

## **The visual effect: A literature review of visual design principles as they apply to academic library websites**

Aaron Bowen

Wichita State University

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This paper reviews the concept of visual design as it applies to academic library webpages. There exist multiple unsettled aspects of visual design on library websites, prompting a need to critically examine and update current design practices. This paper presents aspects of layout, graphics, and navigation where no consensus for an effective design allowing students to interact with a library website has been achieved among librarians. It suggests areas of research whose investigation would strengthen the design of academic library webpages, and make them both more usable and more aesthetically pleasing to a student population.

Keywords: visual design, library webpages,

In a Net-based world, where eyes are drawn to digital screens daily, the desire to have academic library content be visible to students is of increased salience to libraries looking to be a part of these students' research process. How a library makes its resources and services findable and useable has never been more important, a principle that extends to the visual design and organization of these resources and services on the library's website. The design and organization of these materials directly affects student perception of the library as a quality instrument to use in addressing their research needs. Highlighting the importance of the design choices a library must make in presenting itself online, Kasperek, Dorney, Williams, & O'Brien, (2011) argue that,

Libraries have ample opportunities to use images, design, and text to cultivate a library's desired persona... By providing users with an initially positive aesthetic experience, libraries send the message that they are reputable and reliable sources of assistance, cognizant of the importance of visual design to the success of engaging increasingly digitally savvy users (p. 243).

A host of broad ideas surround this design process. There are multiple interpretations of what it means to make a library and its resources and services "visible," or to employ "visual design" principles to make them findable and useable to patrons. These ideas are presented in different pockets of literature across such disciplines as library and information science, computer science, psychology, fine art, and business. Thus far, no one has undertaken a review to pull the ideas from these fields together and broadly relate them to academic library websites.

This article reviews design elements that make academic library resources visible to students.<sup>1</sup> Through this review it summarizes generally agreed-upon tenants of how such design may be applied to library websites, but more importantly, highlights areas (of which there are many) where no such consensus exists. Finally, it identifies future research directions these areas invite.

***What, precisely, is visual design, and why should it be of note to an academic library?***

As defined by the U.S. Government's usability website,

Visual design focuses on the aesthetics of a site and its related materials by strategically implementing images, colors, fonts, and other elements. A successful visual design does not

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<sup>1</sup> There exist related bodies of literature focusing on visual design for non-student audiences. While these bodies are notable, they fall outside the scope of this article. With its focus on academic libraries, this article focuses on a student user population.

take away from the content on the page or function. Instead, it enhances it by engaging users and helping to build trust and interest in the brand (usability.gov, n.d.).

In the case of an academic library website, the library, its resources and services, and the perceptions students form about these resources and services by interacting with the site, represent the library's brand.<sup>2</sup>

Usability.gov (n.d.) goes on to list certain basic elements of visual design, which may be understood as the building blocks of a visual representation. Among these elements are lines, shapes, color, and typography for the textual elements of design. The site also lists certain visual design principles, which may be understood as the underlying processes through which design elements may be constructed to impart meaning. These principles include hierarchy, balance, contrast, scale, and others. Both Marsh (2015) and Parsons & Sedig (2014) offer similar lists. Lastly, the wording "a site and its related materials" (usability.gov, n.d.) is a valuable acknowledgement that a website consists of more than just its top-level homepage. Library websites are often expansive collections of pages, hosted through both the parent university and third party services, such as the Springshare company in the case of LibGuides. A library website is comprised of all these elements, and much of the literature on library websites focusses on these individual elements as opposed to the site as a whole.

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<sup>2</sup> The terms graphic design, graphic user interface (GUI) design, Web design, and user experience design all exist as well, and are to some extent fluid in their relations to visual design. Chapman (2018) distinguishes visual design from the others by describing it as an overarching practice that combines the worlds of graphic design (which, echoing Cezzar's (2017) definition, she describes as having its roots in print media), and the worlds of Web, user interface, and user experience design. Visual design is, accordingly, a broad concept that gets scaled into increasingly granular conceptualizations.

The idea that visual design principles are processes through which Web design may be constructed further ties these principles to a library profession that has accepted both Constructivism and visual literacy as two of its basic tenants. Broadly laid out by Kuhlthau (1991; 2004) and Bruce (1997), Constructivism in the academic library world is a theory stating that students derive or construct their own meanings from the information they discover when using the library. As a theory, it places the student at the center of the resources and services the library offers, including those offered through library websites.

