifically on their icons. "I would like to see a usability study that basically spoke only to the graphical content of the website including the icons. I would be very interested in redesigning the icons," said a staff member at UG. Usability should be seen as one factor of an icon. Taken together with data from other approaches such as conversational interviewing, and testing versions of an icon, usability testing can contribute to icons that are functionally and aesthetically effective.

If all of the libraries employed usability testing then why were some of them still presenting problems in terms of access? For example, students could not find the chat box on the KSU reference page and some icons did not have alternative text. In the case of the KSU chat box, it had not been tested yet. In the others, the testing must not have been with users who had to use special browsers and so they did not have to rely on the alternative text. This is a good example of where testing with a general audience can miss important usability issues. This study found that students wanted the icons to make sense and would often re-evaluate the icons in light of new information they gained from using them. For example, one interviewee felt that an icon did not make any sense to her, but once she clicked on it and saw what it led to then she said, “Oh, yeah, that makes sense.” Just because she was able to complete the task of accessing the service did not mean that the icon made sense to her initially and although representative images can be learned and associated with their referents over time, it is best if they are immediately recognizable and understandable.

Standards

All of the library web staff were aware of the W3C coding standards and of the WCAG accessibility guidelines. Only one web staff member interviewed was aware of the ISO standards, he did label himself as “sort of anal retentive when it comes to standards.” This web developer also said that he did not consult the ISO standards because “you have to pay for the ISO papers just to see what their standards are.” The cost of the ISO papers could be prohibitive to an academic institution. In addition the ISO standards for web icons do not directly apply to unique icons in general web contexts and there is no regulatory incentive for libraries of any kind to adhere to ISO standards. Like ISO the W3C does not have authority to enforce its guidelines in general web contexts. However the ease of access of the W3C guidelines in terms of their free availability over the web and in terms of their more user friendly format and writing style makes it a more natural choice for libraries to turn to.

The fact that all of the libraries were aware of the accessibility guidelines and still some were not putting them into practice begs the question of why? In one case it was because of a problem of attracting and retaining web development staff. This left the library with a website that had not been redesigned in ten years and so work such as adding alternative text to icons and images on the site was seen as best done along with the always imminent but constantly delayed redesign.

In other libraries, according to the staff interviewed, it seemed that the icons in general, and therefore their accessibility implications, were not top priority. As indicated by this staff person, “So much of it just boils down to time. Short cuts tend to happen, the focus is always on the home page. It is safe to say a lot of things like the [reference page] or the services page tend to fall by the wayside.” At another institution the staff commented, “It’s really frustrating for my designers, you design something and by the time it gets implemented it’s kind of out of date and you can already see a better way to do it.” This delayed implementation at UCI was no doubt the result of a shortage of human resources in terms of web staff time to make these changes. These quotes illustrate the general consensus that there was not enough time to do what the staff wished to with the design of their sites.

Regarding the Use of Icon Standards in Libraries

In general, the library staff were in favour of knowing more about web design standards and using these in their web design work. Said one, “I think a lot of libraries would appreciate [knowing more about standards]. A lot of places they don’t have design backgrounds and the more you get icons where they mean something to people consistently the better.” Another commented on their own icons, “ I think they need to be cohesive I think they need to be cross cultural and transparent in terms of how people see them. I’d like for us to have our own icons which are basically fool proof. I don’t know how easy that is.” Overall, library staff were anxious to use existing guidelines and testing methods to improve their icons, however, none indicated that they would be able to create time for this activity.

Staff were asked for their thoughts regarding standardization of common icons among libraries. One replied, “if you had it that so that students had seen them since they were in elementary school and then high-school and these things persisted in their lives then they could navigate our systems much easier. We wouldn’t have to keep telling them that this is the way that we try to say the same things at this library.” This interviewee was in favour of standardizing common library website icons because of the benefit to lifelong learners who will use many different kinds of libraries in their lives. Most staff were in favour of standardizing library icons. However there were variations. One interviewee thought it would only be prudent to standardize between post-secondary institutions in their province vs. with public libraries or others outside the province, for two reason: student overlap, and service similarity. She explained that she thought students were more likely to attend more than one post-secondary institution within the province than inter-provincially, and that the post-secondary reference services had more in common than they did with the public library’s reference services. These comments identified the issues of student migration and reference service levels among North American libraries. Shared student body is one of the main reasons for standardization, and may only exist in sufficient volume between certain groups of institutions. Institutions tailor their reference service goals to their missions and in some cases this results in a different kind of service being offered from library to library. This presents a problem for using a common symbol for reference between libraries because representing a service with a common symbol indicates that a user can expect a common reference experience where that symbol is used. Other challenges to library icon standardization, such as difficulty reaching consensus, and library demand for icons that were strongly associated with their institution were mentioned by almost all of the interviewees.

Summary of Staff Interview Results and Discussion

The interview data indicated that web staff at four ARL libraries were the ones responsible for supplying the icons and consulting library staff regarding them. This was true even in cases where designers outside of the library staff were contracted with or engaged to work on other aspects of these library

websites (e.g. UA and UG). There was only one library that had its own design department and where a designer created the icons rather than a person whose primary responsibility was web development. Therefore, four staff members responsible for these icons were not professional designers and did not have a significant amount of formal design training, although two of them (KSU, UW) did have on-the-job design experience. This indicates that even though these libraries have professional designers working on some parts of their websites such as the layout and illustrative photograph, they are still relying on relatively inexperienced and minimally trained staff whose main area of expertise is web design rather than graphic design to provide their icons.

Interview results demonstrate that W3C guidelines such as the WCAG are well known to library web staff. This is not surprising, considering the W3C coding guidelines are the basis for well constructed websites and essential knowledge for any web developer. The interview results also demonstrate that the ISO standards regarding web-icons were unknown to all but one web staff member. This too is not surprising considering that the ISO standards are created by and meant to support professional designers. These findings do support the characterization of these web staff as being mainly web developers, who are asked to do design work for some areas of their library's websites.

Therefore, if libraries are employing designers or library staff with some design experience to create their icons, then why are these icons still showing deficiencies in areas where the selector/creator is knowledgeable and has the skills to improve the icon? The interview results suggest three possible answers to this question: 1) A lack of staff time to devote to icons 2) Collaborative design decision making processes 3) Overreliance on usability testing vs. user-centered design

1. A lack of staff time to devote to icons

The interviews demonstrated that at three of the institutions (KSU, UA and UCI), the icons were not a priority, and therefore staff did not spend sufficient time considering and selecting/creating icons. This contributed to the use of shortcuts

such as having a student design class design the icons for a committee which did not demand additional time from web development staff (UA), and also to icons that had not been updated in years (KSU and UCI).

2. Collaborative design decision making processes

The interviews revealed that collaborative design decision making processes were employed in the creation/selection of icons at all but one (UCI) institution. The interview data also provided examples of how these processes resulted in use of historic icons and aspects of icons which did not follow guidelines.

3. Usability testing vs. user-centered design

The interviews revealed that at four of the libraries the only user feedback regarding the icons was collected in the course of usability testing of the entire site. This meant the icons were not the focus of any specific questions or tests. It also means that the icons were only tested in one way, and in one context, to determine their functionality as part of the site. These findings are consistent with the finding that icons were not considered a priority and therefore would not merit the considerable amount of staff time required to conduct version testing or in-depth interviews. It is also consistent with the finding that some staff did not have formal training or graphic design experience that would allow them to conduct other kinds of tests. By its very nature usability testing is necessarily conducted on a beta or complete version of a website. If usability testing was the main form of user input into these icons then it is clear that user needs and desires were not considered pre-design/selection or during design/selection (UW is the exception).

