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Barriers and solutions to assessing digital library reuse: preliminary findings

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Abstract
Purpose – The purpose of this paper is to highlight the initial top-level findings of a year-long comprehensive needs assessment, conducted with the digital library community, to reveal reuse assessment practices and requirements for digital assets held by cultural heritage and research organizations. The type of assessment examined is in contrast to traditional library analytics, and does not focus on access statistics, but rather on how users utilize and transform unique materials from digital collections.
Design/methodology/approach – This paper takes a variety of investigative approaches to explore the current landscape, and future needs, of digital library reuse assessment. This includes the development and analysis of pre- and post-study surveys, in-person and virtual focus group sessions, a literature review, and the incorporation of community and advisory board feedback.
Findings – The digital library community is searching for ways to better understand how materials are reused and repurposed. This paper shares the initial quantitative and qualitative analysis and results of a community needs assessment conducted in 2017 and 2018 that illuminates the current and hoped for landscape of digital library reuse assessment, its strengths, weaknesses and community applications.
Originality/value – In so far as the authors are aware, this is the first paper to examine with a broad lens the reuse assessment needs of the digital library community. The preliminary analysis and initial findings have not been previously published.

Keywords Assessment, Value, Digital libraries, Repositories, Reuse, Cultural heritage organizations

Paper type Research paper

Introduction and problem statement
Current assessment efforts that focus on the unique content found in digital libraries are not meeting the needs of the practitioners that serve them, or the communities that use them[1]. Although numerous quantitative ways to view digital object use exist, from page views, to

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downloads, to newly developed multimedia standards for institutional repository use[2],
these measurements do not reliably demonstrate the value of these materials in ways that
resonate with the digital library community. Specifically, they are too often unfavorably,
and perhaps unfairly, compared to very different types of library use, such as journal article
downloads, chapter views or circulation statistics.

A key indicator of the impact of digital collections is content reuse, specifically how
materials are utilized and repurposed. There have been ongoing efforts within the digital
library community to demonstrate and measure reuse. These types of investigations have
produced meaningful results, but efforts have been scattered among institutions and
organization types. Additionally, in this relatively new arena, few recommended practices or
gold standards have emerged. The lack of reuse metrics, combined with the lack of
community assessment norms, has a two-fold effect: it makes it difficult for institutions to
develop, using appropriate data, strong infrastructures and collections that are responsive
to user needs; and it suppresses the ability of a digital library to demonstrate its value to
stakeholders, including administrators, funding bodies and potential users.

An Institute of Museum and Library Services (IMLS) national leadership grant,
“Developing a Framework for Measuring Reuse of Digital Objects” (Thompson et al., 2017),
tries to address the challenges faced in assessing content reuse through a comprehensive
needs assessment of the digital library community. The eventual goal behind the grant is a
multidimensional framework to support digital libraries in demonstrating their value and
better advocating for the resources and platforms that will best serve their communities.
In order to do this, a deeper understanding of how digital objects are used and repurposed is
critical. This must be coupled with an understanding of what types of resources already exist,
how reuse is or is not valued differently from access use, and what approaches and tools need
to be developed. This paper shares the initial quantitative and qualitative analysis and results
of the community needs assessment conducted in 2017 and 2018 that aims to illuminate digital
library reuse strengths, weaknesses and community applications.

Literature review
In 2015, the white paper, “Surveying the Landscape: Use and Usability Assessment of
Digital Libraries,” detailed both the efforts and the challenges in assessing content reuse
(Chapman et al., 2015). Analyzing 26 articles published between 2010 and 2014, the authors
focused on understanding current strengths and gaps in the research, with the aim of
highlighting areas that could benefit from future study. This review found that there were
promising assessment developments, including a growing body of research on reuse
patterns and practices among content related to work in the humanities and arts. It also
identified a series of deficiencies, including: difficulty in identifying who uses digital
libraries (sometimes due to user privacy safeguards) and how research focus (e.g. general vs
scholarly use) affects how and what is reused; a lack of research on methods to track online
reuse through hyperlinking; and difficulties measuring the reuse of digital objects in virtual
and analog environments. The white paper made several recommendations, including a call
for additional studies to better understand diverse user groups, the connection between
reuse and repository design, and when users can ethically and legally reuse digital library
content. Most importantly for this study, the authors recommended “the development of a
reuse assessment framework and an accompanying toolkit or best practices to help unify
future studies and discussions of reuse in the digital library field.”

Since the release of “Surveying the Landscape,” more recent literature has addressed
some of the identified research gaps, in particular, reuse assessment work done beyond
humanities and arts user groups. One such area is data set reuse. Open access funding
mandates, coupled with strong data management outreach efforts and a growing open
science movement, appear to be facilitating reuse and its measurement in this arena. In the
article “Discovery and Reuse of Open Datasets: An Exploratory Study,” the authors suggest that these efforts have led to digital data objects that are well documented, usable with different software, shared in open access repositories and using persistent identifiers, are allowing reuse to be both tracked and assessed (Mannheimer et al., 2016). Further, projects such as “Always Already Computational” start to bridge the gap between largely science research and the humanities user groups by positioning digital collections themselves as data sets (Padilla et al., 2016).

General movement within the digital library community helps in developing and broadly applying standards that demonstrate the impact of repositories abound. Although not specifically focused on reuse, two current projects should be noted. One, JISC’s Institutional Repository Usage Statistics (IRUS) UK[3] is working to aggregate and compare usage statistics across repositories using Counting Online Usage of NeTworked Electronic Resources (COUNTER) – compliant metrics[4]. Another, the Repository Analytics & Metrics Portal (RAMP)[5] is investigating the difficulties digital repositories face in tracking and evaluating use. Benchmarking at the aggregate has been problematic for institutional repositories, and these efforts highlight the current drive for adaptable, transparent metrics.

Rights have also risen to the surface, particularly research highlighting the relationship between copyright, permissions and reuse of digital materials. Clearer terms of use, the encouragement to embrace open access policies, and object attribution for digital content are critical to maximizing the potential for reuse (Terras, 2015). Unstandardized rights metadata can complicate users’ attempts to reuse content, such as that found in the Digital Public Library of America (DPLA), and this has accelerated efforts by such referatories to standardize aggregated rights metadata (Frick, 2016).

Recent literature has also highlighted some of the approaches information professionals can use to track and measure reuse over the web. Several studies have documented the benefits and limitations of using reverse image lookup to trace digital image reuse (Kelly, 2015; Reilly and Thompson, 2017). Kelly has also evaluated both the reuse of digital collection content in Wikipedia entries through tracking citations (Kelly, 2017a) and the employment of Google Alerts to signal image reuse (Kelly, 2017b). Further research has tested the viability of using embedded metadata to identify reuse (Bushey, 2013; Thompson and Reilly, 2018).

Fewer articles have tackled the challenge of formulating analytical frameworks for assessing reuse. In “Beyond Clicks, Likes, and Downloads: Identifying Meaningful Impacts for Digitized Ethnographic Archives,” the authors devised a framework for “documenting, demonstrating, and assessing the impact of digitized ethnographic collections” (Punzalan et al., 2017). The researchers formulated six topical areas of potential impact, including: knowledge, professional discourse, attitudes, institutional capacity, policy and relationships. They note that these areas can assist how “institutions and communities articulate and assess major sorts of impact that are most relevant to institutional projects to digitize and share knowledge.” This work shows the potential for information professionals to re-define the current framework for measuring impact. The research detailed here extends these kinds of analyses by collecting and analyzing community feedback to provide important use cases and functional requirements that expand the profession’s perspective on assessment.

Methodology

The structure for the needs assessment is both multi-part and iterative. It includes data collection and analysis of pre- and post-community surveys, in-person and virtual focus groups, and regular incorporation of advisory board and community feedback. The culmination of this work will be the identification of shared tools and best practices for reuse assessment within the digital library and cultural heritage communities.

The research team began the needs assessment by administering a pre-survey to digital library practitioners – its purpose was to identify potential gaps in reuse assessment practices.
The survey instrument was developed on the Qualtrics platform, and included 19 questions aimed at gathering institutional demographic information, as well as statistics gathered for digital collection use, available infrastructure support, existing assessment barriers and what kinds of data would be useful for practitioners. The survey was distributed on 25 listservs related to research data professionals, cultural heritage organizations, digital library and library assessment groups. The Digital Library Federation advertised the survey as well on their social media channels. The full survey instrument can be found here https://osf.io/ptvh5/. Of the responses, 302 were kept for analysis. These were respondents that had agreed to the institutional review board statement and answered a minimum of one question.

The focus groups were structured after the pre-survey was completed. Their purpose was to gain qualitative insight into the use cases for assessment metrics, and to drive the investigations of the research team. Close attention was paid to gathering a broad perspective from academic, public and special focus institutions. Suggested participant criteria included: demonstrated experience building, preserving and/or assessing digital library collections; self-identified individuals from underrepresented groups; representatives from organizations with diverse and inclusive collections; and self-identified representatives from cultural heritage organizational types that might not be represented in the research team membership.

The focus group questions centered on identifying reuse assessment needs within different communities, tools and methods currently being applied, financial and institutional costs involved in reuse assessment, user privacy concerns, functionalities needed in assessment tools, and the costs of building and maintaining assessment instruments. For each focus group a facilitator and a note-taker attended the sessions. Prior to the session, participants received an outline of topics to be covered. Sessions were recorded to ensure all themes were captured. First round focus groups were held in October and December of 2017, participants came from academic libraries or archives (29 percent), public libraries (21 percent), museums (21 percent), consortiums (21 percent) and special focus institutions (8 percent). Participants included practitioners (58 percent), administrative decision makers (21 percent), as well as some in more removed roles at consortial levels (21 percent).