Also tying visual design to library websites is the concept of visual literacy. Drawing from its connection to information literacy, visual literacy guides library website designers in moderating respectively the general look and feel of the site and its navigational structure.

The Association of College & Research Libraries (ACRL) has defined visual literacy as “a set of abilities that enables individuals to effectively find, interpret, evaluate, use, and create images and visual media” (ACRL, 2011). Michelson (2017) offers a summary of the visual literacy field over the past half century. The essential points to understand about visual literacy as it relates to library website design are that, similar to Constructivism, there is a strong emphasis on how a person views and interprets images throughout these definitions, as well as the person’s ability to create images to communicate to others, as is the case with a librarian choosing or creating images for a library website. There is also a strong emphasis on connecting visual literacy to information literacy, both explicitly articulated by the ACRL (2011), and present in the scholarly literature, of which Matusiak, Heinbach, Harper, & Bovee (2019), Schwartz (2018), Brown, Bussert, Hattwig, & Medaille (2016), Gendron & Sclippa (2014), Beatty (2013), Hattwig, Bussert, Medaille, & Burgess (2013), and Harris (2010) are just a few examples from the past decade.

There have been some efforts to synthesize visual literacy standards with the ACRL's current Framework for Information Literacy ACRL (2016), such as Brown et al. (2016) and Hattwig et al. (2015). Also relevant to library webpage design, Brown et al. (2016) notes the close relationship between visual literacy and text, which becomes important in designing the navigational elements of a library website.

There are a variety of reasons why academic library personnel have an interest in espousing visual design principles (and their underlying Constructivist and visual literacy principles) in presenting their resources and services to the students they serve. For example, library website designers will want to ensure their website is both understandable and usable (it is no accident that the above definition of visual design came from usability.gov). Usability is an area of library Web design that is well documented, for example by Azadbakht, Blair, & Jones (2017), E. Mitchell & West (2017), and Farney (2013). The intersection between usability and visual design naturally centers on the question of whether the site's observable layout and content make sense to a viewer such that s/he is able to use the site for his or her intended purposes.

By extension, librarians can use visual design principles to reduce the level of cognitive load required of a student to intellectually process and understand the site such that she or he may use it effectively and efficiently – two principles comprising the International Standards Organization (1998) standard for usability. Designing usable websites that require minimal cognitive processing are two core goals librarians have embraced in their drive to place students at the center of their resources and services.

Arguably the biggest reason, however, is that hit upon in Kasperek et al. (2011) – that a library communicates its reliability as a source of information in no small part through the aesthetic

visual design of the content it offers. McGillis & Toms (2001) offer a similar idea. In calling a library's website its "virtual public face", they argue that the site must, "give the library some form of identity and encourage repeat visitation (p. 355)." Möller, Brezing, & Unz (2012, p. 739) argue that the visual design of a website affects its "acceptance and recommendation" among people who have used it. Hintz et al. (2010) extend this idea to individual subject guides within library websites. They note that students responding to a questionnaire they developed chose the most visually appealing guides as the ones they were most likely to use (which implies acceptance). Success in being seen as a reliable source of online information is critical to a library's existence, particularly in an environment of ubiquitous Internet access that is constantly offering alternate search options and questionable information.

### ***Methodology***

Literature searching was conducted using the Library, Information Science & Technology Abstracts (LISTA) database. Bibliographies from the resulting literature would occasionally indicate additional studies of interest, prompting individual known item searches to include this literature in the body under consideration. When relevant, some literature discovered through the research process reported in Bowen, Ellis, & Chaparro (2018) has also been included.

The literature discovered through this search process can roughly be grouped into categories dealing with the graphic layout of a library's website, as well as its images, color, navigation, and search features. These categorizations do not exist in a vacuum from one another. A website's graphic interface plays a direct role in its navigation system, and both interface and navigation in turn influence the site's usability and aesthetic appeal. As such, the literature reviewed below often straddles two or more categories.