CHAPTER 5

Conclusion

Introduction

One of the outcomes of this study, which was not part of the research agenda, but which does contribute to the rationale for research in this area, was that students has strong emotional reactions to the icons, which dramatically shaped users' perceptions of library services and institutions. The student interviews provided ample evidence confirming the view in the design and marketing literature (Danesi, 2008) that visuals do evoke strong feelings and association in viewers (i.e. "disrespect"). Icons are an important part of web design, just as important as page layout (see Horton, 2006, p. 194) for the navigation and visual appeal of a website. If they are not visually obvious, comprehensible, and easy to use then they can be a barrier for student access to library assistance and resources. It is important for icons to be consistent with users' expectations based on what they encounter elsewhere on the web. That is one reason why web standards are so important. For example, if a student feels betrayed by a false promise of functionality (e.g., a white entry box that is not active), that betrayal is also associated with the represented service and institution. This experience will, in the mind of the user, reflect poorly on the skills of the web staff and possibly staff in general.

The goals of this study were to develop a set of assessment criteria for library use in evaluating icons, to compare the results of the assessment to student perceptions, and to examine user and staff perceptions of academic library VR IM/Chat to see how they differed. The results of the criteria-based assessment point to a number of areas that librarians should consider in crafting effective websites, with a focus on the appropriate use of icons to represent information services (such as IM/Chat).

Icon Design Areas Needing Improvement

This study identifies some essential design areas in which a significant amount of studied library IM icons studied were not following icon design standards, guidelines, and best practices. In the area of visibility and visual appeal, 46% of icons were found to be lacking in what are considered basic requirements for good design such as effective use of: contrast, boundary, colour, and style (Bowers, 2008; Evans & Thomas, 2008; Visocky O'Grady and Visocky O'Grady, 2008).

The purpose of combining the methodological approach of categorical analysis with the student interviews was not only to confirm or disagree with the researcher's analysis but also to provide further insight into the effects of icons which are sub-standard in certain areas. In the case of visibility and visual appeal, student interviews revealed that icons which were assessed to fall below standard recommendations and requirements were harder for students to visually identify (e.g., UA out of context – see results). In addition, icons which were visually difficult because of an inappropriate style were viewed negatively by students (e.g. PSU – see results). This research confirms the importance of basic design building blocks, and also the importance of in-depth assessment and user evaluation of icons. The implications for library staff or design professionals working in libraries is that icons must be examined with basic design principles in mind and specifically tested with users to ensure that those affective reactions to the icons which cannot be anticipated are considered.

In the area of comprehension, another essential design criteria, 47% of the icons did not follow best practice. According to the logic of simplification, icons which carry too many simultaneous messages, without distinction, have a diminished message due to noise (Sudick, 2006, p. 187).

The student interviews confirmed that icons with a higher number of messages which were not distinguished by visual emphasis were more difficult to understand. However, student interviews also demonstrated that the strength of a symbol's association with its referent is as significant for comprehension as the

number of messages and their visual hierarchy. For example, two icons which were found to be ambiguous, to have multiple meanings for each viewer, none more prominent than the rest, were the KSU and PSU icons. It is interesting to note that although PSU's had a lower number of messages (one, to KSU's three) students found the PSU icon just as ambiguous, possibly more so because the only symbol (computer) was not strongly associated with a particular concept for the students. While the KSU icon featured an unfamiliar symbol, it was metaphorically descriptive, giving students a better idea of what it represented.

In the area of symbol comprehension, two of the four different symbols included in the sub-sample tested with students were not found to be closely associated with their referent: IM reference. Unanimously, students did not find that computers represented IM either literally or in an abstract manner. They felt that computers were too broad in their meaning to point to IM. Three students felt to a certain degree that the figure coming out of the screen did not necessarily refer to IM. There was more certainty that symbols for "person" did indicate chatting live over IM, but students did not think that there was a direct relationship because they thought this could also stand for someone available by phone. Students did agree that the speech bubble, in an online context did refer to IM, however, not exclusively to IM. Therefore students felt the connection was not so strongly established and that there is still room for other common interpretations of this symbol.

In the area of accessibility, only 53% conformed fully to standards by being active and providing feedback when selected (indicated state change). Further, only four icons or 13% provided alternative text for their icons as required by the W3C accessibility guidelines. The results of the staff interviews showed that staff are aware of the W3C Accessibility Guidelines. In cases where icons were not in compliance, staff gave reasons of limited resources. For example, UCI staff were not able/willing to devote human resources to "update" an old website to more recent standards because resources were being focused on a new version of the website. Taken together, these results suggest that staff are aware of icon accessibility guidelines, and see them as important, however, not as a crucial requirement for their library websites. The lack of alternative text

only affects those who view the web in text only mode, or with other software that translates websites into sound or other stimulus. Therefore, it is a less visible breach of a design guideline than, for instance, a lack of contrast, which renders an icon less visible to everyone viewing a website in a traditional manner, not just those using special software.

Fulfilling the technical requirements of making an icon clickable, indicating state change and displaying alternative text are minimal and require only basic web skills. The web development staff interviewed all possessed these skills to a far greater degree than they did the design skills needed to design icons that met the other two essential criteria. The staff at the institutions represented by the rest of the icons in the main sample can reasonably be assumed to have the same skills since these are basic web design skills involved with creating text links and displaying images. However, the number of icons which conformed to the assessment criteria (53%) was only slightly above half compared to the more difficult requirements of visual appeal (46%) and comprehension (47%) which were just under half. The difference may be due to the more visible nature of the first two criteria while accessibility is more functional. In addition, it is possible that library staff do not view these tiny representative graphics as web icons which are part of the navigation of their websites. They may see them only as window dressing meant to make the page more interesting. This was a popular reason given when staff were asked why they used icons.

It is important to note that in all of the essential design areas discussed here approximately half of the sample, minus or plus 5% (or 1-2 icons) were found to satisfy standard requirements, just as half did not. This indicates that there are library icons which do conform to standards. Further research is suggested, identifying specifically some of the reasons why some library icons meet standards and some do not; whether it is due to staff awareness, skill, processes, university web guidelines and requirements, the re-design cycle, or where the web designer draws their inspiration from. Knowing this kind of information could inform library staff of steps to take that are known to contribute to better icon and web design in general.

How Library Staff Currently Use Icons to Represent Reference Services

When library staff were asked why they use icons on their websites in general one common answer was to provide visual interest, break up the text, and draw users' attention. Staff wanted to draw attention to reference services in particular and that is why icons used to represent these and not other features or services on the website. In addition, it became clear that staff wanted to communicate certain ideals, such as "personal" or "fun" in association with their reference services. In addition, staff did not always think that their icons were sending the messages theywould like (e.g., KSU). Staff attributed this to time constraints and to the relatively low priority level that the icons occupied. These results at least give a preliminary picture of how icons are viewed by staff who are involved with their creation and selection.

Students perceived the same messages staff thought their icons were communicating, be they intentional or unintentional. However, their reactions to these perceived messages were not always what staff predicted. For example UW thought that students would be drawn to use the service because of the personal photo when in fact, although some students recognized the message of "personalization," it did not appeal to them.

Why Library Staff's Knowledge and Attitude Towards Icon Design Standards Seems Incongruous With Their Icons

Staff were very supportive of the idea of standardizing icons for common library services. The main advantage identified by staff was the consistency users would experience which would in turn raise the profile of reference services in general. However, staff recognized the logistical considerations of providing a consistent service across institutions to go with the visual identity.

This study contributes to the library profession's discussion of web standards. In the past there has been great support in the North American library community for standards that support shared catalogues such as Z39.50. In

addition there has been support for libraries to make their web services accessible to those with disabilities; however, there has not been the same kind of discussion regarding standardization of online symbols. It would be beneficial for the RUSA Committee of ALA or a CLA Committee to investigate and adopt a standard set of guidelines for symbol selection and icon development for virtual reference services.

Interviews with staff revealed that they are aware of guidelines and design principles and do have design skills or access to those skills through a designer. However, the icons are not demonstrating adherence to the design principles, guidelines, or standards. The interview data suggested some possible reasons for this incongruity between design knowledge and skills available, and application of these in the design of icons. One reason was the collaborative design decision making model. A second was the lack of time that was allowed for designers to create icons. A third was the lack of in-depth testing of the icons which is necessary to provide the kind of feedback needed by designers to truly ensure an effective icon. This indicates that icon design was not a priority for the library administration. In contrast the library staff were aware of the importance of icons and felt that they were not supported in devoting sufficient time and expertise to them. Examining these possibilities on a wider scale could build upon these findings and identify if this is a wider trend among libraries.