The second round of focus groups, held in February and March 2018, built off of the themes found in the Exploratory Focus Groups. Participants in this round were typically from academic institutions (80 percent) but there was also representation from public libraries, museums and special focus institutions, further detailed in the findings. Participant makeup was almost exactly split between practitioners and decision makers.

Researchers applied a grounded theory approach to analyzing data generated from the focus groups (Charmaz, 1983).The team used Dedoose to code the notes generated during in-person and virtual focus group sessions.

The full needs assessment is structured so that each component builds upon the completion of the last. For example, upon the completion of the pre-survey, the research team worked with the grant advisory board[6] to refine the approach to analyzing the results, and re-examine how to best structure future surveys. Likewise, the results of the first focus groups shifted the next focus group topics to areas that had warranted more discussion, including the definition of reuse, sticky metadata and privacy concerns.

This paper, and the methodology detailed, centers on the initial findings of the yearlong research project, including the results of the pre-survey, and preliminary analysis and noteworthy themes from two of the in-person focus groups and two of the virtual focus groups. Future analysis, research and subsequent steps are detailed below, but as with the approach thus far, future research will build upon these results. Next steps already informed by this approach include an upcoming post-survey, the results and analysis of an additional focus group, and the final recommendations for the functional requirements of a reuse toolkit.
Survey findings

Pre-survey

The first survey was sent in the Fall of 2017 and provided a critical snapshot of the current assessment practices within the digital library community. In addition to the demographic data captured, questions explored if and which use and reuse metrics were collected, and what the major pain points were for assessment work. The majority of respondents to the survey (56 percent) came from academic institutions. Other respondents represented public libraries (10 percent) and museums (8 percent), with the remaining respondents (26 percent) hailing from government libraries, historical societies, archives, community archives, data archives, consortia, for-profit organizations, or “other” institution types. In total, 30 percent of respondents reported serving traditionally underserved communities, with the largest of this respondent group serving tribal institutions. While more intricate demographic data about institution and population size were collected, analysis was not possible due to a design flaw in the survey question.

The survey found that a majority (80 percent) of respondents were doing some manner of assessment and that they typically utilized Google Analytics. This was fairly consistent across institution types, ranging from 61 to 100 percent reporting collecting use information. Respondents were gathering basic data points such as number of visitors, downloads or clicks. Respondents who were not engaged in any data gathering were typically just getting their digital collections online or lacked the staffing to dedicate toward assessment.

Tracking reuse was more difficult, with only 40 percent of respondents noting that they were gathering reuse data. Most often reuse was tracked by gathering social media metrics, or through citation analysis. When asked why they did not gather reuse data, 37.5 percent of respondents cited the lack of an accepted methodology for gathering and/or interpreting reuse data. In all, 16 percent of respondents also cited lack of staffing and time as a significant barrier. Academic institutions were the least likely institution type to measure reuse, with only 28 percent (n = 40) of respondents reporting in the affirmative. Comparatively, respondents from other institutions reported much higher engagement with reuse assessment: 45 percent (n = 14) of public libraries respondents, 52 percent (n = 11) of museum respondents, 81 percent (n = 13) of government library respondents, 62 percent (n = 5) of historical society respondents, 60 percent (n = 9) of archives respondents, 40 percent (n = 2) of community archives or libraries respondents, 40 percent (n = 2) of consortia respondents, 100 percent (n = 2) of for-profit or corporate organizations respondents and 35 percent (n = 6) of “other” institution respondents.

Ultimately, respondents wanted to do more assessment and felt that documented standards would be the best support for digital library assessment work. They reported needing technologies that functioned across platforms, were simple to implement and were reliable. Respondents wanted more training on data interpretation and communicating results. They also expressed concern about patron privacy and desired thoughtful consideration about the ethical implications of data collection.

The results of this pre-survey were documented in depth in the conference proceedings, “Measuring Reuse of Digital Objects: Preliminary Findings from the IMLS-funded project” presented at the Joint Conference on Digital Library international forum in June 2018 (Kelly et al., 2018).

Focus group findings

The following summaries are broken out by type of focus group (Exploratory or Technologies and Standards), and within those categories, by major topics. The project team conducted a total of three rounds of focus groups, with each round offering participants the opportunity to partake virtually or in-person. At the time of publication, only two types of focus groups (Exploratory and Technologies and Standards) had been completed, and that is the analysis summarized here. In total, the project team interacted
with 38 people through these groups. Half of all participants (47.4 percent) represented academic libraries. Special focus libraries, such as corporate and government libraries, made up on nearly one-fifth of the participants (18.4 percent), with remaining participants representing museums (10.5 percent), public libraries (10.5 percent), consortia (7.9 percent) and academic archives (5.3 percent).

The project team conducted each focus group with two grant team members present—a facilitator and a note-taker. A set of questions was used to frame and guide the focus groups, and these were distributed to participants in advance of the conversation. Each session was recorded, and these recordings were used to supplement notes. Per the grant specification, audio recordings were destroyed after 48 h. The qualitative analysis software, Dedoose, was used to code the focus group notes for further analysis.

**Exploratory Focus Groups**

This first set of focus groups concentrated on developing an in-depth understanding of what assessment metrics were and were not being collected by digital libraries. Participants analyzed the researchers’ definitions of use and reuse, critiquing the clarity of the descriptions and adding examples from their own practices (Woolcott et al., 2018). They pointed out the overly academic tone of the definition and examples, and shared ways to be more inclusive.

One way the group attempted to distinguish between use vs reuse was to think of an interaction with a digital object that happened within a repository as use, and reuse as any interaction with a digital object outside of a repository. Participants noted that without context, use and subsequent impact could not be assessed, and that lack of usage could be indicative of a range of issues, such as discovery platforms, rather than object relevance.

Many participants noted that they had not considered the concept of reuse when gathering assessment metrics; instead they tended to focus solely on use. The majority reported doing some manner of assessment, and were most likely to use Google Analytics to gather data. The use of platform-supplied analytics was also reported (e.g. YouTube, Facebook or CONTENTdm). Additionally, participants reported collecting data on analog usage, including visitor logs, visitor surveys or requests for materials. A few reported that online usage was not collected at all.

**Current collection and application of use data.** Usage data were often represented as the number of visitors to a site, the time spent on a page, the number of times a page was visited or the number of object downloads. These kinds of data were used to inform UX decisions. For example, participants reported that page loading time was analyzed to find problems that might impact how user interacted with a repository. Occasionally usage data were reported to show impact for decision makers or funders. For analog collections, it was used to determine demand for digitization. Typically, if the usage was analyzed, participants reported that they looked for aggregated data that showed trends. Many noted that they gathered use data but do not do much with it, often because analysis takes time, staffing, expertise and training.

**Current collection and applications of reuse data.** The collection of reuse data typically took the form of social media analytics such as likes or shares on Facebook, retweets on Twitter or likes on Instagram. One participant reported analyzing the number of times a specific object was re-pinned on Pinterest. Other data included Google Alerts or measuring citations on Wikipedia. Participants noted that in addition to these quantifications, qualitative information including stories of how collections impacted individuals was important to assessment.

Reuse data were used to show the reach of digital objects. Some participants reported using social media analytics to demonstrate platform efficiency (e.g. images on Instagram, documents on Facebook). Institutions also used social media metrics to make collection development and digitization decisions. Some noted that reuse data provide a deeper context than use data because it has more potential for showing “who” is using something.
Use cases for assessment. The application of specific use case examples was explored. Common themes revolved around monetary considerations, specifically use cases for reporting impact to show good use of current or future funding, justifying existing expenses or personnel and justifying continued membership in consortiums that helped broaden their outreach. Also discussed were ways metrics could be used to improve work, including better understanding who users are and how they interact with digital repositories. Assessment metrics could better inform which collections would be worth full processing at the descriptive level, or which collections might need specific treatment, such as transcription, to better serve a community. The focus groups found that assessment provided the ability to measure the effectiveness of outreach to specific communities. In some cases, digital repositories may use such metrics to tie work to the outcomes of parent institutions, such as support for online learning.

Concerns and negative implications of assessment. When asked about ways that use and reuse assessment could be controversial, participants noted that, while not directly related to assessment, digital content can be reused in ways that are inappropriate or hurtful. Participants suggested developing a common code of conduct for both online users and also cultural heritage institutions. Additional closely related discussions included concerns about cultural appropriation of publicly posted content meant for specific audiences, or unauthorized commercial use of content. Concerns about patron privacy and data collection policies that unintentionally informed third parties weighed heavily, and participants felt these concerns warranted deep consideration by the digital library community in the development of tools and standards.

What practitioners need. When asked about what a toolkit could provide the digital library community, participants identified a number of must-haves, including the need to understand statistics and assessment practices, training on tools that could help with data visualization, and methods for translating data points into impact statements that would be relatable to stakeholders. Certain technologies and standards were mentioned as imperative, such as unique identifiers, sticky metadata that stays with digital objects across platforms and citation standards for digital objects. Participants noted that having objects on multiple platforms made it impossible to see larger trends. A dashboard that pulled metrics into a single location was identified as a way to make assessment more attainable for institutions with less resources.