No previous reviews of literature on visual design as it applies to library websites were identified through this search process. With her review of webpage studies on academic libraries, Blummer (2007) offers the closest parallel. While she has a section on usability and navigation, her focus is, however, on the content of library webpages and their descriptions of the services offered at the libraries being reviewed, and not on their visual design. Holtze (2006) offers a review specifically on the use of color on library websites, Gaona-García, Martin-Moncunill, & Montenegro-Marin (2017) review the strengths and weaknesses of different visual search interfaces, and Michelson (2017) offers a historical review of the field of visual literacy. None of these studies focus directly on reviewing visual design literature with respect to academic library webpages. Rather, Holtze (2006) and Gaona-García, Martin-Moncunill, & Montenegro-Marin (2017) both review specific aspects of visual design, and Michelson (2017) reviews a related field.

Search terms were kept broad through the use of truncation in particular. For example, the term *librar\** was searched, as it would reach articles that used both libraries and librarianship in their descriptors. As visual design is described and discussed in many ways across different bodies of scholarly literature, it was shortened to *visual\**, which in turn allowed for articles on visual literacy and visual search to be identified. While this strategy is less precise than it could have been, it allowed for a broad range of articles to be retrieved. Given the interdisciplinary nature of the review subject, this breadth proved desirable, and helped foster a rich review of the visual design literature from multiple angles (though, ironically, experiments with substituting the terms *visible\** or *visibility\** in place of *visual\** did not lead to useful pools of literature). No

specific date range was set when searching, though the literature under review rarely extended beyond the late 1990s, due to the age of the Web. Literature was retrieved from a broad range of journals, conference proceedings, and other sources, though at least four articles from the *Journal of Web Librarianship*, *The Electronic Library*, and *Behaviour & Information Technology* respectively are featured in this review.

This search process resulted in bodies of literature relating visual design to both websites generally and library websites specifically. It further led to literature relating visual design to individual elements of websites, falling into the general categories of layout, use of images, color, navigation, and search interfaces. *Web\* AND user interface\* AND visual\** was the most fruitful search string, retrieving 196 articles. Adjusting the string to *website\* AND user interface\* AND visual\** reduced the findings to 64 articles. Both iterations of the string identified notable sections of the literature under review.

Focussing the *website\* AND user interface\* AND visual\** string on libraries specifically prompted the *library website\* AND user interface\* AND visual\** string, which retrieved seven articles. Dropping the *user interface\** section of the string increased the results to 77. Despite identifying a smaller pool of literature, this avenue of searching did identify the two articles published by Newell (2004; 2005).

Broadening the focus from the library website specifically to academic libraries led to the variant terms of *academic librar\**, *university librar\**, and *college librar\**. Re-adding the *user interface\** term created the *(academic librar\* OR university librar\* OR college librar\*) AND user*

*interface\* AND visual\** string, which yielded 50 results and further offered notable contributions to the literature under review.

Alongside the visual design literature, this searching yielded literature on visual literacy. While closely related to visual design, visual literacy is its own subject with its own distinct body of literature. It plays a role in how students interpret the design of library websites and, in particular, the images placed on these sites. Despite the topical proximity of the two concepts, however, visual design places greater emphasis on the construction of the elements of a website, where as visual literacy places greater emphasis on how the site may be viewed and interpreted. As such, visual literacy does not constitute a comprehensive subject within this review.

The search process also led to bodies of literature that used the term “visual” in ways that were only partly connected to visual design. For example, some literature examines library visibility in a marketing sense – using marketing, outreach, and promotional ideas to make a library visible to its patrons. Other bodies of literature examine library websites scaled for smartphone and tablet screens, and examine making library websites accessible for visually impaired people. The body of marketing literature has few direct ties to visual design of library websites, with the graphic appearance of marketing and branded materials on the website being the main connection. There are extensive bodies of literature examining the use of smartphones and tablets to access library website content and examining design factors for library websites to meet the needs of visually impaired people – extensive enough that each would merit its own, separate review. The essential point about these bodies of literature is that, while there are areas

in which they can be tied to visual design on a website, they largely fall outside the scope of this article.

*The visual aspects of design: what must academic librarians consider?*

Academic librarians have not been complacent in considering the graphic and navigational design of their websites. They have adapted the body of literature focusing on the design of websites broadly to design library websites specifically. Comeaux (2017), Chow, Bridges, & Commander (2014), Jones & Thorpe (2014), Aharony (2011), Kasperek et al. (2011), and Liu (2008), for example, dedicate parts of their research to examining the visual design elements of library homepages. Librarians have further dedicated parts of their research to examining visual design and organization of library guides (Brandon, Sattler, & Tobias, 2011).