Further research into library attitudes towards design in general and icon design in particular may reveal a lack of support for design work in libraries when it comes to application (vs. in theory). This kind of qualitative research would have implications for how information design and presentation, the other half of information organization, are treated in library and information studies literature, schools, and in professional settings. Examining these possibilities on a wider scale could build upon these findings and identify if this is a wider trend among libraries.

The Value of a Three-Pronged, Dual-Method, Approach to Data Collection

The three-pronged approach which used the data collection methods of categorical assessment, and interviews with both designers (staff) and viewers (students) allowed for findings to be supported, confirmed, and informed from three different points of view. For instance, when students raised questions regarding an icon, those questions could be informed by the staff answers. In addition the effect of staff decisions could be observed in the student interactions with the icons and their web pages. This approach allowed the researcher a more complete understanding of the library icons, not only factors involved with icon design, but the creation processes and the consequences of those. This kind of mixed method design is recommended "when quantitative results are inadequate to provide explanations of outcomes, and the problem can best be understood by using qualitative data to enrich and explain the quantitative results in the words of participants" (Creswell & Plano Clark, 2007, p. 34). In the case of this study, the quantitative results only provide limited insight into the big picture of how libraries are using, selecting and designing icons. The larger questions of how these icons affect the user experience and how academic library staff see these icons are only addressed by the qualitative data.

Strengths and Weaknesses of the Assessment Tool as Compared to the Student Interviews?

There was a high degree of agreement between the assessment of the sub-sample of icons and student reactions to those icons. This validated the assessment criteria and method as a useful way for libraries to assess their icons prior to gathering user feedback. Library staff could benefit from conducting a preliminary assessment using some (e.g., the three essential criteria) or all of the assessment criteria, even when they are working through the creation process with a designer; keeping these criteria and the principles they represent in mind will ensure that there are no major shortcomings in the icon.

The interviews with students provided detailed and granular information regarding reactions to the affective elements of these icons to supplement the more basic and broad findings of the assessment. One example is the student explanations for why they did not like the UW photo of a real library staff member. This aspect of the results confirmed research into design heuristics which notes the limitations of using such checklists to learn about some of the more complex aspects of icons such as comprehensibility and style (Huang et. al, 2002). As the Visocky O'Grady's (2008) state, basic "understanding of cognitive science and educational theory" along with "hours researching subject matter and intended audience; exploring creative, conceptual, technical, and production issues; and finally, carefully crafting that message with rhetoric, imagery, typography, layout and form" is what a good designer puts into designing an icon, and all of this cannot be measured with a simple check list (p. 85).

Relevance to Designers

This study pulls together a wide range of design standards, guidelines, and best practices which are not usually considered together in the design literature. In addition the ISO standards are viewed from the non-professional perspective, which is uncommon. The assessment criteria gathered represents some suggestions to the graphic and icon design community for how their standards, guidelines and best practices might be enriched or combined so they are more accessible to non-designers. Combining standards (e.g., ISO) with more explanatory background information on the principles these standards are meant to uphold (such as is found in the best practice literature) would contribute to their application and use by non-professionals. In addition, providing specific, and measurable, ways for icons to be in compliance with guidelines (as the W3C does with their implementation guide (2008)) is essential to the application of standards by non-professionals who do not have the training to judge, based on their experience alone, if their icons are in compliance or not.

In order to fully address the three essential areas for icon design, visual appeal, message clarity and access, non-designers currently have to research

design principles, ISO standards and W3C Accessibility guidelines. This study has provided a combined set of defined categories which address all three of these areas. It is quite clear that this categorical analysis is only the beginning of ensuring effective icons. This study also illustrates the value of interviews for evaluating icons vs. questionnaires or usability testing, which are more limited and are not able to effectively gather feedback on the three essential areas of icon design. For example, usability testing ensures functionality, but does not always encourage student discussion of affective reactions to icons. Questionnaires are also often not conversational and although they may ask about a student's feelings regarding an icon they are not likely to prompt respondents to go beyond the surface.

The results for placement of icons beyond the reference page demonstrates that in this area libraries are ignoring the marketing and design best practices, which state that an icon should appear repeatedly within an environment so that users have ready access to that tool/service and so that they may become familiar with it, and therefore recognize it more readily and become more comfortable with using it (Horton, 1994; King County Library System & University of Washington, 2002). Marketing best practices state that in order to attract a user to a service, an icon or logo should be seen in multiple places, which reminds the user of the service and also builds curiosity (Danesi, 2008). This finding indicates that further research into marketing of online services in electronic library environments is required.

Recommendations for Libraries when Creating/Selecting Icons

The combined data from the student interviews and the assessment a clear picture emerges of areas where library icons are falling short, and suggests some strategies for addressing those areas. The major areas of concern are those of the three essential categories, visual appeal/visibility, comprehensibility, and accessibility.

In the area of visual appeal it was clear that contrast between the icon and its background was one of the biggest factors affecting students' ability to

spot these icons. For example, on the UP site, their icon (Figure 30) blends in with the background and has no particular border; because of this none of the students clicked on it. One easy thing staff can do whether selecting a predesigned icon set or working with a designer is to find out if the contrast levels meet the W3C guidelines (2008). None of the icons with an illustrated or detailed cartoon style were chosen by students as icons which appealed to them. When considering icon style, only consider styles which are recommended for icons, (i.e., simplified drawing, silhouette or outline).

Figure 30 – Low Contrast. This renders University of Pennsylvania IM reference icon invisible (University of Pennsylvania, 2009). Used with permission.

Library icons were shown to be especially sub-standard in areas of accessibility. Students had the most difficulty accessing services on sites where the icon images were not clickable (i.e. KSU). Libraries need to realize that it is now a web standard that small representative images act as links to what they represent. Users expect to navigate using graphics and they will find it difficult if these are not set up as part of a site's navigational structure. In addition, students were clicking on "contact us" to locate reference services. What does this tell us about the terminology we use? Perhaps we should rethink the relationship between our terminology and what we are using these terms to represent as well as the relationships between sections on our websites. We need to ask ourselves if these divisions and labels make sense from the user's perspective.

To address these areas libraries have to listen to their designers and value their knowledge and contributions by allowing them sufficient time to consider these essential design areas when creating or modifying library icons. In addition, an appropriate stakeholder should be granted the final say in accepting a designer's work and design changes should be based on design research, not staff preferences or perceptions. Raising awareness of icon design standards, guidelines and best practices in libraries could assist designers in procuring more time for design and testing processes. Governing bodies such as the CLA and ALA could recommend that libraries use icons which conform to standards and guidelines. This would serve the library communities well moving forward as icons may be used to represent more and more library services.

Lakos (2007) argued for a more evidence-based approach to decision making in libraries which can refocus libraries on patron needs and expectations rather than internal ones. Many academic libraries have moved towards evidence based practices. In the area of web and icons design, evidence requires a variety of user testing methods. Icons should be tested separately from their websites and in a variety of contexts to ensure that they are extensible and to identify any issues of comprehensibility related to context. If possible, icon element testing conducted by a designer, with users, to discover redundant or complicating elements of an icon is the best way to ensure an effective icon. Allowing for an icon design process which includes testing and incorporation of modifications based on testing as recommended by ISO & Horton (1994), is essential if libraries want to take an evidence based approach to icon and web design.

Implications of the Findings

Possible applications for the findings include improved selective/creative processes in academic libraries, and increased evaluation and awareness of how academic library icons meet, or fail to meet, design standards. As discussed in Chapter 2, LIS scholarship on marketing VR services does not directly investigate evaluation of VR icons according to marketing and design principles (e.g., MacDonald et. al, 2008; Naylor et. al, 2008; Taddeo, 2008). There is a gap in the LIS literature on marketing virtual reference services where design

literature is not being considered as part of the creative or evaluative process of icon design. This study examines the marketing and design literature in the area of icon and logo design and finds that library VR icons could benefit from application of icon design standards and knowledge. The findings contribute to filling the design gap in the LIS literature.