The information gathered during the Exploratory Focus Groups and the pre-survey sets the stage for the composition and questions of the Technology and Standards Focus Groups.

Technology and Standards Focus Groups
Building on the previous groups findings, the second focus group discussions began with a review of use and reuse definitions. Participants cited many of the same things that earlier focus groups had identified. They continued the discussion around the context of digital content use. Participants again noted that stories were as important as quantitative metrics, particularly as they created space for meaningful context. They stressed that understanding what was learned or gained from interaction with a digital object was critical to their work.

Metrics and Standards. When discussing what metrics should be collected as part of an assessment framework, participant examples included social media metrics, clicks and downloads. Participants also discussed the impact of versioning on tracking reuse and use, particularly as related to pre-prints. Participants again brought up the need for embedded metadata that was consistent across platforms; this was of particular import for tracking object identifiers or relational metadata. They also noted that existing non-library databases already do this.

In developing a common standard or set of metrics, participants in all of the focus groups placed heavy emphasis on articulating a purpose for measurements specific to the outcomes and goals prioritized by a given organization. In the case of academic institutions, this could
be learning outcomes for students, or demonstrations of research impact. For public libraries or museums, this could be community engagement. Participants noted that mission and priorities naturally differed, making a master standards problematic. They recommended that a toolkit focuses on a variety of methods that institutions could choose from, including instructions on how to use and set up reports in Google Analytics, best practices for interpreting data, examples of statistics and metrics, examples of qualitative and quantitative methodologies, and rubric templates that take into account institution demographics and discrete collection parameters.

**Content management systems and cross-platform tools.** The Tools and Technology Focus Groups discussed what kinds of system architecture would be needed to facilitate the collection of reuse data. Responses showed that flexibility and modularity were crucial. Content management systems or data collection systems should be able to collect use and reuse data on a granular level. This included being able to collect specific kinds of object, system or audience data with the ability to turn on or off the gathering of specific data points at the collection level. The ability to develop reports from the data that would show trends across or within collections or across or within repositories was identified as key, as was the ability to send alerts when digital collection material was getting more traffic than usual, and the ability to identify its source. Additionally, system architecture would ideally interface with aggregators’ data (e.g. DPLA or Internet Archive). Two of the focus groups discussed International Image Interoperability Framework (IIIF) as a model to investigate options for measuring reuse, as it provides embeddable images that are not downloads or derivatives.

The concern about using third-party software for gathering and analyzing assessment data came up in all groups. There was anxiety that using Google Analytics fed information to Google on user behaviors without digital libraries determining what kinds of information they were willing to share. Participants would like an analytics gathering tool that functions independently of third-party vendors and gives control over what is shared. In lieu of this type of software, participants noted that a toolkit that demonstrated options for licensing language about data collection that could be used in vendor negotiations would be helpful. They also pointed out that a toolkit should explain how content management systems and analytics software gather and expose data.

**Collaborative data sets and ethical implications of assessment.** Building off the suggestion of a collaborative statistical database discussed previously, a collaborative statistical database was envisioned as a repository for use and reuse data that could show the larger impact trends for digital collections across institutions. Such a database would allow for benchmarking, and provide information about what collections could be digitized that would have the biggest impact, or what collections still need to be digitized in order to better serve underrepresented groups. They also mentioned using such a system to leverage data with vendors to build or modify existing systems to provide better user experiences and data tracking.

Even with these benefits, participants noted that there were issues to consider. For instance, benchmarking could help institutions set and meet goals, but it could also set inappropriate expectations for use of collections. Participants warned that many institutions may not provide data for such a data set due to fear that comparisons might lead institutions to overstate impact, nullifying the data. Additionally, participants felt that a collaborative database would require careful construction to ensure that metrics were appropriately contextualized.

Participants felt an assessment toolkit should address ethical implications for both individual institutional assessment and collaborative assessment, including recommendations on what kinds of data to collect. Determining “good” or “bad” data collection was seen as problematic. Detailed individual user data collection helps to provide a clear picture of outcomes, but may also be used by third-party vendors in ways that are out of sync with the general values of the
Conclusions

Analysis of the survey and focus group data highlights several key themes in reuse assessment. The most prominent of which is that the digital library community is looking for field-wide approaches for assessing the impact of reuse in order to better understand, and tell the story of, what has been learned or gained by a user when they repurpose a digital object. Although standardized assessment approaches are critical, it is equally important that they be both modular and flexible enough that a range of institution types can apply them within the context of community-specific values and needs.

Although a majority of institutions do track limited types of use data, very few track reuse data, and even less consistently do so across collections. For those that are tracking use data, analysis and dissemination of this information is haphazard. It is clear from this research that metrics developed must be purposeful, and link directly to the outcomes prioritized by the organization. Too often practitioners felt they were collecting data for data’s sake, and adding to that data noise would be a mistake.

Embedded metadata that is consistent across platforms will be important to tracking object identifiers and relational metadata. Ideally, content management or data collections systems can collect use and reuse data on a granular level, and institutions will have the ability to turn on or off the gathering of specific data points. An ability to interface with aggregator data is crucial for smaller institutions, and specific approaches to data collection and dissemination should be detailed in licensing negotiations with vendors. The IIIF, with its community research focus, defined APIs and compatible software, can serve as a model for the reuse assessment toolkit. Similarly, RAMP and JISC’s IRUS can serve as models for large scale aggregation and implementation of standards across institutional repositories.

Finally, this research points to the need within the digital library community for benchmarking, and the ability to show relationships and patterns among digital objects that are being missed by currently collected data. Although software and approaches have been identified, foundational assessment techniques and training opportunities may be more immediately useful to the community at large. This includes resources on everything from data visualization, to methods for translating data to impact statements, to building and normalizing assessment practices that are specific to cultural heritage, data and digital repositories, and digital library organizations.

Ethical considerations and community values should be at the forefront of all discussions, and a future toolkit should explore how data can be used, the good and the bad, to empower institutions to make decisions.

Finally, this research has made clear that the digital library community is hungry for ways to understand the users and uses of digital collections by applying a new type of assessment lens – a lens that examines how materials are reused and repurposed within various communities, rather than simply measuring volume of use.

Further study

Beyond the final analysis of the upcoming focus groups, post-survey, and framework development and recommendations, significant themes have emerged. Any year-long project that engages a large group of practitioners and interacts with a hands-on advisory board will inspire additional areas of study. During the course of the analysis to date, the following areas have emerged that warrant deeper interrogation outside the parameters of the current research project.
Re-contextualization concerns were surfaced by the focus groups in two ways. First, the ethical consequences related to the tension of capturing detailed reuse metrics with the challenge of third-party vendors using the information. In fact, this theme generated so much conversation that the project team added related questions to subsequent focus group outlines. Digital librarians expressed an interest in utilizing specific personal information within a digital library to inform priorities. Indeed, the potential for third-party vendors (such as Google) to use the same information in a context misaligned to the goals of the institution poses a threat to the information and its custodians. As a community keenly sensitive to the misuse (or perhaps this too is a form of reuse) of personal information, how should standards be set? What is the digital library community’s role, as a group that regularly interfaces with for-profit, third-party entities, in shaping this conversation?

Second, focus groups revealed that digital librarians prepare for, but may not feel empowered to handle instances where digital assets are being used in a controversial context. Re-contextualizing digital assets, especially for use by extremist, revisionist or hate groups likely occurs. Digital librarians rarely have a vehicle to consistently track usage of their images in any forum. However, in the situation where digital assets are being used to promote a credo that stands in opposition to that of the original collection or home institution, digital librarians and other stakeholders may find themselves in a difficult position. While legal deeds and rights may be cited to prevent institutional liability, digital librarians must consider the implications to the relationships forged, partnerships cultivated and personal histories misused.

Third, platforms need to keep up with practitioner needs and community usage of digital assets. Perhaps the only sustainable approach for digital librarians to interact with third-party systems that meet immediate (and changing) demands is to be involved in the development of new platforms and tools. Do digital librarians and information management professionals leverage positions with vendors who supply tools that are integral to daily operations in all the ways they can? Every focus group raised the topic of Google Analytics as a platform through which usage was collected and analyzed, which presents a portrait of their significance in the institution or the community. However, most focus group participants did not report using the same platform to track reuse. If reuse metrics are equally important to initial use, how can these types of tools assist?

Finally, the importance of shaping a strong narrative to demonstrate the value and impact of a digital library on relevant communities stands out as critical to the sustainability for digital libraries in a competitive environment. Stakeholders and funding sources in academic or cultural heritage settings can range considerably, and are quite diverse. One way this diversity impacts digital libraries is through their ability to tell stories to all the entities that need to hear them. Beyond use and reuse metrics, how can we empower the community to better convey the impact of the digital library and related services to stakeholders?

Through engagement with the digital library community the researchers initiated a series of conversations with experts where few were occurring around topics of reuse. As a result of this unearthing, the research team, along with the digital library community at large, has much still to do in an effort toward a fluency of the importance on reuse for the future of digital libraries.