As noted above, this literature can roughly be grouped into studies of graphic layout, images, color, navigation, and search features, though the categories often bleed into each other.

*Layout*

With regard to layout, Kasperek et al. (2011) examine the webpage design of 49 academic libraries, observing that discovery tool search bars and promotional materials are prominent features. They note content areas and links to content as being featured as well, with varying degrees of clarity regarding how this material is assembled. Rod-Welch (2012) examines the placement of reference and social networking tools on library homepages. She concludes that they are often placed far down on these pages, and libraries might receive higher engagement with these tools if they gave them more prominent placement on the page.

Outside the academic library world, by conducting experiments with placement of objects within

grids, Möller et al. (2012) found that grouping like elements together on a webpage resulted in greater acceptance of the page. Benway (1999) produced an extensive work on “banner blindness,” the idea that people are often unable to locate information that Web designers have explicitly sought to highlight by placing the information in banners separate from the page’s main content. In particular, the spatial placement of the banner on a page, and how near or far it is from other items on the page, can affect whether the highlighted item received any use or not.

Related to the layout is the level of clutter on a webpage. Within the library world, Kasperek et al. (2011) note clutter as a distracting element on certain library webpages. Both Sonsteby & Dejonghe (2013) and Hintz et al. (2010) find that students prefer an uncluttered layout to library guides, and Degler (2012) calls for reducing clutter on LibGuides. Additional voices commenting on clutter have come from the fields of computer science and psychology, such as Rosenholtz, Li, & Nakano (2007). They essentially accord with the “less is more” finding from the library literature.

Evaluations of webpage use that tie layout and clutter together are particularly revealing. For example, Geissler, Zinkhan, & Watson (2006) conclude that websites that provide enough images and text to communicate needed information to those using the site, but not more, are optimal for serving their purpose while not being perceived as overly complex.

### *Images*

Tying images to layout design, Tchangalova & Feigley (2008) note the role images can play in breaking blocks of text on webpages up, thereby making the information presented on the page more easily digestible. Cobus-Kuo, Gilmour, & Dickson (2013), however, found images questionably effective in this role. They note that just over 1/3 of their test subjects found

images to be “wasted space” (p. 49). They elaborate that images which operate as navigational aids receive greater approval than purely decorative images.

Tchangalova & Feigley (2008) offer an implicit argument that such chunking of content can in turn help minimize the cognitive load students expend as they use the library website. Rybin (2012) further discusses how visual literacy principles can be employed to reduce cognitive load when using a website, and Parsons & Sedig (2014) describe ten properties of visual representations that affect human cognitive processing. Library websites can (and do) use images to aid in the process of effectively communicating their resources and services to patrons such that their pages do not create unnecessary cognitive processing. None of this literature, however, addresses the content of the images being depicted.

Focusing on the images themselves, Newell (2004) ties constructivism to visual imagery (specifically photographic imagery) on library websites. While he acknowledges the importance of the design placement of images, his primary concern is to discuss the construction of images, and the messages they send through their composition, as opposed to their placement within the overall graphic design of a library webpage. He uses the term visual grammar to describe the compositional elements that are combined to create a finished image. He writes that,

The use of the term grammar acknowledges a relationship between the grammar of language and visual grammar. Linguistic grammar is an inventory of elements and rules underlying culture-specific verbal communication. Visual grammar is a grammar of contemporary visual design... and hence an inventory of elements and rules underlying a culture-specific form of visual communication (Newell, 2004, p. 310).

He then focusses on people, locations, and objects in images as forming “the vocabulary of the

image” (p. 310), which in turn communicates the message’s meaning.<sup>3</sup> Specific elements of this vocabulary can include the clothing and posture of people depicted – both patrons and librarians – as well as their spatial placement in relation to each other, their eye contact and facial expressions, and their depicted activity. The camera’s point of view and its distance from the image’s elements (either due to physical proximity or due to the zoom on a camera lens) add further compositional structure to the image that can affect the message communicated through the image (Newell, 2004). In a subsequent study, Newell (2005) surveyed 150 images from public, academic, and special library websites, finding that the majority of these images depict the professional authority of librarians working in the library, knowledge equality between librarians and patrons despite the existence of a professional barrier between them, and medium levels of warmth between them.