This study establishes icons as a major factor in how VR services are perceived by students. Further, this study clearly demonstrates some of the possible implications of poorly designed and implemented icons. One implication of the findings is that students are actually being discouraged from using IM reference services due to poorly designed icons which can make it harder for them to identify and understand what is offered as well as to actually access it. These implications are not restricted to icons alone and have been found to apply to other web design aspects such as images and page layout (Horton, 2006, p. 72). However, this study applies those broader findings specifically to icons, and gives a greater understanding of how navigation and feature access can be affected by icon design.

This study contributes to the growing body of research on visual communication and icon design by exploring the connection between user expectations (i.e. quick answers) and affective feelings (unease) produced by visual elements (i.e. staff photographs). The mixed methods approach contributes a multiple perspectives examination of elements of icon design, which is not a common approach. Usually icons are tested with students (Cheng, 2007) or designers (Huang et. al, 2002). The student findings regarding their overall attraction/satisfaction with the icons in relation to the assessment findings confirms the findings of Huang et. al, (2002) regarding essential icon design elements of visual appeal, comprehension and accessibility.

Areas for future research

Building upon work from the fields of visual communication (Kress & Van Leeuwen, 2006), design (Bowers, 2008; Visocky O'Grady and Visocky O'Grady, 2008), and web icons standards (i.e. Horton, 1994; ISO, 2000) the findings of this

study strongly support the possible benefits of applying icon standards to library web icons. This exploratory study was conducted on a small sample of academic library icons and with a small sample of students and library staff so its findings, while they do provide more knowledge regarding an area of library web design that is largely unexplored by LIS literature, also provide the imperative for a variety of future research in this area. For example, future research examining IM icons in public libraries, and with larger icon samples would allow for comparison and trend identification across library sectors. In addition, studies which included an element of time, where students were allowed to "learn" the icon and become familiar with it to see how their perceptions changed and how their access behaviors were affected over time, would contribute a more realistic and in-depth understanding of how icons affect user perceptions and use of IM reference services.

This study only consulted university students, not faculty. This is partly because IM services are mainly targeted at students in consideration of the other contact options that faculty are usually aware of and encouraged to use. For instance, directly contacting a liaison librarian may suit the often in-depth questions of faculty better. However faculty are exposed to the same icons as students on library websites and research investigating their perspective on these would contribute to a more informed and well rounded icon design approach for libraries if they intend to market these services to faculty as well as students.

One of the interesting issues raised by the student interviews was regarding the students' statements to the effect that although they did want to contact a live person because they believed this was the fastest and most efficient way to get a good answer to their question, they did not want the service to be personalized. There has been much discussion regarding making library service in academia more personal in order to make it more appealing to the academic community (e.g., Bell, 2009). This new data provides evidence against this approach, if libraries want to appeal to students, and warrants further investigation. A study focusing on this question and including a wider sample of students would confirm if this is a widely held view among students.

Another interesting point raised by students in terms of library web design was that they did not distinguish between “reference” and contacting library staff in general; therefore they expected to view all of the reference options under the “contact us” links on library home pages. On all of the sites shown to students which had a “contact us” link, that page was separate and very different from the “reference” page. This may be the result of the traditional division in academic libraries between “reference” which is to answer research questions, and general contact which is for more circulation or “directional” questions. The current trend towards integrated service desks where patrons can ask both kind of questions in one place may lead to a combining of the “contact us” general contact information and the modes of reference access online. The University of Toronto (2009) has redesigned its website so that their “contact us” and “Ask us” pages, though still labeled differently, are one and the same. This would be an area for future study, and could address the question, “Are library websites truly incorporating a user-centered design approach, or are they still more reflective of internal structures?”

Library websites are no longer simply a communication tool, they are a functional part of the library, and should be treated as such. Graphical communication is essential to the functionality and appeal of what is not “just” the library’s website, but *the library* as it exists for many academic users. The essentially visual environment of the web is being embraced by all the citizens of the web and libraries too must become expert graphical communicators if they want their messages to be heard in the online environment. This study provides an initial investigation into this important challenge for libraries.

REFERENCE LIST

Adams, S., & Morioka, N. (2004). *Logo Design Workbook A Hands-On Guide to Creating Logos*. New York: Rockport.

American Library Association. (2008, January 14). ALA | Definitions of Reference. In *ALA | Home - American Library Association*. Retrieved March 22, 2009, from http://www.ala.org/ala/mgrps/divs/rusa/resources/guidelines/definitionsreference.cfm

American Library Association. (2004, June). ALA | Guidelines for Implementing and Maintaining Virtual Reference S. In *ALA | Home - American Library Association*. Retrieved August 22, 2009, from http://www.ala.org/ala/mgrps/divs/rusa/resources/guidelines/virtrefguidelines.cfm

Arnheim, R. (1972). *Visual Thinking*. Berkeley: University of California Press.

Ashwin, C. (1989). Drawing, design and semiotics. In V. Margolin (Ed.), *Design discourse: History, theory, criticism.* (pp. 198-209). Chicago: The University of Chigago P.

Balcombe, S., Barrett, A., Lo, Y., Taylor, M., Wong, V., & Yeung, W. (2009, January). University of Alberta Beta Reference Icon Set. Retrieved August 26, 2009, from http://www.sarabalcombe.com/libraryicon.html

Barnard, M. (2005). *Graphic design as communication*. New York: Routledge.

Bell, S. J. (2009, February 17). The Library Web Site of the Future. *Inside Higher Ed*. Retrieved March 5, 2009, from http://www.insidehighered.com/views/2009/02/17/bell

Berney, J. (2008, May 19) When there are too many cooks in the kitchen. Posted to http://blogs.sun.com/designatsun/entry/when_there_are_too_many

Bessa, P. (2008). Skittish Skirts and Scanty Silhouettes: The Tribulations of Gender in Modern Signage. *Visible Language*, *24*, 119-142.Blackwell, A. F. (2001). Pictorial Representation and Metaphor in Visual Language Design. *Journal of visual Languages and Computing*, *12*, 223-252.

Bickman, L., & Rog, D. (1998). *Handbook of applied social research methods*. Thousand Oaks, CA: Sage Publications.

Blackwell, A. F. (2001). Pictorial Representation and Metaphor in Visual Language Design. *Journal of Visual Language and Computing*, *12*, 223-252.

Booth, C. (2009). *Informing Innovation: Tracking Student Interest in Emerging Library Technologies at Ohio University* (pp. 1-135, Publication). Chicago, Illinois: Association of College & Research Libraries, A Division of the American Library Association.

Bowers, J. (2008). *Introduction to two-dimensional design understanding form and function*. Hoboken: Wiley.

Brodsky, A. E. & Welsh, E. A. (2008). Applied Research. In L. M. Given (Ed.), *The Sage Encyclopedia of Qualitative Research Methods* (Vol. 1, pp.17-21). Thousand Oaks, CA: SAGE Publications Inc.

Buchanan, R. (1996). Wicked Problems in Design Thinking. In V. Margolin, & R. Buchanan (Eds.), *The Idea of Design* (pp. 3-20). New York: MIT P.

Capsule. (2007). *Logos 01 an essential primer for today's competitive market*. Gloucester, MA: Rockport.

Carroll, J.M. and J.C. Thomas. (1982). “Metaphor and the cognitive representation of computing systems”. *IEEE Transactions on Systems, Man and Cybernetics*. 12.2.

Charmaz, K. & Bryant, A. (2008). Grounded Theory. In L. M. Given (Ed.), *The Sage Encyclopedia of Qualitative Research Methods* (Vol. 1, pp.374-376). Thousand Oaks, CA: SAGE Publications Inc.

Cheng, H., & Patterson, P. E. (2007). Iconic Hyperlinks on e-Commerce Websites. *Applied Ergonomics*, *38*, 65-69.

Creswell, J. W., & Clark, V. L. (2007). *Designing and Conducting Mixed Methods Research*. Minneapolis: Sage Publications, Inc.