Acknowledgments
The authors would like to acknowledge that this project was made possible in part by the Institute of Museum and Library Services National Forum Grant lg-73-17-0002-17. The views, findings, conclusions or recommendations expressed in this paper do not necessarily represent those of the Institute of Museum and Library Services. The authors would also like to acknowledge the Digital Library Federation for its support of the Assessment Interest Group, and for their aid amplifying the work of this grant project and its deliverables. Finally, the authors are grateful to their home institutions for their encouragement of this research, and support in participating in this grant project.
1. For the purposes of this paper “digital library community” refers to practitioners employed by cultural heritage organizations including academic digital libraries, special, government, public and museum digital special collections and archives, and institutional and subject repositories.

2. In the COUNTER 5 release an Item Master Report (IR) is used to assess multimedia usage from institutional repositories. An example of the report components can be seen here: http://bit.ly/2n0w34m

3. JISC’s IRUS-UK: www.jisc.ac.uk/irus

4. COUNTER is the non-profit organization that maintains a Code of Practice, or standards, for vendors and publishers to follow when providing usage statistics of online resources to libraries: www.projectcounter.org/

5. RAMP: http://ramp.montana.edu/

6. Grant advisory board: https://reuse.diglib.org/advisory-board/


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Comparison of personas between two academic libraries

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Donna Harp Ziegenfuss
University of Utah, Salt Lake City, Utah, USA

Abstract
Purpose – A persona describes a group of library patrons as a single person to better identify and describe user patterns and needs. Identifying personas in academic libraries can assist in library planning by focusing on patrons. Initially, personas were thought to be unique to each library; additional insights led the researchers to rethink this assertion. The purpose of this paper is to determine if personas, developed in one library, are unique or more universal than previously thought.

Design/methodology/approach – In this study, 903 surveys were completed across two institutions asking library patrons to identify use patterns within each library. Mean score responses were analyzed using an ANOVA, principal component analysis and RapidMiner technology. All analyses were used to identify personas with common interests and place personas in groups or neighborhoods.

Findings – The findings provide evidence for the universality of academic library personas. However, differences occur in how the personas are grouped and use different library services and resources.

Originality/value – Personas allow librarians to view patrons in a more personal way as they connect personas to specific library spaces. While the personas appear to be universal, their interactions with each other depend on specific library amenities.

Keywords Strategic planning, Personas, Quantitative, Library planning, Library users, Library assessment

Introduction
An increasing desire to meet patron needs has resulted in librarians exploring new approaches to plan for and develop library services and resources. Traditional metrics (e.g. gate counts) no longer tell the full story of how academic libraries are being used. Large-scale library-assessment instruments (e.g. LibQUAL+®, Ithaka survey) illuminate emerging trends as libraries adapt to patron use patterns. Additionally, libraries are also using local library assessments to better understand patron needs (Hiller, 2001; Roberts and Weaver, 2006). However, Hiller (2001) contended that we must make sure that the data we collect answer the questions we want to ask. He emphasized the need to focus on answering questions related to local needs, as well as collecting data to benchmark against other similar institutions.

Literature review
A new approach for uncovering the needs of local library users is to develop and use personas. Borrowed from marketing and design, personas consolidate use patterns and needs of a group of people into a single description (Guenther, 2006; Mckay, 2010; Olsen, 2004; Pruitt and Grudin, 2003). Instead of trying to think about individual group members, planners use the single persona to better plan for patron needs.

Once developed, personas are used in a variety of situations, including changes to library services (Al-Shboul and Abrizah, 2014; Cunningham, 2005; Fourie and Fourie, 2014; Olsen, 2004), developing smart-space technology (Bilandzic and Poth, 2013), changing website design (Guenther, 2006), training employees (Idoughi et al., 2012) and improving library chat services (Tempelman-Kluit and Pearce, 2014). Personas become a new way to identify patron needs and examine library services.
Methods for identifying, developing and describing personas include surveys, observations, ethnographies, interviews, focus groups and existing records (Blomquist and Arvola, 2002; Cunningham, 2005; Guenther, 2006; Tempelman-Kuit and Pearce, 2014). The persona descriptions may be brief portrayals of each patron group or they can be complex profiles that include artificial profile pictures and background information created by the persona designer.

The final step is to validate the personas found within the institution and to determine the total patron population percentage that each persona represents (Mulder and Yaar, 2007). In the validation step, the persona designer creates use statements connected to each persona and asks a random sample of library patrons to indicate which use pattern statement best describes how they use the library. In this way, persona developers are able to determine if the persona exists in the library and the size of the group the persona represents.

In some cases, further analyses (e.g. principal component analysis (PCA), RapidMiner) determine how personas interact with one another. In these cases, personas are grouped with other personas that have commonalities (Blomquist and Arvola, 2002; Hellstrom and Eriksson, 2013; Leary and Allen, 2011). For example, two personas may have a common connection of collaboration, but collaborate in different ways. The connection of collaboration would place them in the same group, but the way they collaborate would identify them as different personas.

Aims
This effort seeks to identify evidence about the universality of academic library personas. Zaugg et al. (2016) identified ten personas at Brigham Young University (BYU) library. Researchers also used PCA to organize the personas into four groups with common use patterns. The three personas Focuser, Islander and Outsider were identified as being task-oriented personas but each has a different motivation for interacting with the library. The Collaborator and Side-Kicks personas are focused on collaborating in the library, but in different ways. The social personas of Socializer, Chillaxer and Explorer are similar in that they each came to the library to socialize but have a different way of socializing. And the last two personas, the In-N-Outer and Pirate are in the tool persona group and come to the library mainly to use library tools. A more detailed description of these ten personas is provided in Table A1. Initially, it was thought that the personas were unique to BYU's library. Following discussions with colleagues at the University of Utah (UU), the researchers questioned the uniqueness of institutional personas. With this new insight in mind, this study sought to determine if personas are unique to an institution or whether they are more universal. Therefore, this research seeks to answer two questions:

RQ1. In what ways are personas similar in two academic libraries?
RQ2. In what ways are personas different in two academic libraries?

Library descriptions
As BYU and the UU libraries have common and unique features, a brief description of each library is included below.

BYU library
The BYU Library occupies a central location on the BYU campus. It serves approximately 33,000 faculty, staff and students across 13 colleges. It hosts approximately 6m items across six floors in an area of about 665,000 square feet (60,850 square meters). During prime semesters (fall and winter), it serves upwards of 15,000 patrons each day.
The J. Willard Marriott Library is the main campus library on the UU campus and contributes to serving over 35,500 students and faculty. The library has approximately 521,000 square feet and supports faculty and students across 17 colleges. The library holds over three and a half million volumes, and has approximately 10,000 patrons visit each day.

Methods

This study is an extension of previous research identifying the ten academic library personas (Zaugg et al., 2016), and is focused on persona validation (Mulder and Yaar, 2007). One change was made in this validation effort that differed from the previous research conducted by Zaugg et al. (2016). Previously, researchers provided undergraduate students one-sentence persona use statements and asked them to identify the one statement that best described their library behavior. During the first validation effort, it became apparent that students identified with multiple library personas. Therefore, in this study, that used an identical survey and use statements, students were asked to rate on a scale ranging from 1 to 7 (1 = not at all like me, 7 = very much like me) to how closely the statement resembled their library use patterns (see Appendix 2).

Survey data were collected from students on each campus. The BYU Library sent out an online survey to a random sample of 1,500 undergraduate students and also randomly asked students walking by the library to complete the survey. The UU Library also randomly stopped students walking by the library and asked them to complete the survey but also collected paper surveys from patrons in the library. The researchers did not keep track of the number of students passing by or declining to take the survey so a final response rate is not known. The study was IRB approved at both universities.

Once collected, responses were summarized and then analyzed using three methods. The mean rating for each persona was used to group personas into high (4.00 or higher), medium (3.00–3.99) and low (under 3.00) groupings. We also conducted a factorial ANOVA using the least square difference to determine if there was a significant difference between the ratings given for each persona at each university. Following this, we used PCA and the RapidMiner analysis to examine personas that fit together. Simply put, both of these analysis tools examine how different personas correlate with one another and predict the ways and the degree to which the personas are similar. The PCA analysis was part of a statistical analysis package. RapidMiner, a commercial data mining analytical program, is typically used to predict patterns and trends.

The mean rating and PCA analysis examined personas as a combined group and by institution. The RapidMiner analysis examined groupings where both institutions where rating from both institutions were at a four out of seven or higher levels. All analyses were used to triangulate and compare the personas found at each institution. As well they indicated the similarities and differences in persona groupings in the two libraries.

Results

A total of 903 students were surveyed (BYU = 509, UU = 394), skewing the combined group slightly in BYU’s favor. A between subjects factorial ANOVA was calculated comparing the ratings for each persona from each university. A significant main effect for personas was found (F(1.9) = 178.83, p < 0.0001). Using the least square difference, we found a significant difference between the BYU and UU ratings for all but two personas (In-N-Outer and Outsider). All means, standard deviations and levels of significance are shown in Table I. All ratings were within 1.4 points of each other, with UU having higher ratings on all but one persona (In-N-Outer). The difference on seven of the ten personas was less than one point. Considering the eight personas with a significant difference, five (Islander, Collaborator, Focuser, Side-Kick and Pirate) had mean differences of 0.6 or less.
While statistically significant, they are not considered a practical significant difference. The three personas that had both a significant and practical mean difference were personas that were identified as personas that represent less than 7 percent of the entire library population (Zaugg et al., 2016).