There is a small but notable collection of articles concerned with the types of personal images librarians will use to present themselves on their library’s website. Anderson & Still (2013), for example, compare librarian’s use of headshots of themselves on LibGuides vs. on personal social

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<sup>3</sup> The presence of the word “grammar” in Newell’s (2004) term “visual grammar,” as well as his focus on the “vocabulary” of images implies a semiotic, language-based understanding of an image. While it enjoys a strong degree of acceptance among many scholars, this understanding of image interpretation has been the subject of criticism as well. For example, both W. J. T. Mitchell (1994) and Baetens & Surdiacourt (2011) point out that images have their own modalities through which they should be understood and interpreted, separate from spoken or written language that assigns terms to objects and themes as a process through which meaning may be communicated. While this criticism certainly has merit, it does not typically reflect the views of visual literacy scholars such as Kress & van Leeuwen (1996), who have largely embraced the dual modality pairing of images and language. This pairing becomes important in designing the navigational elements of a library website.

media platforms. They identified a trend of librarians using headshots as opposed to other types of images within their guides, and, given the choice of a professional-looking headshot vs. a casual one, a preference for maintaining a professional appearance. Drawing from Schneider (2012), who argues that librarians pay significant attention to the image of themselves they put forward to their patrons and their colleagues, Anderson & Still (2013) speculate that headshots librarians choose for their LibGuides serve to make them recognizable in a professional library context, according with the professional authority and medium levels of warmth Newell (2004) identified when viewing library images generally. Anderson & Still's (2013) observations further accord with Möller et al's (2012) finding that website users more often accept a site as valuable if it includes a picture of a contact person instead of a cartoon or no picture, and Wisniewski's (2008) argument that patrons appreciate the ability to visually see the librarians they interact with when using a library website.

Kavanagh (2013), by contrast, had success using cartoons to break up blocks of text on LibGuides. Her work represents a somewhat different dynamic in that she created characters that interacted with each other in full comic strips, not cartoon portraits to stand in place of librarian pictures (only one of her characters was based on an actual librarian). Her work suggests a related avenue of research, though, surrounding how libraries depict patron-librarian interaction. Research could be crafted on student reactions to cartoon images on a library website as opposed to images of real people, and whether the dynamics observed by Newell (2004) hold up similarly in a cartoon medium.

### *Color*

There is little literature on color regarding library websites specifically, which may be a partial

reflection of an institutional circumstance faced by many academic libraries: that they have limited ability to select colors for their website because their home university asks them to follow specific color guidelines for branding purposes. While this circumstance may limit the hues available to library web designers, it does not necessarily limit their ability to manipulate saturation and luminance.

In the small amount of library literature on color in website design that exists, Brandon et al. (2011) write about using color for branding in LibGuides, and Degler (2012) calls for legible, high contrast text as an essential feature of LibGuides. Holtze (2006) reviews different aspects of color use in library websites, but she herself notes the paucity of librarian-generated literature on this topic.

The rest of the literature on color in website design comes from the fields of art history, computer science, psychology, and marketing. In this regard, both Morton (2002) and Hill & Scharff (1999) provide broad ranging overviews.

Discussing hue<sup>4</sup>, Arnheim (1998) notes the primary colors of red, yellow, and blue, the secondary colors of purple, green and orange, which fall evenly between the primary colors, and tertiary colors, which are blended from the primary and secondary colors. He then characterizes primary colors as cold and inflexible, as “their presence influences their neighbors, but they are not influenced by them” (p. 349). He contrasts this with the secondary and tertiary colors, which he argues are flexible composites of the primary colors, and therefore warmer. Through its

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<sup>4</sup> Color is characterized by hue, saturation, and luminance – hue being a color’s pigment, saturation being the strength and intensity of the color, and luminance being the brightness of light in a color.

relation to temperature, a color's hue forms an element of the visual grammar Newell (2004) identifies as contributing to the medium warmth often depicted in library website images.