Danesi, M. (2008). *Why It Sells Decoding the Meanings of Brand Names, Logos, Ads, and Other Marketing and Advertising Ploys*. New York: Rowman & Littlefield, Inc.

Davis, S. B. (2007). Article: A Schema for Depiction. *Visible Language*, *41*(3), 280-301.

Dennison, K., Sanders, M. M., & Sims, M. E. (2003). M3: Marketing, Management, Manpower: Virtual Reference Services at LSU Libraries. *Louisiana Libraries*, 23-27.

Dix, A., Finlay, J., Abowd, G. D., & Beale, R. (1997). *Human Computer Interaction*. (2nd ed.) Upper Saddle River: Prentice Hall.

Eskilson, S. J. (2007). Chapter 10, Contemporary Graphic Design. *Graphic Design a New History*. Yale, UP.

Evans, P., & Thomas, M. A. (2008). *Exploring the Elements of Design (Design Exploration Series)*. Belmont: Cengage Delmar Learning.

Frascara, J. (2004). *Communication Design: Principles, Methods, and Practice*. New York: Allworth P.

Gittens, D. (1986). Icon-Based Human-Computer Interaction. *International Journal of Man-Machine Studies*, *24*, 519-543.

Given, L. M., Reucker, S., Simpson, H., Sadler, E., & Ruskin, A. (2007). Inclusive Interface Design for Seniors: Image-Browsing for a Health Information Context. *Wiley InterScience Logo Journal of the American Society for Information Science and Technology*, *58*(11), 1610-1617. Retrieved June 18, 2009, from Wiley Inter Science.

Goonetilleke, R. S., Martins Shih, H., Kai On, H., & Fritsch, J. (2001). Effects of Training and Representational Characteristics in Icon Design. *International Journal of Human-Computer Studies*, *55*, 741-760.

Horton, W. K. (1994). *Icon book visual symbols for computer systems and documentation*. New York: J. Wiley.

Huang, H., & Lai, H. (2008). Factors Influencing the Usability of Icons in the LCD Touch Screen. *Displays*, *29*, 339-344.

Huang, S., Shieh, K., & Chi, C. (2002). Factors affecting the design of computer icons. *International Journal of Industrial Ergonomics*, *29*(4), 211-218.

Hughes, R. (2008). Telephone Interview. In L. M. Given (Ed.), *The Sage Encyclopedia of Qualitative Research Methods* (Vol. 2, pp.862-863). Thousand Oaks, CA: SAGE Publications Inc.

International Standardization Organization. (1998). *Ergonomic requirements for office work with visual display terminals (VDTs) -- Part 11: Guidance on usability*. (Publication no. 9241-11). (1st ed.). International Standardization Organization.

International Standardization Organization. (2000). *Information Technology - User System Interfaces and Symbols - Icon Symbols and Functions - Part 1: Icons - General* (Publication No. 11581-1) (1st ed.). Canadian Standards Association.

International Standardization Organization. (2000). *Information Technology - User System Interfaces and Symbols - Icon Symbols and Functions - Part*

2: Object Icons (Publication No. 11581-2:) (1st ed.). Canadian Standards Association.

International Standardization Organization. (2003). *Information Technology – Icon Symbols and Functions for World Wide Web Browser Toolbars*. (Publication no. 18036). (1st ed.). International Standardization Organization.

International Standardization Organization. (2007). *Graphic Symbols – Test Methods – Part 1: Methods for Testing Comprehensibility*. (Publication no. 9186-1). (1st ed.). International Standardization Organization.

Janiszewski, C. (2007). Rethinking Visual Communication Research: Updating Old Constructs and Considering New Metaphors. In M. Wedel (Ed.) & R. Pieters (Author), *Visual Marketing From Attention to Action (Marketing and Consumer Psychology)* (pp. 278-293). Mahwah: Lawrence Erlbaum.

Kapoun, J. (2006). Creating a Library Logo for an Academic Library. *Library Philosophy and Practice*, *8*(2), 1-9.

Kent State University Libraries. (2003-2009). Kent State University Reference Icon Set. In *Kent State University Libraries*. Retrieved August 26, 2009, from http://www.library.kent.edu/page/10599

King County Library System, & University of Washington. (2002, October 17). Marketing Guidelines. In *Washington State Library*. Retrieved October 1, 2008, from http://www.secstate.wa.gov/library/libraries/projects/virtualref/textdocs/marketingguidelines.pdf

Kress, G., & Van Leeuwen, T. (2006). *Reading Images: The Grammar of Visual Design*. New York: Rutledge.

Lakoff, G. and Johnson, M. (1980) *Metaphors We Live By*. Chicago, IL: University of Chicago Press.

Lakos, A. (2007). Evidence-based library management: The library leadership challenge. *portal : Libraries and the Academy, 7* (4), pp . 431-450.

Lee, J. (2008). Otto Neurath's Isotype and the Rhetoric of Neutrality. *Visible Language*, *42*, 159-179.

Leventhal, L., & Barnes, J. (2007). *Usability Engineering Process, Products and Examples*. Upper Saddle River: Prentice Hall.

Liang, S. M. (2007). Applying Axiomatic Method to Icon Design for Process Control Displays. *Meeting Diversity in Ergonomics*, 155-172.

Lin, R. (1994). A Study of Visual Features for Icon Design. *Design Studies*, *15*(2), 185-197.

Lodding, K. N. (1983). Iconic Interfacing. *IEEE Computer Graphics and Applications*, *3*, 11-20.

Lupton, E. (1989). Reading Isotype. In Margolin, V (Eds.), *Design Discourse. History, Theory, Criticism* (145-156) Chicago, IL University of Chicago Press.

MacDonald, K., van Duinkerken, W., & Stephens, J. (2008). It's all in the Marketing: The Impact of a Virtual Reference Marketing Campaign at Texas A&M University. *Reference & User Services Quarterly, 47*(4), 375–385.

Macnab, M. (2008). *Decoding Design Understanding and Using Symbols in Visual Communication*. Cincinnati, Ohio: How Books.

Marcum, J. W. (2002). Beyond Visual Culture: The Challenge of Visual Ecology. *Libraries and the Academy*, *2*(2), 189-206.

Margolin, V. (1989) (Ed.): *Design Discourse. History, Theory, Criticism*. Chicago, IL University of Chicago Press. 91-109.

McDougall, S., & Isherwood, S. (2009). What's in a Name? The role of graphics, Functions, and their Interrelationships in Icon Identification. *Behaviour Research Methods*, *41*(2), 325-336.

McMaster University Libraries, & Etches-Johnson, A. (2009). University of McMaster Reference Icon Set. In *McMaster University Libraries*. Retrieved August 26, 2009, from http://library.mcmaster.ca/justask/

Meggs, P. B. (1992). *Type and Image: The Language of Graphic Design*. New York: John Wiley & Sons Australia, Limited.

Mills, A. (2008). Comparative Research. In L. M. Given (Ed.), *The Sage Encyclopedia of Qualitative Research Methods* (Vol. 2, pp.862-863). Thousand Oaks, CA: SAGE Publications Inc.

Mitchell, W. J. T. (1994). *Picture Theory: Essays on Verbal and Visual Representation*. Chicago: University of Chicago P.

Naylor, S., Stoffel, B., & Van Der Laan, S. (2008). Why Isn't Our Chat Reference Used More? Finding of Focus Group Discussions with Undergraduate Students. *Reference & User Services Quarterly*, *47*(4), 342-354.

NISO (National Information Standards Organization). (2004). Section 7.3.1 Virtual Reference Transactions. In *Home - National Information Standards Organization*. Retrieved May 12, 2009, from http://www.niso.org/dictionary/toc/section7/

Norman, D. A. (2002). *Design of everyday things*. 3rd ed.New York: Basic Books.

Owyang, J. (2009, June 2) Is Your Website SNOWED? (Stakeholders' Needs Overwhelm Web Experience Design). Posted to http://www.web-strategist.com/blog/2009/06/02/is-your-website-snowed-stakeholder-needs-overwhelm-web-experience-design/

Palys, T. (2008). Purposive Sampling. In L. M. Given (Ed.), *The Sage Encyclopedia of Qualitative Research Methods* (Vol. 2, pp. 697-698). Thousand Oaks, CA: SAGE Publications Inc.

