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Emerging Roles: Academic Libraries Crossing the Digital Divide

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Introduction

For every advance of information and communication technology in the 20th and 21st centuries, there has been gap between those who can readily adopt and benefit from it and those who cannot. From telephone service to television, computer access to electricity itself, there are invariably some groups who lag behind when it comes to accessing new technology. The newest manifestation of this is what some have labeled the digital divide—the disparity between those who have access to the internet and those who do not. The concept of a digital divide is at this point not a new social phenomenon, despite its focus on relatively modern technology. In fact, it will likely see progressively diminishing coverage as internet use continues to become an integral part of everyday life. However, this is precisely why it will—or should—influence the evolution of the academic library. As the gap in *access* has shrunk, a gap in *ability* remains. This is known as the second-level digital divide. Students, including majority populations, are often less technologically proficient than some university educators and administrators assume them to be. Minority populations (whether of race, income, or other factors) can be even further behind. As higher education becomes increasingly enmeshed in Internet-based learning, academic libraries will need to maintain and even increase digital literacy and fluency instruction in spite of presumed reduced need. Furthermore, academic libraries themselves will need to examine their own status in the divide. Libraries like to tout their technological proficiency, citing leadership in public access to computers and the Internet, promoting shiny new makerspaces, and building extensive digital collections. However, at their core, academic libraries still run almost exclusively on pre-internet data-exchange protocols that search engines like Google do not index. This does not mean that patrons cannot access a library's electronic resources. Anyone on the Internet can search an academic library's catalog. Rather, would-be users have to do so on the library's terms, in its own ecosystem, instead of the broader Internet they are accustomed to use. In an age of instant Google results, an academic library's walled garden resources risk the perception of irrelevance. The digital divide, whether on the individual or institutional level, will continue to shape the development of the academic library.

Digital Divide: Students

The phrase "digital divide," coined in the 1990s, initially referred to the gap that exists between those with ready access to information and communication technology tools, such as computers and the Internet, and those without such access. This was, and usually still is, measured along axes of race, gender, geography, and socioeconomic status (Campos-Castillo, 2014; Khalid & Pedersen, 2016). As the proportion of United States homes with Internet access grew during the 1990s, and with governmental goals of universal Internet access, numerous reports and studies documented the trends in access across population subgroups. These early reports documented that whites were more likely to have Internet access than other racial groups, and that this divide was a consequence of social factors such as income and educational attainment; studies also consistently showed that men were more likely to access the Internet than women (Campos-Castillo, 2014).

Starting in the 2000s, the gap began to close, but more recent data suggest that it does still exist. According to Campos-Castillo's analysis of Department of Commerce reports, as of 2014, only 55 percent of African American households and 56 percent of Hispanic households (compared with 74 percent of white households and 81 percent of Asian American households) have Internet access at home. The social factors that maintain the digital divide are not limited to race and gender. One-third of low-income and rural K-12 students in the United States are unable to go online when at home, and 58 percent of rural households (compared with 72 percent of urban households) had broadband

Internet at home (Campos-Castillo, 2014; Young, 2016). That said, recent trends in technology suggest that the first-level digital divide may soon disappear in the US. This is due to the increased adoption of smartphones capable of Internet access, and for some, particularly Hispanics (Zhang et al., 2015), this is the primary way they now access the Internet. When it comes to gender differences, the gap has actually reversed: more women now report access than men (Campos-Castillo, 2014; Khalid & Pedersen, 2016; Young, 2016). A different kind of gap still exists, however, and as dependence on technology increases, the severity of this gap will increase as well.

As the gap in physical *access* to computers and the Internet within the United States narrowed, concern shifted to differences in actual *use* and *ability*, or what is known as the second-level divide. This is where the digital divide, at least in a social sense, is perhaps most significant to academic libraries. As Khalid & Pedersen (2016) point out, just because students may have access to the Internet does not automatically mean that the can use the Internet. They may lack the ability to pay for hardware or Internet service, face technology avoidance as a cultural norm, have a physical or mental disability, live in an area where connections are poor or unreliable, or encounter any number of other obstacles to Internet use (Khalid & Pedersen, 2016). Academic libraries have moved and continue moving to increase the number of computers and electrical outlets to help lower barriers to use, at least on campus. The problem of ability, however, still remains and can often remain undetected.