Hue can further be used to affect a Webpage's design and use. Benway (1999), for example, notes that brightly colored text can be an effective way of drawing attention to a link in a menu, particularly if that link is the first item in the menu. Fitzsimmons, Weal, & Drieghe (2019) note that the typical blue of hyperlinks does not affect the readability of Web text, so changing the color of a hyperlink can enhance the attention drawing effect Benway (1999) describes.

In addition to their examination of background clutter, Hill & Scharff (1999) examined the effect of color saturation on text legibility. They tested black text against three background colors (blue, gray, and yellow) at two levels of saturation, finding no significant effect on legibility due to background color saturation. By contrast, Merchant (1999) notes a bleeding effect that can occur between two adjacent, highly-saturated colors on screen, and Morton (2002) notes that high levels of saturation can lead to eye fatigue. Based on this observation, Holtze (2006) recommends using muted colors on library websites.

The color of text and the color of the background on which it appears has an effect on webpage readability related to luminance. In the case of screen text, luminance governs contrast, with the highest contrast occurring between black and white. This high contrast has naturally fostered a Web environment that most often presents black text on a white background, leading, for example, Nielsen (2000) to offer a highly prescriptive statement that legible text reproduction on the Web suffers with any other color combinations. Lin published multiple articles confirming the value of high luminance contrast, starting with Shieh & Lin (2000) and finishing with Lin (2014). Other studies have found similar effects (Ko, 2017; Ojanpää & Näsänen, 2003). Unlike

Nielsen (2000), however, none of these articles recommend black text on a white background as the most legible combination. Rather, they prefer high contrast combinations of a range of other colors.

Hall & Hanna (2004) further challenge the Nielsen passage by arguing that legibility is not the sole factor governing choices of color for text and backgrounds. In addition to legibility of website text, they research the retention of information a website facilitates, its aesthetic appeal, and whether this appeal can drive a consumer to make a purchase. In the case of a library website, a substitution for the purchase goal would likely be acceptance of the site as a valuable resource for information discovery and academic success.

### *Navigation*

Navigation can be highly visual in the case of a technology like ProQuest's AquaBrowser, or it can rely heavily on presenting text in a stylized graphic layout, such as a menu.<sup>5</sup> Regarding navigational design, Burrell & Sodan (2006) test different navigational styles for intuitiveness and ease of use. They confirm that the placement and design of a menu matter significantly to website users, though, interestingly, they report a preference for tabs across the top of a screen over other navigational styles. This finding has been disputed in literature on library guides in particular. Hintz et al. (2010), Frigo, Harris, Liss, & Seale (2009), Beaton, Bonnet, Dueber, Desai, & Piacentine (2009), and Teague-Rector & Ghaphery (2008) all confirm it, but Thorngate & Hoden (2017), Pittsley & Memmott (2012), Ouellette (2011), Hungerford, Ray, Tawatao, & Ward (2010), and Corbin & Karasmanis (2009) dispute it. Conerton & Goldenstein (2017) note

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<sup>5</sup> ProQuest's AquaBrowser (<https://www.proquest.com/products-services/AquaBrowser.html>).

that some of their test subjects preferred top tabs but others preferred a side menu – some even changing their preference based on the individual page they were viewing. Jackson & Stacy-Bates (2016) note a lack of consistency in the organization of navigational elements across library guides offered through 100 different academic libraries, and call for guides to feature an explanation of how they are arranged.

Regarding textual navigation on LibGuides, Pittsley & Memmott (2012) analyze traffic to their library's LibGuides both before they applied changes to the guides' navigational tabs, and after. They observed an increased flow of traffic following their intervention, and accordingly recommend strategies for adding additional links to improve navigation within the body of the guide, and enhancing the tab design. Similarly, Bowen et al. (2018) test two draft navigational designs which can be implemented in LibGuides version 2, concluding that students prefer a longer menu with more content up front over a shorter menu that occupied less webpage real estate and forces content deeper into the guide.

Chen & Chen (2013) note the lack of consistency in terminology to describe resources on library guides as a source of confusion among patrons. In their study of academic library guides, Jackson & Stacy-Bates (2016) note that only 54% of the guides they reviewed offered annotations for all or most resources presented on the guide. The remaining 46% offered either no annotations or annotations on less than half of the resources. This finding led the authors to suggest that, "Since many librarians plan guides to serve as starting points for patron's research, this lack of explanation of resources seems to limit their usefulness" (p. 223). Hintz et al. (2010) also note that students appreciate concise terminology and resource descriptions that avoid jargon.