Passini, S., Strazzari, F., & Borghi, A. (2008). Icon-Function Relationship in Toolbar Icons. *Displays*, *29*, 521-525.

Pavivo, A. (1971). *Imagery and Verbal Process*. New York, NY: Holt, Reinhart and Winston.

Peirce, C. S. (1955). *Philosophical writings of Peirce*. New York: Dover.

Penn State University Libraries. (2008). Penn State University Reference Icon Set. In *Penn State University Libraries*. Retrieved August 26, 2009, from http://ask.libraries.psu.edu/?stream=8 and http://www.libraries.psu.edu/psul.html

Purdue University Libraries. (2008). Purdue University Reference Icon Set. In *Purdue University Libraries*. Retrieved August 26, 2009, from http://www.lib.purdue.edu/askalib/

Rabner, L., & Lorimer, S. (2002). *Definitions of Reference Service: A Chronological Bibliography* [for ERUS (Evaluation of Reference and User Services Committee)] (pp. 1-19). Chicago: ALA (American Library Association).

Rice University - Fondren Library. (2009). Rice University Reference Icon Set. In *Fondren Library Rice University*. Retrieved August 26, 2009, from http://library.rice.edu/services/reference_assistance/ask-a-librarian

Rogers, Y. (1989). Icons at the Interface: Their Usefulness. *Interacting with Computers*, *1*, 105-117.

Rosted, J., Lau, T., Høgenhaven, C., & Johansen, P. (2007). *Concept Design: How to solve complex challenges of our time*. Copenhagen: FORA, The

Danish Authority for Enterprise and Construction's Division for Research and Analysis.

Samure, K. & Given, L. M. (2008). Convenience Sample. In L. M. Given (Ed.), *The Sage Encyclopedia of Qualitative Research Methods* (Vol. 1, pp.124-125). Thousand Oaks, CA: SAGE Publications Inc.

Schindlholzer, B. (2007, October 13). Concept Design: How to solve complex problems of our time. In *Customer_experience labs*. Retrieved November 14, 2008, from http://www.customer-experience-labs.com/2007/10/13/concept-design-how-to-solve-complex-problems-of-our-time/

Scratchmedia Ltd., Web 2.0 how-to design style guide. (2006, December 20). In *Web Design from Scratch. Retrieved February 26, 2009, from* http://www.webdesignfromscratch.com/web-2.0-design-style-guide.php#cute-icons

Sebeok, T. A. (2001). *Signs an introduction to semiotics*. Toronto: University of Toronto P.

Sless, D. (1986). *In Search of Semiotics*. Totowa, N.J: Barnes & Noble Books.

Smashing Editorial, Current Web Design Trends for 2009. (2009, January 21). In *Smashing Magazine*. Retrieved February 26, 2009, from http://www.smashingmagazine.com/2009/01/21/current-web-design-trends-for-2009/

Snavely, L. (2005). Visual Images and Information Literacy (L. Arp & B. S. Woodard, Eds.). *Information Literacy and Instruction*, *45*(1), 27-32.

Sudick, B. (2006). Paul Rand: Using Context to Create Meaning. In J. Frascara (Ed.), *Designing Effective Communications Creating Contexts for Clarity and Meaning* (pp. 186-190). New York: Allworth P.

Sugars, B. (2009). Startup Basics: 10 Rules for Quick and Easy PR: Simple steps to give your business a competitive edge on a budget. In Entrepreneur. Retrieved Aug 10, 2009, from http://www.entrepreneur.com/startingabusiness/startupbasics/startupbascscolumnistbradsugars/article202426.html

Taddeo, L. (2008). R U There? How to Reach a Virtual Audience Through Affordable Marketing Strategies. *Internet Reference Services Quarterly*, *13*(2-3), 227-244. Retrieved February 26, 2009, from The Haworth Press.

University of California Irvine Libraries. (2009). University of California Irvine Reference Icon Set. In *University of California Irvine Libraries*. Retrieved August 26, 2009, from http://www.lib.uci.edu/services/ask/ask-a-librarian.html

University of Guelph Libraries, & Ask Ontario/Knowledge Ontario. (2008). University of Guelph Reference Icon Set. In *University of Guelph Libraries*. Retrieved August 26, 2009, from http://www.lib.uoguelph.ca/assistance/ask_us/

University of Manitoba Libraries. (2009). University of Manitoba Reference Icon. In *University of Manitoba Libraries*. Retrieved August 26, 2009, from http://www.umanitoba.ca/libraries/

University of Minnesota Libraries. (2007). University of Minnesota Reference Icon Set. In *University of Minnesota Libraries*. Retrieved August 26, 2009, from http://www.questionpoint.org/crs/servlet/org.oclc.home.TFSRedirect?virtcategory=12947

University of Notre Dame - Hesburgh Libraries. (2008). University of Notre Dame Reference Icon Set. In *Hesburgh Libraries - University of Notre Dame*. Retrieved August 26, 2009, from http://www.library.nd.edu/reference/asklib/

University of Pennsylvania Libraries. (2009). University of Pennsylvania Libraries. In *University of Pennsylvania Libraries*. Retrieved August 26, 2009, from http://refchat.library.upenn.edu/

University of Pittsburgh Libraries. (2007). University of Pittsburgh Libraries Reference Webpage. In *University of Pittsburgh Libraries*. August 26, 2009, http://www.library.pitt.edu/reference/index.html.

University of Toronto Libraries, & Belray, G. (2009). University of Toronto Contact Us Icon Set. In *University of Toronto Libraries*. Retrieved August 26, 2009, from http://discover.library.utoronto.ca/utl_help/contact-us

University of Washington. (1998-2009). University of Washington Reference Icon Set. In *University of Washington Libraries*. Retrieved August 26, 2009, from http://www.lib.washington.edu/about/contacts.html and http://www.lib.washington.edu/

University of Waterloo Libraries. (2008). University of Waterloo Reference Icon Set. In *University of Waterloo Libraries*. Retrieved August 26, 2009, from http://www.lib.uwaterloo.ca/asklib/index.html

Vilelle, L. (2005). Marketing Virtual Reference: What Academic Libraries Have Done. *College and Undergraduate Libraries*, *12*, 65-79.

Visocky O' Grady, J., & Visocky O' Grady, K. (2008). *The Information Design Handbook*. Cincinnati, Ohio: F & W Publications.

Wang, R. W., & Hsu, C. (2007). The Method of Graphic Abstraction in Visual Metaphor. *Visible Language*, *41*(3), 266-280.

Waterworth, J. A., Chignell, M. H., & Zhai, S. M. (1993). From Icons to Interface Models: Designing Hypermedia from the Bottom-Up. *Journal of Man-Machine Studies*, *39*, 453-472.

Warren, S. (2001). Visual Displays of Information: A Conceptual Taxonomy. *Libri*, *51*, 135-147.

Westendorp, P.H.& Waarde, K. van der (2007). Visual Metaphors in User Instructions. *Visible Language*, *41*(3), 196-203.

World Wide Web Consortia. (2008, December 11) *Web content Accessibility Guidelines (WCAG)*. Rep. no. 2.0. World Wide Web Consortia (W3C). Retrieved April 7 2009, from http://www.w3.org/TR/2008/REC_WCAG20-20081211/.

World Wide Web Consortia. (2008, April 29). About W3C. In *World Wide Web Consortium - Web Standards*. Retrieved August 23, 2009, from http://www.w3.org/Consortium/

Yale University. (2007- 2009). Yale University Library Reference Icon Set. In *Yale University Libraries*. Retrieved August 26, 2009, from http://www.library.yale.edu/reference/asklive/index.html

Zammit, K. (2000). Computer Icons: A Picture Says a Thousand Words. Or Does It? *Journal of Educational Computing Research*, *23*(3), 217-231.

Zender, M. (2006). Advancing Icon Design for Global Non Verbal Communication: Or What Does the Word Bow Mean? *Visible Language*, *40*(2), 178-194.