Just as access does not guarantee use, use does not guarantee proficiency or mastery. This can be almost as limiting as not having access at all, which can severely limit social mobility. For example, accessing computerized medical records, government services, online banking, and employment applications is becoming a strictly Internet-based activity, but those who lack the skills can be shut out (Mackert et al., 2016). This applies just as strongly to higher education. The integration and adoption of digital technologies have enabled improvements in the quality of and inclusion in higher education, making it possible for more people to access more—and higher quality—learning resources. However, a significant proportion of the population still cannot benefit fully from these improvements because they do not have the ability to use them well. People from lower income groups in particular are less likely to be prepared for and have experiences with Internet use in general, and are therefore less likely to be prepared for things like virtual learning environments, library databases, and other research tools (Khalid & Pedersen, 2016). This is particularly problematic at community colleges, whose students are more likely than those of four-year institutions to be first generation, students of color, women, part- time students, and older—all groups over-represented among those on the wrong side of the second-level divide (Young, 2016). Students like this can get caught in a cycle that perpetuates the second-level divide. Little or no experience with Internet use may impact participation in classes or activities that promote information literacy, which hinders learning, which keeps experience low, and so on. Academic libraries have the opportunity to decrease second-level divide by continuing information literacy classes they might already offer, and also, and perhaps more importantly, offer instruction at a more basic level, like a public library might. Programs like this will need careful planning to avoid stigma (“Internet for Dummies!”) or assumptions about relevance (“Kids today were born with phones in their hands and know all about the Internet”) but could result in indirect boosts in educational attainment.

Digital Divide: Libraries

Although it is not often (ever?) phrased as such, there exists another kind of digital divide that affects the library itself as an institution. To illustrate this, it may be useful to examine its origins in the development (or lack of development) of the online public access catalog. Antelman, Lynema, and Pace (2006) briefly outline the history of online library catalogs, with an emphasis on how they have failed to evolve with time and been outstripped by other systems.

The first generation of online catalogs in the 1960s and 70s attempted to replicate the access points of

the original card catalog (Antelman et al., 2006). This design choice makes sense, given that these early catalogs were intended to be familiar to library users who had grown up working with card catalogs. The expectation with these early systems was that most users were interested in known-item searching rather than browsing-based discovery (Antelman et al., 2006). Ironically, this made the online catalog slightly less useful than its paper bound counterpart, given that the physical nature of the traditional card catalog made it inherently browsable, like miniature stacks. Regardless, online catalogs were arguably quicker and easier to use, and in time became the most widely-available retrieval system and the first one with which many people came into contact.

The second generation of online catalogs started to develop their ability to search beyond just known items. The development of keyword and Boolean logic searching (Antelman et al., 2006) provided a degree of flexibility that moved the online catalog beyond merely a digital analog of the card catalog. However, while searching systems based on Boolean algebra were certainly an improvement over those that preceded them, it was still a search technique designed for trained and experienced searchers (and largely remains so today) (Antelman et al., 2006). Boolean systems remained despite this drawback, since it was simple to implement and required minimal storage and processing power for the limited hardware of that time.

The third generation of online catalogs in the 1980s saw the refinement of keyword searching and discovery. There was a surge of interest in improving online catalogs, resulting in a number of experimental systems that incorporated advanced search and matching techniques developed by researchers in information retrieval (Antelman et al., 2006). Rather than relying only on exact matches as filtered through Boolean limiters, these catalogs employed partial-match techniques based on probability. Following the surge of innovation, however, the development of online catalogs began to slow down, and many today are essentially not far removed from this era.

Indeed, according to Antelman et al., as of 2006, libraries were no better off: all major ILS vendors were still marketing catalogs that represented second generation functionality. Despite Internet style, between-record hyperlinks made possible by migrating catalogs to more modern interfaces, the underlying indexes and exact-match Boolean search remained unchanged. The literature on the topic had tapered off since 1997, and as promising innovations failed to appear in commercial systems, online catalog technology fell by the wayside as the library community's attention was turned to the Internet (Antelman et al., 2006). The online catalog still exists, of course, and still receives use as the tool for accessing and using library book collections, but is now only one of many search tools, often secondary to the database or metasearch engines on an academic library's website. As such, the catalog has become a call-number lookup system for many students, with resource discovery happening elsewhere, much like the original card catalog (Antelman et al., 2006).