### *Search interfaces*

As with librarian images, there is a small body of literature that focusses on the visual design and layout of search interfaces. Librarians have experimented with these interfaces with varying degrees of success. Shiri et al. (2011), for example, test a visual search interface that presents patrons with three-panes – one pane offering an interactive search thesaurus, one pane presenting search results, and a third pane presenting the full text of these results. Tay & Feng (2015) experiment with a LibGuides-based search system that would present categories of results in a bento box style. Wissel & DeLuca (2018) describe a process of developing data visualizations to present a collection of Italian literature and historical documents through a library website. All of these studies report positive results as well as a need for further investigation into graphic representation of search results.

Gaona-García, Martin-Moncunill, & Montenegro-Marin (2017) present a literature review that considers the strengths and weaknesses of different visual search representations and examines strategies for integrating visual search systems and their underlying knowledge organization systems and metadata into digital libraries and repositories. While they have a strong focus on Constructivism and user-centered design, they argue against using a plain, single-line search box on library webpages in favor of search systems that, for example, include displays of knowledge organization systems -- an argument that, for example, recalls the three-paned search interface proposed by Shiri et al. (2011), and the visual display of search information afforded via such an interface.

While there may be some value to offering such an interface to students, Miller (2005) in particular argues that doing so may not be a best practice for librarians. He argues that

presenting a search interface with too many controls may discourage student use of library search tools, and send them to Google instead. Teague-Rector & Ghaphery (2008) make a similar observation. Drawing from Constructivism and user-centered design as well, they call for a clean layout to search interfaces on library websites. Through their own testing, they found a central placement of a search bar on a library webpage, with a long search bar and different options for search targets made explicit as a series of tabs, optimal for presenting patrons with a set of search options. This type of interface represents the current default for most North American library websites.

***Unresolved aspects of visual design in library websites, and the future research they suggest***

Reviewing the literature on the visual design of library webpages leads to certain observations regarding their overall composition, as well as some observations regarding specific aspects of their design. All of these observations in turn suggest areas of further research.

One overall observation is that much of this literature is dated, and there is a need for new studies updating previous aspects of thinking on design. Academic library websites have continued to develop since the literature reviewed above was produced, and testing the usability and aesthetics of these contemporary websites from a visual design standpoint will help library Web designers best understand what makes for a quality, up to date webpage.

Another overall observation is that the page design presented to students may change from the homepage to subpages. Given that library web designers typically strive for consistency with the designs they craft, how they incorporate these changes such that the purposes of different page elements remain clear and consistent becomes critically important. While this observation will

naturally spur library web designers to conduct localized usability testing of their pages, no one has considered the prospect of recurring changes occurring in the transition from homepage to subpage – and it is entirely possible that different web designers will adopt similar strategies to make this transition on their respective websites. Examining this transition among multiple university library websites, particularly with regard to any common strategies they adopt to facilitate this transition, may represent a valuable aspect of page design to consider.

### *Layout*

Specific questions to examine anew regarding the layout of library webpages include what contemporary students expect to see on a library homepage, how long a page can be before they find it cognitively overwhelming, how many elements they can observe on a page and still find it uncluttered, how spatial placement of these elements can best present library resources and services, and what balance of text-to-graphics they find optimal. Existing literature has touched upon these questions, but no one has conducted a thorough examination of library webpage layout and elements in nearly a decade, aside from the grassroots consensus that a homepage must feature a multi-search tool similar to that described by Teague-Rector & Ghaphery (2008).

### *Images*

Further questions surround the images themselves. There is an open question about how much images add to webpages vs. distract from the content they present. Cobus-Kuo et al. (2013) touches upon this issue, suggesting that images can be a distraction, especially if they are purely decorative as opposed to presenting intellectual content in a graphic medium. By contrast, Tchangalova & Feigley (2008) note the value of images in chunking blocks of information. While it is possible to chunk information without using images, doing so leads to extensively

text-based webpages, even when presented as a set of brief pages with little text on each individual page (thus invoking the layout question of how long pages should be). Research considering what types of images, from functional to decorative, add the most to a page would enhance library webpages' value. Likewise, follow-up research on the use of playful images, such as Kavanagh's (2013) cartoons, vs. professional images, like those suggested by Anderson & Still (2013), would help address questions surrounding the messaging library websites promote.