Appendix A: Data Collection Elements

Icon Types

1. Photographs: this category includes photographic images that are used as icons.

   e.g. 

   (University of Washington)

2. Graphic: includes graphics, drawings, or any pictorial representation. This category includes all icons that are created with any illustrative software, or by hand.

   e.g.  (University of Alberta Beta)

3. Text: includes words or letters that have been graphically represented – includes wordmarks.

   e.g. 

   (University of Minnesota)

   In this case the text is graphically represented by being embedded in the graphic icon area.

   *some icons include more than one element; however they are labeled according to their dominant feature.

APPENDIX B: List of Icons Assessed

#	Institution	Webpage where icon is located
1	Auburn University	http://www.lib.auburn.edu/chat.html
2	Boston College University Libraries	http://www.bc.edu/libraries/help/askalib.html
3	Boston University Libraries	http://www.bu.edu/library/ask/index.html
4	Fondren Library Rice University	http://library.rice.edu/services/reference_assistance/ask-a-librarian
5	Hesburgh Libraries University of Notre Dame	http://www.library.nd.edu/reference/asklib/
6	Kent State University	http://www.library.kent.edu/page/10599
7	McMaster University Library	http://library.mcmaster.ca/justask/
8	Morris Library Southern Illinois University Carbondale	http://www.lib.siu.edu/askalibrarian
9	Penn State University Libraries	http://ask.libraries.psu.edu/?stream=8
10	Purdue University Libraries	http://www.lib.purdue.edu/askalib/
11	Syracuse University Library	http://library.syr.edu/information/reference/index.html
12	Tulane University Howard-Tilton Memorial Library	http://library.tulane.edu/help/index.php
13	University of Alabama Libraries	http://www.lib.ua.edu/forms/ask.htm
14	University of Alberta Libraries	http://www.sarabalcombe.com/libraryicon.html
15	University of British Columbia	http://www.library.ubc.ca/home/ask.html
16	University of California Irvine	http://www.lib.uci.edu/services/ask/ask.html
17	University of California San Diego Libraries	http://libraries.ucsd.edu/locations/bml/services/ask-a-librarian/index.html
18	University of Guelph Library	http://www.lib.uoguelph.ca/assistance/ask_us/
19	University of Manitoba Libraries	http://www.umanitoba.ca/libraries/
20	University of Minnesota Libraries	http://www.unl.edu/libr/ask/
21	University of Nebraska-Lincoln Libraries	http://www.questionpoint.org/crs/servlet/org.oclc.home.TFSRedirect?virtcategory=12947
22	University of Pennsylvania	http://www.library.upenn.edu/
23	University of Pittsburgh	http://www.library.pitt.edu/reference/index.html
24	University of Saskatchewan Library	https://library.usask.ca/uask
25	University of Toronto Libraries	http://main.library.utoronto.ca/index.shtml
26	University of Washington Libraries	http://www.lib.washington.edu/
27	University of Waterloo Library	http://www.lib.uwaterloo.ca/asklib/index.html
28	University of Wisconsin - Madison Libraries	http://www.library.wisc.edu/ask/
29	Yale University Library	http://www.library.yale.edu/reference/asklive/index.html
30	York University Libraries	http://www.library.yorku.ca/ccm/Home/VirtualReference/askalibrarian.htm

APPENDIX C: Icon Assessment Criteria

(In order of application)

Visual Appeal

Contrast – high or low measures the difference in value between the foreground and background.

Boundary – the background border or outline which separates an object from the rest of the page.

Colour - evaluation of use of colour

Style – overall style of the symbol (e.g. silhouette, outline, or photographic)

Message Clarity

How easily is the main message understood? (Considers visual noise or elements which detract from the communication of the main message)

Accessibility

Interaction/Clickable – can the service be accessed by clicking on the icon?

State Change/Feedback – refers to visual indication of different states or modes.

Consistency of Icon Set (appearance, arrangement, interaction etc.)

Discriminability - easily discernable within the set, there are no other things that could mean the same thing.

Typeface/Legibility - readable

Placement on site/Navigation – where is it located, is it easy to find?

Extensibility - remain readable in different sizes, colours and mediums.

Alternative Text – pops up when icon is moused over.

APPENDIX D: Assessment Criteria Defined

(In order of application)

Visual Appearance

Contrast – Is the contrast between the primary object (foreground object or word) and the background of the icon high or low?

High contrast (dark on light or light on dark) increases legibility of an icon and high contrast between the primary object and its background allows for identification of the most important part of the icon and its subject. (Horton, 1994, p. 85 & 145-55) Therefore low contrast is not generally considered good practice when designing an icon. Low contrast is defined as where it is hard to make out the primary object because its outline and/or colour are too close in value to the background.

ISO recommendation: icons should be “sufficiently prominent in comparison with other information on the screen” (ISO 1803:2003 sec 5.2.2). Meaning the icon should stand out against the other elements of a webpage, including the background. The W3C recommends a contrast ratio of “at least 4.5:1” or 22% between the icon and its background (2008, sec 1.4.3)

Boundaries – Is the boundary or border, or outline between the icon and its web page background clear and uniform or not?

Huang et. al (2002) state that one of their criteria for good icons is that an icon should have clear boundaries (p. 213). In this case clear boundaries are defined as a background, border or outline which has a high contrast with the webpage background and is uniform and does not blend into the page background. Unclear boundaries for icons detract from their identification and readability and are not recommended design practice.

Colour – Is colour used to the benefit or detriment of the icon?

Colour can be used to achieve different effects, including; for visual interest and beauty, to make object easier to recognize, and to represent categories. Often academic institutions use their school colours to brand things as belonging to the institution. Colour can be used for uniformity or to distinguish. This category will be judged according to if the colours break one or more of the following rules as laid out in The Icon Book (Horton, 1994, p. 173-75)

- Are the colours balanced?

Balance warm with cool, dark with bright.

- Are the colours garish to the point of being offensive?

Limit use of pure, bright, or primary colours to small areas.

"Pick colours that most users like. Western adult viewers prefer colours in this order: blue, red, green, purple, orange, and yellow" (p. 174).

- Are the colours conflicting?

"Do not overwhelm subtle colour icons with bright borders and brilliant backgrounds" (p. 174). Avoid juxtaposing colours that are opposite or distant on the colour spectrum such as green and red, blue and yellow, and red and blue (ibid.)

Style – Which style is the icon?

PhotoTableic realism – Is the icon in the style of photo realism?

"Typically this technique is used for complex objects that require a uniformly high level of detail to make them recognizable. One common use of photographic icons is to represent specific people, buildings, or works of art" (Horton, p. 138). This is common in the fields of history, current events and architecture (Horton, p. 139). In this case photo realism will be applied to all photographs that are not abstract.

Simplified drawing –Is the icon in the style of simplified drawing?

Identified by a clear outline and distinctive interior details (Horton, p. 140). “Probably the most common icon drawing style” (ibid.) “Details may be omitted for simplicity but features are not deliberately exaggerated” unlike caricature (ibid.). This style is recommended by Horton for complex objects that require inclusion of specific details to be recognized, (e.g. this is the kind of illustrations the accompany IKEA furniture the details are required to tell similar objects apart.)

Profile or outline – Is the icon in the style of outline?

Icons are considered to be in outline style when only the contour or outer outline is shown, with only the most prominent internal details show (Horton, p. 142). For example the outline of a book may be shown, without the non-essential detail of the writing on the pages being represented. According to Horton this style is used most when representing objects that consist of “just edges and lines” (ibid.), for example a folder.

Silhouette – Is the icon in the style of silhouette?

Silhouette icons consist of a shape filled with a solid colour, usually in high contrast with its background (Horton, p. 143). “By obscuring irrelevant details…, this style makes icons more generic” (ibid.) Silhouettes are common in road signs (ibid.). Filled shapes have more emphasis than outlined shapes.

<u>Comprehensibility</u> - List of Tableic components and their referents or meanings.