To help answer the study questions of similarities and differences in the personas at the two academic libraries, the personas were sorted into groupings using three methods. The intent is to indicate the commonality of each grouping at each institution compared to both institutions. First, using the ratings for each institution and the combined ratings, all personas were placed into three groupings – high (ratings of 4.00 or higher), medium (ratings of 3.00–3.99) or low (ratings less than 3.00). Table II shows these groupings by library and combined.

Second, using PCA analysis and the combined, BYU and UU ratings, we divided the ten personas into three groupings (see Table III). Unlike the groupings in Table II, these do not indicate a hierarchy, but merely describe one way that the persona ratings correlate with one another to show similar use patterns.

Finally, using RapidMiner analysis and paired persona ratings, we identified three groupings for the ten personas. Similar to Table II, these pairings indicate a hierarchy. Personas for patrons at both libraries were rated at the indicated level to be included.

<table>
<thead>
<tr>
<th>Grouping</th>
<th>Combined</th>
<th>BYU</th>
<th>UU</th>
</tr>
</thead>
<tbody>
<tr>
<td>High (4 or higher)</td>
<td>Islander</td>
<td>Islander</td>
<td>Islander</td>
</tr>
<tr>
<td></td>
<td>Collaborator (t)</td>
<td>Collaborator</td>
<td>Collaborator (t)</td>
</tr>
<tr>
<td></td>
<td>Focuser (t)</td>
<td>Focuser</td>
<td>Focuser (t)</td>
</tr>
<tr>
<td></td>
<td>Side-Kick (t)</td>
<td>Side-Kick</td>
<td>Side-Kick (t)</td>
</tr>
<tr>
<td>Medium (3-3.99)</td>
<td>In-N-Outer</td>
<td>Side-Kick</td>
<td>In-N-Outer (t)</td>
</tr>
<tr>
<td></td>
<td>Pirate</td>
<td>Pirate</td>
<td>Explorer (t)</td>
</tr>
<tr>
<td></td>
<td>Explorer</td>
<td>Explorer</td>
<td>Socializer</td>
</tr>
<tr>
<td>Low (Less than 3)</td>
<td>Socializer (t)</td>
<td>Explorer</td>
<td>Chillaxer</td>
</tr>
<tr>
<td></td>
<td>Chillaxer (t)</td>
<td>Chillaxer (t)</td>
<td>Outsider (t)</td>
</tr>
<tr>
<td></td>
<td>Outsider</td>
<td>Outsider</td>
<td>Socializer</td>
</tr>
</tbody>
</table>

Notes: Mean ratings are out of a possible 7. (t) indicates a tie in the ratings.
in the grouping. Similar to Table III, Table IV indicates hierarchal groupings where persona ratings for both BYU and UU were both in the defined level. For example, to be placed in the high rank the person for both institutions had to be at a rating level of four or higher. To be placed in the medium groupings, both schools needed to have ratings between 3.00 and 3.99. Table IV shows three potential groupings based on this hierarchal ranking. These three configurations were examined to determine similarities and differences between the libraries at each of the two institutions.

Discussion
Since patrons often identify with several personas and switch personas to meet their specific needs, examining personas requires a holistic approach. Taking a holistic approach that examines the persona groupings using three different analyses to determine similarities and differences in personas and how they interact with each other and at each library. It also prevents patron stereotyping by examining the interplay of patron personas as they navigate the library space and services.

Similarities
There is evidence to indicate that the personas identified in one academic library are present in the other. First, as mentioned earlier, all self-identified patron ratings for each persona are within 1.4 points or less with one another. Half of the personas had ratings that were within 0.6 points of each other. This similar ranking provides the first indication that personas found in one academic library are also found in the other. Most of the UU personas were

<table>
<thead>
<tr>
<th>Rank</th>
<th>Grouping 1</th>
<th>Grouping 2</th>
<th>Grouping 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>High (4 or higher)</td>
<td>Focuser</td>
<td>Focuser</td>
<td>Explorer Focuser</td>
</tr>
<tr>
<td></td>
<td>Islander</td>
<td>Islander</td>
<td>Pirate</td>
</tr>
<tr>
<td></td>
<td>Outsider</td>
<td>Outsider</td>
<td>In-N-Outer</td>
</tr>
<tr>
<td></td>
<td>Explorer</td>
<td>Explorer</td>
<td>Chillaxer</td>
</tr>
<tr>
<td></td>
<td>Collaborator</td>
<td>Collaborator</td>
<td>Collaborator</td>
</tr>
<tr>
<td></td>
<td>Side-Kick</td>
<td>Side-Kick</td>
<td>Side-Kick</td>
</tr>
<tr>
<td></td>
<td>Socializer</td>
<td>Socializer</td>
<td>Socializer</td>
</tr>
<tr>
<td>Medium (3.00–3.99)</td>
<td>Collaborator</td>
<td>Collaborator</td>
<td>Explorer</td>
</tr>
<tr>
<td></td>
<td>In-N-Outer</td>
<td>Explorer</td>
<td>In-N-Outer</td>
</tr>
<tr>
<td></td>
<td>Chillaxer</td>
<td>Side-Kick</td>
<td>Pirate</td>
</tr>
<tr>
<td></td>
<td>Explorer</td>
<td>Chillaxer</td>
<td>Chillaxer</td>
</tr>
<tr>
<td></td>
<td>Pirate</td>
<td>In-N-Outer</td>
<td>Outsider Socializer</td>
</tr>
<tr>
<td>Low (Less than 3)</td>
<td>Chillaxer</td>
<td>Chillaxer</td>
<td>Chillaxer</td>
</tr>
<tr>
<td></td>
<td>Explorer</td>
<td>In-N-Outer</td>
<td>Outsider Socializer</td>
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<td></td>
<td>Pirate</td>
<td>Outsider</td>
<td>Pirate</td>
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<td></td>
<td>Outsider</td>
<td>Pirate</td>
<td>Outsider Socializer</td>
</tr>
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<td></td>
<td>Socializer</td>
<td>Socializer</td>
<td>Socializer</td>
</tr>
</tbody>
</table>

Table III.
Persona groupings for the combined, BYU and UU campuses using PCA

Table IV.
Groupings of personas for both BYU and UU sorted by high, medium and low pairings

Note: *Correlates negatively to other personas in group
rated higher than the BYU personas and all but two were significantly higher. This difference is attributed to the manner in which students were surveyed. The UU only collected response near or in the library. BYU emailed surveys to a sample of the entire student population, including those who do not or rarely come to the physical library. This finding accounts for the significantly higher UU ratings. However, the significantly higher ratings do not discount the finding that the specific persona ratings are extremely close. This finding lends support that the universality of personas.

Second, we were aware that some personas gravitate toward each other. While the groupings of personas were determined using different methods, several personas consistently paired in the same grouping, often with other personas. Our analysis placed personas into nine potential groupings. Eight of the ten personas were consistently paired together in seven or more of these groupings (see Table V).

The consistency and repetition of pairings across the analysis methods lends support that the personas not only exist at each campus, but that they also function in similar ways. It should be noted that, while persona pairing is often common, it does not indicate the impact of the persona. For example, in an initial study (Zaugg et al., 2016), only 5 percent of library patrons identified Chillaxers or Socializers as one of their personas. Focusers and Islanders had almost ten times the number of patrons identifying with them. However, that the personas pair together provide evidence of similar use patterns in the library.

Two personas, Outsiders and Explorers, did not pair with other personas at a high rate, but did at a moderate rate. For example, both Outsiders and Explorers were separately paired with Socializers in five of the potential nine groupings. An examination of the Outsider persona indicates an additional unique pattern. By definition Outsiders are those patrons who do not typically come to the physical library to use the physical library resources. As a result, they are placed in the lowest grouping for six groupings. Using the PCA, Outsiders correlated in a strong negative manner with personas with a strong positive association with the physical library, namely Focusers and Islanders. These findings, combined with the previous discussion, lend support that the ten personas identified in one academic library are also found in the other and function in a similar manner.

**Differences**

The differences between the library personas focus differences at the libraries. While personas are more or less constant, how they group together largely depend on the spaces offered at the specific library. BYU is set up to provide academic services (printers, interlibrary loan, reserve pick up) close to each library entrance. It is geared to have In-N-Outers come in and use popular services and leave.

BYU only has vending machines in a limited Food Friendly zone. UU has a café with booths nearby. The UU set up facilitates collaboration near the café especially with the Socializers and Chillaxers. UU also has a maker-space. This helps to explain the first grouping in Table III where Explorers, Pirates and In-N-Outers match up with Focusers to create and explore options at this space. BYU does not have a Maker-Space.

BYU also has more computers for student access than UU does (684 vs 236). This explains the In-N-Outer/Pirate grouping at BYU. Students commonly come in use the

<table>
<thead>
<tr>
<th>Persona pairing</th>
<th>Number of groupings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chillaxer/Socializer</td>
<td>9</td>
</tr>
<tr>
<td>Focuser/Islander</td>
<td>8</td>
</tr>
<tr>
<td>In-N-Outer/Pirate</td>
<td>8</td>
</tr>
<tr>
<td>Collaborator/Sidekick</td>
<td>7</td>
</tr>
</tbody>
</table>

Table V. Pairings of personas in total groupings

147
libraries computers and leave. Furthermore, UU has unique collections (e.g. games for Entertainment Arts and Engineering program or diagnostic tools for dentistry students) that explain the Islander/Outsider grouping for the UU.