### *Color*

In a recent update of the literature on color, Hsieh (2017) draws from all three properties of color (hue, saturation, and luminance) to look beyond onscreen text legibility and instead consider recognition of color in digital icons. Her work is further notable in that she pays greater attention to visual depictions of shapes and lines as elements of composition than previous literature does. Despite this current research, however, both the librarianship field and the Web design field broadly have not updated their examinations on the use of color in the visual imagery they offer. Within regulations on color use imposed by universities, this paucity of recent information represents a notable avenue of research for contemporary Web design, and might be a useful area of collaboration between librarians and computer scientists.

### *Navigation*

Directly relating to a webpage's layout is its navigational schema. Virtually every library webpage uses a navigation menu, either down the left side of the page or across its top. As with Web design broadly, menu design conventions change with time. As such, libraries have an interest in keeping abreast of current conventions, and, more importantly, regularly evaluating

student preferences for how they would like to navigate the library webpage. There are notable bodies of literature advocating for both navigational conventions – a lack of consensus which suggests that libraries have an interest in regularly revisiting this question, as well as investigating any possible third options for navigational design that may arise.

### *Search interfaces*

Given that many students prefer to search a website for information rather than browse their way to it, library websites need clear search systems. More specifically, they need search systems that distinguish between searching for subject-related content, and searching for individual webpages within the library website. Offering a unified search bar on the library homepage is now a well established convention, but how library webpages may be designed to differentiate between these two search functions has long been a difficult question. One strategy that some designers have adopted has been to have two search bars on the homepage – one for searching content and one for searching webpages. This strategy however can confuse students about which search bar does what. A variation on this strategy is to have a single search bar with tabs across its top, often including tabs dedicated to searching specific types of resources such as books or articles, as well as a tab dedicated to searching the site itself. The nature of what the bar searches changes depending on which tab is clicked. None of the literature in this review made an attempt to test the usability of this type of search schema. Further testing of ideas to address this usability issue would be valuable.

Furthermore, different means of integrating search systems with webpage layout remain open for evaluation. Academic librarians will always benefit from considering different ways of visualizing search systems within their sites, such as the interface [Wissel & DeLuca \(2018\)](#)

present.

***Conclusion: What message about the library does design send?***

Certainly composing the different elements of a library website into a visually synthesized whole espouses the dual goal of making the site usable and minimizing the level of cognition required to use it. Designing towards this goal will lead to a functional website, but won't necessarily encourage students to make use of the site. Beyond mere functionality, library Web designers have an interest in focusing on the aesthetics of their site, as it is the virtual front door to the library, its resources, and its services.

Regarding aesthetics, Kim & Fesenmaier (2008) in particular note that inspiration-related design factors, which are similar to aesthetic design features, operate alongside usability factors to create websites that promote engagement. By some of their measures, inspiration was an even more significant factor in promoting engagement than usability. Tractinsky, Katz, & Ikar (2000) as well found that aesthetic features were as important if not more important than usability with regard to engagement – a finding that Tractinsky has reconfirmed multiple times over in subsequent publications (Tractinsky, Cokhavi, Kirschenbaum, & Sharfi, 2006; Porat & Tractinsky, 2013).

Considering the question of what precisely makes a website aesthetically pleasing, Schenkman & Jönsson (2000) identify four determining factors: beauty, images vs. text, overview (which refers to how intuitive a page is to understand), and structure. After developing some measures against which to plot these factors, they compile data from test subjects which highlight beauty as the strongest determinant of preference for one design of webpage over another.

These observations support the focus on aesthetics as one of the components of the U.S. Government usability website's definition of visual design. They further support the ideas put forth by Kasperek et al. (2011), Hintz et al. (2010), and McGillis & Toms (2001) (and echoed from outside the library world by Möller et al. (2012) and Hall & Hanna (2004)) – that librarians have an interest in making their sites aesthetically pleasant and appealing. While inherently paired with usability, aesthetic design and the related aspects of branding and messaging seems to be the primary determinant of the ease with which students may engage with a library website, and how valuable they find it as a resource.

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