The purpose of this category is to provide a framework for understanding what prior knowledge a viewer would require to interpret intended meanings. Graphic components representing, objects, actions, and relationships will be recorded along with their possible meanings and discussion of what background knowledge users might require when interpreting the components. This is in keeping with ISO requirement: “All available icons should be comprehensible” (ISO 11581-1:2000 (E) sec 6.2.4). ISO defines comprehensibility as the “ease with which the meaning of an icon is understood” ((ISO 11581-1:2000 (E) sec

4.3). The W3C has a similar principle in its guidelines, “information and the operation of user interface must be understandable” it is more broadly applied, but still applies to any navigation elements such as icons (2008, sec 3).

Messages were recorded when elements contributed information to the categories of;

- How: to access the service (i.e. IM)
- Who: Who you will be contacting (i.e. library staff)
- What: What the service provides (i.e. answers)

The findings from this category were used to inform analysis of the student and librarian interview data regarding their understanding of the icon.

Accessibility

Interaction – Is the icon clickable?

The W3C guidelines state that “user interface components and navigation [including icons] must be operable” (2008 sec 2). They specify that by “operable” they mean not only active, but also usable via keyboard for those who are not able to use mice. The ISO standards assume that web icons will be active and able to be selected (ISO 18036: 2003, sec. 5.1.3)

State Change – Does the icon represent the fact that it has been selected or activated in a visual manner?

ISO states that, “there shall be visible feedback when a function has been invoked” (ISO 18036: 2003, sec. 5.1.4).

Consistency within Icon Set – If the virtual reference icon or any other icon is inconsistent with any of the other icons in the set on one or more of the following elements then the set is considered inconsistent.

Consistency is defined by ISO as relating to appearance, interaction and feedback within an icon set. Most of the factors below are related to appearance. Those that are not defined here are defined above.

Contrast – see above

Border/ Boundary/background (these go together because the boundary is often set by the background border) – see above

Style – see above

Shape –Are all the icons in the set the same shape? If not, does it make the set inconsistent in appearance or does each icon have its own distinctive shape?

Size – Are the icons all of the same size?

Colour – If the use of colour is uniform throughout the icon set it will be considered so. If there is one inconsistent icon it will be considered an inconsistent set. This does not mean that each icon has to contain the same colours, but that each icon has to be coloured using the same logic.

Viewpoint – Are the icons shown from a consistent viewpoint? (e.g. side, top, front, bottom etc.)

Dimensionality - For example, are the icons all three dimensional, two dimensional, etc.?

Shadow – Is the shadow consistent? (e.g. are all the shadows the same kind and are they in the same direction?)

Consistent interaction- Can the icons all be activated the same way?

Consistent state change- Do the icons represent state change the same way?

Consistent typeface – Is there a consistent use of typeface if letters or words are part of icons?

Consistent appearance on website - LIS marketing literature (King County Library System & Washington University, 2002) recommends that there is a consistency of appearance when an icon is used in more than one location on a website.

Consistent arrangement on webpage – The ISO general icon standards state that icons of a set shall be arranged in a consistent manner, either in a grid, column, line or other.

Placement

Home - Is the VR icon present on the library homepage?

LIS marketing literature (King County Library System & Washington University, 2002) recommendations that help icons should be present on the homepage and throughout library websites. This practice assists access to the virtual reference services.

Other - Is the icon seen on library pages other than the reference page?

Typeface – Is the text legible?

ISO states “if text is included to improve the comprehensibility of the graphic, plain typefaces should be used” (ISO 18036: 2003 (E) sec 5.2.6).

Discriminability - Can you easily and quickly visually tell the difference between the IM/chat icon and the other reference icons?

ISO defines discriminabilty as the “ease with which a given icon can be distinguished from other icons that might occur in close spatial, temporal, or contextual proximity” (ISO 11581-1:2000 (E) sec 4.5). standard is meant to insure that icons can be told apart. Icons may be confused if they contain similar objects in similar relationships.

Extensibility – Would the icon remain readable in different sizes, colours etc.?

This is a requirement of library virtual reference icons if they are to be used in promotional materials other than the website (King County Library System & U of W, 2002, p. 28).

Alternative Text – Is alternative text provided for the icon?

W3C guideline 1.1.1 states “all non-text context that is presented to the user has a test alternative that serves the equivalent purpose” (2008).

APPENDIX E: Staff Interview Questions

Library Staff Interview Script – Sample

Exchange signed Information/Consent Letter

To be sure that we are talking about the same icon, an image of the icon was be sent via email along with the Information/Consent Letter.

Introduction

Review of study purpose - Review of participant rights

Background

1. Can you tell me about your position at the library and the kind of work you do?
2. What is your responsibility in regards to the website?
3. How long have you worked at this institution?
4. What is your academic/work background?
    a. Have you done any work in marketing or design?

Design Process

5. Can you describe some of the reasons why you decided to use an icon(s) to represent your reference service(s)?
6. Can you describe the process of choosing/designing the reference icons for your website?

    a. Was someone with a marketing or design background involved?
    b. What was your selection process and criteria for evaluating the options you looked at?
        i. What were some of the reasons why you chose to use this particular icon for your IM/Chat reference service?
        ii. (If there is a set of icons) Can you explain how you chose to differentiate your IM or Chat reference service icon from the icons for your other services**?**
        iii. Did you consider any of your peer libraries as examples? Why or why not**?**

7. Does the IM/Chat icon appear on pages other than your reference page on your site? Reasons?
8. Do you use this icon in other promotional materials for your site?

Standardization

9. Did you consider and or use any standards (WC3 accessibility, ISO) for symbols and icons to be used on the web? Why or why not?
10. Do you think there would be benefits to having standards for icons on library websites (i.e. consistency)? What do you think about the idea of having a common symbol to represent reference for all ALA libraries? Why or why not?

Reference

11. Can you describe the goals your institution has for its reference service?

    a. Specific goals for IM/Chat ref? Is there any difference in the kinds of questions or answers that are intended to be received/given over IM/Chat reference? (Note initial contact will request a statement or definition regarding reference.)

12. What are some of the messages you would like to communicate to users regarding your reference service in general and your IM/Chat service specifically?

Comprehensibility

13. Can you describe the icon to me? What does the current IM or chat reference icon mean to you?
14. Do you feel that it communicates the messages that you would like about your reference service?
15. How closely do you think the meaning of the icon matches the institutional understanding of the service?
16. What kinds of meanings do you think this icon may communicate to visitors to your site?
17. How do you expect people to interact with or use these icons?

Evaluation

18. How long has this icon been in use?

19. Are there plans for evaluating the effectiveness of the icon? What would the evaluative process look like?
20. Are there plans for redesign? What process would be used for this?

Other

21. Is there anything else you would like to discuss? (i.e. regarding the design process etc?)

APPENDIX F: Student Interview Questions

Student Interview Script – Sample

Introduction

Background

Step 1: The interviewee was shown a picture of each of the library IM or Chat reference icons without context.

Comprehension

1. What does this icon mean to you? What do you think it stands for?
2. Can you identify any of the parts in this icon (i.e. symbols, objects, colour) Do they give you clues as to what the image means/represents?
3. How do you feel about this icon? Do you like it? What do you like about it?
4. What do you think would happen if you clicked this icon?

Step 2: The interviewee was shown the IM icon along with the others in its icon set.

5. Seeing all of these icons together, can you tell me what you think each one stands for? In general, is it difficult or easy for you to tell what they stand for?
6. Are there any that you think could mean the same thing? Is it hard to tell some of them apart? Why or why not?

Step 3: Now we are going to look at these icons in the context of their webpages.

7. Do you think that the context of the website makes it easier or harder to understand the icon? What words or what is it about the page that helps you understand the icon?
8. Is there anything about the webpage that makes it easier to tell the icons apart?
9. What would you do in order to access the service?

10. This is the library's homepage how would you get to their IM service?
11. Earlier when I asked you how you felt about the icon and if you like it you said…how do you feel about it now when you see it online? Why do you think your feelings have changed or not?

Step 4: The participant was shown all of the icons on paper or screen out of their webpage contexts.

12. Which icons do you like the most and least? Why (e.g. colour, style)? Was it the easiest to understand?