Each of these differences illustrates that while personas are common between the two academic libraries, they group differently based on the amenities offered at each library. It would be of interest to determine if one library added resources it currently does on have, if the groupings would shift. For example, if BYU added a cafeteria would it see similar groupings that the UU has around its cafeteria? Similarly, if UU added more computers for students to use, would it see a similar groups change to what BYU currently has?

**Limitations**

Several limitations need to be noted for this study. First, the study only involved two academic libraries, quite similar in nature. They serve comparable student bodies and faculties. They are of similar size and have a similar prominence at their respective universities. It would be of value to determine if similar persona patterns exist and could be validated at universities that differed in size, cultural make-up and location.

Second, some university libraries are broken into several, somewhat equal branches. Both of these libraries were the dominant library at their institution. It would be of interest to determine if these persona and group patterns existed in institutions with multiple and equal libraries.

Data collection may have also affected results. BYU used online and in-person data collection for their results. UU used a combination of in-person and paper-based data collection methods due to a lack of technology tool access. While UU data collection was in or near the library, BYU’s data collection had a large sample that was not near the library. We surmise that more of the BYU respondents do not use the physical library than did the UU respondents, because of the proximity of data collection.

Looking at the persona data at different institutions can help identify unique library contexts that might drive new specific library initiatives or affirm how current initiatives are driving library use. Persona data can be used to help create new local surveys, which are important for finding out more about the local library culture, uncovering the contexts of library use or building on library strengths (Hiller, 2001).

Third, more BYU respondents were in the Outsider category. Surveys at the UU were administered in or near the entrance to the library. Collecting data online at the UU would, most likely, result in a higher rate of Outsider personas. Finally, it would be good to increase the total responses for both institutions. This initiative includes not just getting more students to respond to the survey, but also to have comparable numbers of respondents at each institution.

**Conclusion**

How do these findings influence the ways the libraries operate and interact with patrons? There is evidence that personas are universal. Those persons identified at BYU were also present at the UU library and could form the foundation of library service. The personas enable the librarians to see patrons through different lenses. For example, instead of seeing students studying, one begins to see Focusers, Side-Kicks and Collaborators.

How the personas interact with each other can help librarians plan for or adjust spaces and services to meet patrons’ needs. Personas and their groups help library staff to make the best decisions for changing or improving library spaces (Creaser, 2006). They help to provide a vision into the future of how libraries will be used and what library purposes will be.

Understanding personas is to better understand the nature of how students use libraries. Changes in the way people interact necessitate changes in the way librarians interact with patrons. It allows the librarian to see how the library fits into their patrons’ lives and not
force the patrons to fit into the life of the library. It is also important to consider the conceptions and training of library support staff for the newly emerging library learning environments (Fisher et al., 2005; Weaver, 2006).

References


<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
<th>Quotes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Task</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Focuser</strong></td>
<td>Motivated by achievement (straight A students), he/she is a personal studier who equate the library with no distractions and productivity</td>
<td>When I'm in the library, I feel like I'm more effective, even if that's not true. My mind knows I'm here to study, whereas if I'm at my house, I don't study. My mind associates studying with the library. I love that there's classical music playing because it helps me study and relax. I feel like it is my main area of the library.</td>
</tr>
<tr>
<td><strong>Islander</strong></td>
<td>Motivated by having a personal, quiet space to enjoy the peace and quiet of the library, he/she may be found at any time of the day reading personal books, writing, drawing, thinking, or even working on homework</td>
<td>You can find your own spot where no one can bother you.</td>
</tr>
<tr>
<td><strong>Outsider</strong></td>
<td>He/She interacts with the library's services through its website or databases and is unfamiliar with the library and/or finds it intimidating. This persona changes into other personas as the patron becomes more familiar with the library.</td>
<td></td>
</tr>
<tr>
<td><strong>Collaboration</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Collaborator</strong></td>
<td>Motivated by getting good grades, he/she comes to collaborate with others for a specific class project or study opportunity. Contains 2 subgroups: Voluntarily forms a group to study, Involuntarily put in a group to complete a class project</td>
<td>I use online resources three, four, five times a week. For my major, the databases are the best place. I read a lot of journal articles. So the databases are the best places to access a variety of articles across a spectrum.</td>
</tr>
<tr>
<td><strong>Side-Kicks</strong></td>
<td>Motivated by studying with a friend but not collaborating. He/She will sit with a friend but study separate things</td>
<td>It seems big and imposing at times. It's associated with intense studying, which brings a lot of stress and anxiety to some people.</td>
</tr>
<tr>
<td><strong>Social</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Socializer</strong></td>
<td>Motivated by the library's socialization opportunities rather than its study opportunities, he/she doesn't go to the library to study but to socialize and meet people. He/She likes the No-Shhh and Snack Zones</td>
<td>I do use group rooms a lot. I have had a lot of group projects, or just study groups, so we'll reserve a group study room. Group rooms with TVs and computers are helpful. Sometimes I use the study rooms for a group project. Study rooms are helpful for projects. You can't talk outside of the rooms. Usually the same amount of work gets done when I'm with a roommate. They just help me not be so lonely.</td>
</tr>
<tr>
<td><strong>Chillaxer</strong></td>
<td>Motivated by enjoying the atmosphere of the library and by what they are doing, he/she will break from studying to sleep, read a recreational book, watch YouTube, play video games, etc.</td>
<td></td>
</tr>
<tr>
<td><strong>Explorer</strong></td>
<td>Motivated to come to the library to explore or discover, he/she uses its resources for things above and beyond school requirements</td>
<td></td>
</tr>
<tr>
<td><strong>Tool</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>In-N-Outer</strong></td>
<td>Motivated to quickly use a library service and then leave, he/she checks out a book, prints a paper, or uses the atrium as a hallway between destinations</td>
<td>I've tried to get dates on the fourth floor before. I've had about a 50/50 success rate. I've gone to flirt before.</td>
</tr>
<tr>
<td><strong>Pirate</strong></td>
<td>Motivated to use library computers for homework and social activities out of convenience, they do not own or do not want to bring their own computer</td>
<td>I come every day because I have class from 10-11, then my next one is at 12. So I come in between. [I use] online stuff, I use the chairs, and [I use] the Wifi.</td>
</tr>
</tbody>
</table>

Table AI. Brief descriptions of undergraduate library personas
Appendix 2. Validation survey

1. Introduction
This research study is being conducted by Holt Zaugg, Assessment Librarian at Brigham Young University (BYU) and Donna Ziegenfuss, Interim Head of Grad and Undergrad Services at the University of Utah (UU) to determine undergraduate use patterns at the Harold B. Lee Library (HBLL) at BYU and the Marriott Library at UU. You were invited to participate because you are an undergraduate student.

Procedures
If you agree to participate in this research study, the following will occur:
• you will be asked to complete a short survey, for approximately 5 minutes about your experience with the respective library.

Risks/Discomforts
There are minimal risks as you are only asked to provide demographic information and answer a single question about your use of the library. Participants may withdraw from the survey without penalty.

Benefits
There is no direct benefit to participants other than the opportunity for the respective libraries to use the information to improve services.

Confidentiality
Only the researchers will have access to the data collected. Any data collected will be destroyed one year after the completion and dissemination of study results.

Compensation
You will be given a mini chocolate bar as compensation for participation.

Participation
Participation in this research study is voluntary. You have the right to withdraw at any time or refuse to participate entirely without jeopardy to your class status, grade, or standing with the university.

Questions about the Research
If you have questions regarding this study, you may contact Holt Zaugg (holt.zaugg@byu.edu) at BYU or Donna Ziegenfuss (donna.ziegenfuss@utah.edu) for further information.

Questions about Your Rights as Research Participants
If you have questions regarding your rights as a research participant contact the respective university IRB Administrators at (801) 422-1461; A-285 ASB, Brigham Young University, Provo, UT 84602; irb@byu.edu.

Statement of Consent
I consent to participate in this study.

Yes No

What is your gender?
Female Male

What is your current year of studies?
Year 1 Freshman
Year 2 Sophomore
Year 3 Junior
Year 4 Senior
Year 5+

With which college/school are you affiliated?
[Specified by university]
Please indicate the degree to which each statement applies to how you currently use the Lee Library (Marriott Library)? 1 = Not at all like me. 7 = Very much like me.

1. I come to the library to explore and discover things above and beyond class assignments.
2. I use the library’s computers and stuff so I don’t have to lug my stuff around.
3. I want good grades so I collaborate with friends in the class or with an assigned group.
4. I come here to find friends, and visit and relax in the zones that allow visiting and food (No Shh and Snack Zone). Work can come later.
5. I am focused on getting an A so please be quiet and don’t bother or distract me!
6. I come here to relax away from roommates and school. I may take a break to nap, read a fun book, watch a DVD, or play games.
7. I get things done when I am with a friend even though we are studying different things.
8. I am in a hurry. I need to get something or print a paper, and get out of here!
9. I have my personal spot that suits my needs and matches my personality, whether I am doing homework or taking a break.
10. Why do I need or would I want to go to the library? I either get everything I need on-line or do not want to go there.

[This question is only included if the last statement is selected.]
We are interested in learning more about your use patterns of library services outside of the library, would you be willing to participate in a focus group or an interview?

I am willing to participate in a focus group.
I am willing to participate in an interview.
I do not want to participate.

[These questions are only included if one or both of the first two choices in the previous question are selected.]

What is your name?
What is an email address we can contact you at?