All of this is not to suggest that there has been absolutely no development in online catalogs in the last decade. Some academic libraries have done a better job of integrating the catalog into their metasearch engine, and some even have sophisticated search "discovery layers" like Primo. Features like spelling suggestions and the option to browse shelves virtually are not unheard of in the catalogs of larger institutions. However, not all academic libraries have been willing and/or able to address the deficiencies their online catalogs. As Antelman et al. (2006) remark, in an interesting twist of fate, it can no longer be said that more sophisticated approaches to searching are too expensive *computationally*; however, they are now likely to be too expensive *financially* to introduce into legacy systems, especially as emphasis shifts to remote services. In the short term, this is an inconvenience that some libraries can tolerate. In the long term, however, it is a symptom of an underlying issue that has the potential to become a much larger problem for all academic libraries.

The time of the online catalog as the first electronic information search and retrieval system the public came into contact with has long since passed (even

though it does not seem that long ago), replaced by the ubiquitous Google search bar. In fact, recent early adoption of "smart speakers" like Amazon's Echo and "intelligent personal assistants" like Microsoft's Cortana may in time render typing search terms into a browser old fashioned, if not obsolete. Meanwhile, libraries have been relatively slow to adapt to what are now common information gathering experiences. At first this statement may seem contrary to the overwhelming perception of (some) libraries being at the forefront of technological innovation. One can hardly skim library trade publications or scholarly articles without encountering breathless accounts of makerspaces, tablets, and social media platforms. However, the underpinnings of an academic library's most essential systems, from cataloging to digital collections, exist on what is becoming the far side of a digital divide. The network architecture libraries use to manage data came into being before the largescale adoption of the Internet, and rather than transition into it, they have developed parallel to it instead, bridging over the divide when necessary rather than just crossing over for good. The longer this parallel development continues, the more likely it will be that libraries may seem increasingly irrelevant or out of touch.

Arlitsch (2014) makes the case that libraries are running the risk of falling into a perceived state of irrelevance due to their resistance, intentional or otherwise, to integrating into what is now the dominate mode of information exchange—the Internet. As Arlitsch puts it, one way to define relevance is to evaluate how well a library's information "products" integrate into the most popular information ecosystem. Even with discovery layers that attempt to present a seamless search experience, to retrieve library resources, users must cross from the Internet as they typically experience it into an ecosystem built specifically by libraries and vendors. The traditional freestanding OPAC terminal (still) serves as a kind of archetype of this separation. Instead of allowing library users to discover and access materials in the ecosystem where they already conduct their business, libraries force them to use technological tools to which they are not accustomed and then refer them to library instruction when they encounter difficulties (Arlitsch, 2014).

Given that most of the online activity in the networked world happens outside of the library's systems, libraries face the challenge of delivering their resources to the outside world, where people can find them. In other words, libraries must take advantage of popular platforms, such as search engines, and the standards that they support. Arlitsch relates the following example: searching for the line "What we've got here is failure to communicate" instantly returns a link to a YouTube clip of the scene from *Cool Hand Luke*, which a user can view with one click. However, the chances that relevant results from an archival collection will appear in a similar Internet search are quite slim, and even if they do appear, they are not as likely to lead as quickly to a digitized photograph or video. This flies in the face of the goal of both search engine providers and users. Both value the delivery of relevant results quickly and conveniently; anything that results in protracted or difficult searching is much less likely to see extensive use. Nearly every other business that provides information, delivers entertainment, or sells a product has figured out how to leverage the protocols and platforms supported on the Internet, and the number and variety of applications that people can access through search engines is stunning (Arlitsch, 2014). On the other hand, the rich resources of libraries barely make an impact at all.

A similar problem that drives the need for libraries to integrate better with search engines and the Internet in general, though not as widely applied to this issue, is highlighted by studies regarding modern users' information search behavior. Students, who make up the bulk of academic library users, tend to be younger and as such bring a different set of approaches and expectations to how they search for information, including what they use to do it and how they interact with the library. D'Couto and Rosenhan (2015) note in "How Students Research: Implications for the Library and Faculty," that having grown up in a digital world with quick access to responses served up from a

"Google-like" single search box experience, students today expect that most information can be found online. The unspoken assumption here is that not only can most information be found online, it is not—or at least should not be—difficult to find it. As Ramdeen and Hemminger (2011) explain, it has become accepted now that users have been influenced by Web search engines, and rather than plan out elaborate "library approved" research strategies, they prefer simply to enter a few initial search terms, skim the list of results, and then filter through them using simple interactions.