End of Survey

Corresponding author
Holt Zaugg can be contacted at: holt_zaugg@byu.edu
International STEM graduate students: reaching a deeper understanding

Jen-Chien Yu and Kelli Jean Trei
University of Illinois at Urbana–Champaign Library, Urbana, Illinois, USA, and Jamie Carlstone
Department of Content Access Management, University of Illinois at Urbana–Champaign Library, Urbana, Illinois, USA

Abstract

Purpose – The purpose of this paper is to better understand the perceptions international STEM students have of the library and higher education based on their responses to the Ithaka S+R Graduate Student Survey.

Design/methodology/approach – To better understand these groups, this study conducted the Mann–Whitney–Wilcoxon test on the Ithaka survey results to compare the groups and identify any statistically significant differences that the international STEM graduate students group (ISG) has to other groups.

Findings – This paper found that ISG valued Higher Education objective variables more than the non-ISG group, with the exception of one question. The ISG group also valued 7 of the 13 role of the library (ROL) variables statistically different.

Research limitations/implications – Since the students self-reported as international or STEM, the authors are unable to assess whether the response pool is representative of the university as a whole.

Practical implications – By understanding how international/STEM students may differ from other populations, libraries can better design spaces and services for these groups.

Originality/value – Existing studies tend to focus on international students or STEM students and information literacy. This study intends to fill a gap in the understanding of how these groups perceive the ROL and their education.

Keywords Academic libraries, Assessment, International students, Graduate students, Ithaka, STEM students

Introduction

Libraries regularly conduct surveys to ascertain both faculty and student perceptions of libraries and library resources. The Ithaka S+R is a not-for-profit service that creates surveys to help the academic community assess various user populations (Ithaka S+R, 2004/2017). In 2016, the University of Illinois at Urbana–Champaign (UIUC) administered the Ithaka S+R Graduate Student Survey. This study uses data collected through the survey to investigate graduate international STEM students’ perspectives of the University and the role of the library (ROL) and how their needs differ from their peers.

UIUC is currently ranked fifth in the largest international student population of US institutions (Institute of International Education, 2016). International graduate students made up 43 percent of the total on campus graduate student enrollment in Spring of 2016, based on self-reporting (International Student and Scholar Services, 2016). In the Spring of 2016, the majority of graduate international students were enrolled in the College of Engineering and Liberal Arts & Science (LAS). The top majors, respectively, were Mathematics and Economics (in LAS), and Electrical and Computer Engineering and Computer Science in Engineering. The top three countries graduate students identified as home countries were: China, India and South Korea (International Student and Scholar Services, 2016). Additionally, according to the Graduate College at UIUC, in the College of Engineering, 52 percent of master/certificate-granting students and 64 percent of doctoral students are international students.
(The Graduate College at the University of Illinois at Urbana–Champaign, 2017). In a broader view, one-third of STEM graduate students in the USA are international (Han et al., 2015). From Han et al.’s study, they found that 90 percent of international students would prefer to work in the USA after graduation.

Therefore, the authors decided to focus on these two prominent groups (the STEM graduate students and the international graduate students) on our campus, and how those groups intersect (the international STEM graduate students, hereafter ISG). During the research, the authors became aware that very little has been published about the general library perceptions and needs of these particular student groups. What do the data from the Ithaka S + R Graduate Student Survey tell us about the impact or areas lacking in library services to this particular group of students? What, if anything, do librarians need to do to meet the needs of this particular user group? To answer these questions, this study conducted the Mann–Whitney–Wilcoxon (MWW) test to compare the groups and identify the statistically significant differences that the ISG students group has to other groups.

Literature review

Literature on international students has largely focused on their information-seeking behavior or the impact of English as a second language. However, surveys often include questions or data on the ROL, even if the study is generally intended to be about information literacy. Articles often note cultural differences or differences between library services in other countries and how this may impact information-seeking in the USA.

International students

Many articles have been written about international students in various disciplines in the last few decades. Click et al. provide a comprehensive overview of the recent literature in “The internationalization of the academic library: a systematic review of 25 years of literature on international students.” They hope that more articles of original research will be written, concluding, “that academic librarians and other scholars have and will continue to pay close attention to information needs and research experiences of international students, but further research is needed to identify best practices for teaching, serving and understanding this population” (Click et al., 2017).

A 2004 study of business international students at the UIUC found that the international students felt more strongly that instruction sessions were effective than non-international business students. Library use was also different, as international students were more inclined to use spaces to study or meet in groups (Song, 2004). According to Yi (2007), “36.1 percent of international students] intensely and frequently need information for improving library skills,” indicating a self-awareness international students have that they need further instruction to use the library in a new country. The same study found that while education level could predict library use, age and gender were not a factor.

A running theme is that international students are comfortable using the library spaces more than services. Knight et al. (2010) state that, “they definitely welcome areas for quiet study, computers, and course materials, they do not often interact with librarians.” Shao et al. (2013) found that “Chinese students appear to like to use the library for studying but are often not aware of the role of the reference librarian.” Sheu and Panchyshyn (2017) found that a social interaction can help librarians reach out to international students, with 78.5 percent willing to return to future events at the library after attending a welcome reception.

Some studies looked specifically at international students from China. A 2006 study from the University of Alberta interviewed nine Chinese international students. The study found that students were unaware of the role of the librarian in research assistance (Morrissey and Given, 2006). Shao et al. (2013) surveyed Chinese students (in their native Mandarin) after
returning to China from studying in the USA at various institutions. The study found that 86.7 percent of respondents felt welcome in their library in the USA (Shao et al., 2013).

Ibraheem and Devine looked at students from Saudi Arabia and found that “the unfamiliar structure of the American academic library posed difficulties for many subjects.” Despite that, “Most respondents nevertheless reported that they were able to use the library effectively most of the time, and the existence of a well-developed and integrated formal library instruction program was at least partially responsible for that” (Ibraheem and Devine, 2016). Articles on international students in the library emphasize the importance of services to this group, even if they are less likely to be aware of or use services than non-international students.

**STEM students**

In a 1999 survey of physical sciences graduate students, the library favored well as a space. In total, 86 percent checked a box saying the library was a preferred place to search (students were supposed to check all that apply) and 31 percent said the library is “your ideal information seeking environment” (Brown, 1999). This survey was taken before electronic journals became ubiquitous in the sciences; by 2007, a survey of academic science researchers found, “The majority of researchers visit the library fewer than 10 times per year for any reason, and almost a quarter visit it twice or less per year.” Only 14 percent of respondents cited “Quiet reading space” as a reason to go to the library (Hemminger et al., 2007). Robbins et al. found that there was no statistically significant difference when comparing institutions when engineering faculty were asked about the importance of library spaces. Furthermore, no institution had a majority of respondents who said that space for study and research was highly valued (Robbins et al., 2011). The literature shows a decline in use of library spaces among STEM researchers since 2000.

Holden surveyed students in two courses: Information Literacy in the Sciences and Information Literacy. The survey found that the group of mostly science majors had a generally positive attitude toward information literacy. For example, 81 percent of respondents agreed or strongly agreed that, “A general course on science literacy should be taught at every undergraduate institution of higher learning in the United States,” with a higher percentage of science students strongly agreeing than non-science students (Holden, 2010).

**International/STEM students**

Chen and Brown examined the library anxiety experienced by Chinese engineering students. The study found that the Chinese engineering students had a more positive perception of librarians at the University of Oklahoma than librarians back in China, although half the responses to the question on the ROL felt they played similar roles. There was a lack of understanding of the role of librarians outside of checking out books (Chen and Brown, 2012).

Zhao and Mawhinney’s (2015) study interviewed undergraduate native Chinese-speaking engineering students and native English-speaking students. The study primarily focused on information seeking, although there were notable differences in perceived ROL, such as a reluctance among native Chinese-speaking students to use services (Zhao and Mawhinney, 2015). This was consistent with the rest of the literature on international students in general.

Although there is literature on international students and information literacy as demonstrated here, there lacks abundant research on the ROL. Research on the ROL is found in articles that are primarily looking at questions of information literacy. Furthermore, there is also a lack of literature that focuses on international/STEM students as a group. Therefore, the intention of this research is to focus on understanding how international/STEM students perceive the ROL.
Methodology and design

Sample
In Spring 2016, a sample of 90 percent (10,918) of the degree-seeking graduate and professional students enrolled at UIUC were invited to participate in the Ithaka S+R Graduate Student Survey. Of these students, 1,388 respondents completed the survey in its entirety which resulted in an overall survey response rate of 13 percent. Of the respondents, 749 (52 percent) self-identified as pursuing a STEM degree and 492 (38 percent) self-identified as an international student. As a result, 284 (20 percent) respondents were recorded as ISG students and 1,104 (80 percent) respondents were non-ISG students.

Instrument
The Ithaka S+R Graduate Student Survey is a set of questions developed by Ithaka S+R and conducted via Qualtrics. The survey is designed to assess graduate and professional student practices and attitudes in order to support strategic planning for the future of libraries and other institutional information services. The survey has three core modules which all institutions administering the survey have to use: higher education objectives, academics and coursework and the ROL. The survey also has several optional modules that the institutions can use to gather information about certain specific issues or user groups. The survey and any portions thereof, including specific questions that may be quoted in this paper, are intellectual property of Ithaka S+R; all rights therein are reserved by Ithaka S+R.