When the expectation of easy and efficient access to information comes up against the demands of time pressures and in-depth academic research tasks, the most commonly observed behavior illustrating this balancing act is the use of Google to supplement or replace specific library resources rather than using facets and advanced search techniques (D'Couto & Rosenhan, 2015; Ramdeen & Hemminger, 2011). It seems that many libraries expect that extensive training will change this behavior and shepherd students out of Google and back into the fold of the library's ecosystem. While this result seems ideal from an experienced researcher's point of view, the reality of student behavior suggests that they are likely to continue with what they are used to and what they find easier to use rather than trying to adapt to how librarians would like them to search. Making library resources more visible to search engines like Google would be a good first step to bridging this divide. What is it, then, that has kept libraries, particularly academic libraries, from closer search engine integration?

Ironically, it is the richness and accuracy of the descriptions of materials in which librarians and archivists have invested countless hours that do not transfer well to the Internet, making those products far less discoverable and usable than they could be, and therefore potentially less relevant (Arlitsch, 2014). More precisely, beyond just search engine access to library resources, the real problem is the incompatibility of library and Internet data standards and the often mutually exclusive variations of library standards themselves. Libraries continue to use data interchange protocols or publishing platforms whose use is almost non-existent outside the library world, even though Internet search engines have little or no use for the metadata standards and the data interchange protocols that libraries and archives developed, which do not scale to the data-deluged world we now live in (Arlitsch, 2014). This resembles a larger reflection of the problems with development of online catalogs, namely the gulf between the information technologies that libraries have developed and what non-librarians actually use. For example, MARC, TEI, and EAD are library standards/ protocols that exist almost exclusively in libraries.

MARC, or MAchine-Readable Cataloging standards, first discussed in the late 1950s and officially launched in the mid-1960s, may be considered the grandfather of library data standards (Arlitsch, 2014). As such, librarians have used the MARC standard to create countless records over the years, but despite (or because of) its rich level of detail, MARC does not see ready use outside of the library environment. Even before search engines came into being in the 1990s, it was evident that MARC cataloging of electronic resources would be too complex and costly, with even OCLC stating that data stored in traditional record formats like MARC had reached the limits of efficiency and utility (Arlitsch, 2014). The Text Encoding Initiative began as a markup language to represent textual material on computers, much like the earlier HTML. It has seen considerable application in some research libraries and rare books archives and is often taught as part of digital humanities classes. However, TEI has remained confined to platforms that prevent it from being able to deliver its data to the Internet in a useful way (Arlitsch, 2014). In the archives world, Encoded Archival Description brought MARC style standardization and machine readability to the detailed records that archivists use to create finding aids. So far, however, search engines seem to have no interest in EAD, and efforts to make finding aids discoverable through the Internet consist mainly of "dumbing down" a subset of EAD fields (Arlitsch, 2014). While this helps discoverability, it largely defeats the whole benefit of EAD—the rich level of encoded detail.

Now, as easy as it is to criticize libraries for not being more web-like, there are a couple of important things to keep in mind when considering solutions to make searching for library resources quicker, easier, and more convenient. A major obstacle that hinders academic libraries, which Google does not have to worry about to the same extent, is copyright. An Internet user can watch full Hollywood movies on YouTube, and due to safe harbor laws, YouTube is generally not liable for uploaders' actions. Libraries that digitize things or offer access to journal articles, however, must navigate copyright restrictions and manage usage rights much more carefully. This results in a search experience that is not as convenient, and certainly not as quick. Another potential problem is the vast amount of incredibly detailed information that libraries hold. By its very nature, this material is not yet as easy to search and sort through as other data may be. That said, making an effort to at least make metadata discoverable with Web standards and to publish on platforms that more people use would be a good start.

Conclusion

Although not by any means a new issue, the digital divide—in all its levels—will continue to have an impact on the development of the academic library. The fact that coverage of the divide has started to taper off only reinforces the need to help a large number of people being pushed out of modern life. Whether the gap is in access or ability, students on the far side of the digital divide can only benefit from the maintenance and increase of digital literacy and fluency instruction. Academic libraries will need to examine their own status in the divide. Hardworking librarians and archivists have spent decades developing data interchange formats that have not been made a part of the Internet, and thus struggle to make their materials visible and usable. As difficult as it may be, academic libraries will need to start asking themselves whether it is right to continue to insist on using standards and platforms that are foreign to non-librarians. The digital divide, whether on the individual or institutional level, will continue to shape the development of the academic library.

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