Variables
Filter variables. This study used two Ithaka S+R Graduate Student Survey questions as filter variables in order to select responses from graduate students who were international and/or STEM students (see Table I). As noted above, this and other survey questions appearing in this paper are part of Ithaka S+R’s Graduate Student Survey; all rights therein are reserved by Ithaka S+R.

Higher education objectives. The Higher Education Objectives module of the Ithaka S+R Graduate Student Survey contained 16 questions that assessed students’ goals as a result of pursuing advanced degrees. This study analyzed 15 of the 16 questions in this module as one question was formatted in an unsuitable way for the analysis (see Table AI[1]).

Role of the library. The ROL module contained 19 questions that assessed the ROL in supporting graduate students’ needs. This present study analyzed 14 of the 19 questions in this module (see Table AII[2]).

Analysis
The authors of this study used the MWW to identify if the ISG student group presented any responses that were statistically significantly different from the responses provided by the non-ISG student group. MWW is a non-parametric measure that can be used to compare two

<table>
<thead>
<tr>
<th>Questions</th>
<th>Variable name</th>
</tr>
</thead>
<tbody>
<tr>
<td>At this college or university, are you pursuing a degree in a STEM field or discipline (i.e. a science, technology, engineering or mathematics degree including computer/information sciences, life sciences, physical sciences, health sciences, agricultural sciences, and medical and veterinary fields)?</td>
<td>S1</td>
</tr>
<tr>
<td>Are you an international student or foreign national?</td>
<td>D14</td>
</tr>
</tbody>
</table>

Table I. Filter variables
Scale range from 0 (No) to 1 (Yes)
sample groups to see if they are independent. And if they are, it can be inferred that the populations which the samples are drawn from are distinctly different.

The authors conducted the test using RStudio to compare the means of the ISG student samples and the non-ISG student samples. The MWW test was used to detect if the two sample groups (ISG vs non-ISG) were identical or independent. For example, if the MWW test shows that the two sample groups have identical responses to variable HE1 (having advanced academic knowledge about a specific subject, field or major), which means there are no statistically significant differences in how the groups perceive HE1. This was step 1. The authors identified a set of variables in which the ISG group and the non-ISG group have statistically significant differences at the 0.05 significance level.

In step 2, the authors conducted the MWW test using the filter variables defined in Table I to compare the means of the variables identified in step 1. This step was performed to gather additional information as they were interested in whether the STEM or the international status of the graduate student samples could be used to explain the variance they observed.

Limitations
There are a few limitations in the data collected through the Ithaka S + R Graduate Student Survey. First, respondents self-identified if they were international students or pursuing STEM/Science degrees by answering survey question D14 (Are you an international student or foreign national?) and S1 (At this college or university, are you pursuing a degree in a STEM field or discipline …). Therefore, it is possible that some students chose not to answer these questions or provided incorrect or unexpected answers.

Second, though 284 respondents (20 percent of the sample of international STEM students) took the survey, the authors do not have sufficient information to evaluate if the 20 percent sample is statistically representative since UIUC does not define STEM majors and the survey respondents self-identified.

Finally, this study used the sample drawn from a large public research university with a strong focus in STEM and with one of the largest international student populations (Institute of International Education, 2016). As such, it might limit the potential generalizability of the results to institutions with different institutional characteristics.

Findings
The MWW test showed there were statistically significant differences among ISG student group and the non-ISG student group. These two groups valued the majority of the Higher Education Objective variables and the ROL variables differently.

Higher Education Objectives variables (HE)
The MWW test revealed that the ISG group valued 9 out of the 15 HE variables statistically different than the non-ISG group at the 0.001 significance level ($p < 0.001$). The MWW test results are shown in Table AIII. Next the authors calculated the mean for the ISG group ($m_{1}$) and the Non-ISG group ($m_{2}$) in order to assess “how” the ISG group was different. For example, did they value the Higher Education Objectives higher or lower? The authors found that with the exception of HE14 (getting a job upon graduation), the ISG group valued the importance of the following 8 HE variables more ($m_{1} > m_{2}$):

1. studying abroad or participating in an international program for credit (HE2);
2. taking general courses on many different topics (HE3);
3. collaborating on research projects with professors or advisors (HE6);
4. having a specific GPA (HE7);
Role of the library variables

Similarity, the MWW test showed that the ISG group valued 7 of the 13 ROL variables statistically different. At the 0.001 significance level ($p < 0.001$), the international STEM group valued ROL1, ROL2, ROL4, ROL12 and ROL16 statistically differently than the non-ISG group. The MWW test results are shown in Table AIII. At the 0.05 significance level ($p < 0.05$), the ISG group also valued ROL5 and ROL7 statistically differently.

The authors found that with the exception of ROL7 (librarians or library staff provide assistance or guidance on using information ethically (such as to avoid plagiarism)), the ISG group perceived less value for the importance of the following 6 variables ($m_{13} < m_{23}$):

1. The library stores, organizes, and keeps track of books, articles, data, images, or other resources (ROL1).
2. The library pays for resources that I need for my coursework or research projects, from academic journals to books to electronic databases (ROL2).
3. The library helps students develop research skills (ROL4).
4. Librarians or library staff provide assistance or guidance in finding sources for coursework or research projects (such as books, articles, databases, websites, etc.) (ROL5).
5. How often do you go inside a library building on campus at this college or university? If you are currently employed in a campus library, please do not include work-related times when answering this question (ROL12).
6. How often do you access information or resources for your coursework or research projects online from an off-campus location (such as through a proxy server, VPN, or by logging in through your college or university account)? (ROL16).

Effect of STEM or international student status (Table AIV)

In order to examine how participants’ STEM and international student status might influence their responses to the variables that were identified as statistically significant, the authors conducted the MWW test using the filter variables S1 (STEM) and D14 (international student).

Discussion

As the ISG group has not been focused on much in research outside of information-seeking behavior, this study focused on perceptions of library services. The authors compared the ISG group and the non-ISG group results and then investigated further to see if the STEM and international students were of the same mind. For example, when it comes to how the students would rate their college experience overall (HE16), this study found no significant difference between the ISG group and the non-ISG group. However, as anticipated, the ISG group does differ from the non-ISG group in some respects, and as we looked further, also from one another.
Comparable views between STEM and international groups
Frequently, the significance shown in the analysis of the ISG group compared to non-ISG groups bore out when the authors investigated the STEM and international group separately. In these instances, both STEM and International groups separately showed significant responses and were responsible for the ISG group scores.

The survey results show that ISG students highly value the experience working and collaborating with other professors and students (HE6, HE12). ISG students also enjoy being involved in extracurricular activities such as student committees, sporting groups and other extracurricular activities (HE8).

Though excited to get involved with the community and peers, ISG students are less dependent on the library as a place for storing resources or accessing information than non-ISG (ROL1, ROL16). For international students, this could be in part due to differences in roles libraries serve in different countries and unfamiliarity with the system here. For students interested in STEM, many resources are available online so these students may not perceive the library as a physical storage location. This ISG distinction could also be related to the broader understanding of access and the way many students perceive certain databases, for example, seeing Google Scholar as an entity unto itself rather than a gateway to library resources.

The ISG group, the STEM group and the International group applied less value to getting a job after graduation (HE14). Perhaps the employability of students in the STEM fields has made them more confident in terms of employability. Additionally, international students who perceived this question as pertaining to a job in the USA may plan to return to their home countries.

Conflicting views between STEM and international groups
There were some distinctions when the STEM or International groups alone were responsible for swaying the ISG results as a whole.

STEM influenced views. The STEM group alone de-valued taking courses spanning many topics and having a specific GPA (HE3 and HE7). The STEM group also placed less importance in the library’s role for providing research assistance and/or guidance, while the international and non-international students showed no significant difference (ROL4, ROL5). The lack of concern that STEM graduate students seem to place in a GPA might relate to their focus on collaborative efforts that they feel are more important in securing positions after graduation. Additionally, they may be more single-minded in their efforts, thus dissuading them from pursuing other interests. The perception of the library is something librarians spend a lot of time working to change. It may be a lack on the library’s side of successfully marketing their expertise in a way that students respond to.

International influenced views. The International group valued the opportunities of enrolling in additional degree programs more than the non-International group (HE13) while there was no difference between the STEM and non-STEM groups. Additionally, international students placed higher values in the library’s role for providing guidance about ethical use of information (such as plagiarism) and visited physical libraries more frequently than STEM or NSNIG students (ROL7, ROL12).

These distinctions between the groups could be related to how involved the instructor is in directing students to library resources. For example, at UIUC, the Department of Linguistics offers an elective course to English as a Second Language graduate students and visiting scholars on advanced academic writing. This course includes a specific session entirely about library services. Of course, the difference in frequency of visiting libraries could also be related to certain services the libraries provide, or the aforementioned desire to collaborate with others in library spaces offered.
Conclusion
Maintaining accurate knowledge of the perception and views these various student groups hold is imperative in determining successful library guidance and services. This analysis of the Ithaka S+R Graduate Student Survey begins to tease out the similarities and differences in graduate student needs for international, STEM and international-STEM students. As this analysis was conducted with the MWW test, it pertains primarily to questions that can be evaluated by that instrument. There is much more to be delved into and other potential analysis tools that could be applied. This study has detailed significant differences between student experiences. While quickly looking at student experience as a whole can be helpful while strategically planning for the future, it is a mistake to assume student needs always coincide. The researchers presented the results of the Ithaka survey in a faculty meeting. The culminating research this paper details has been shared with our library. The researchers plan to continue to delve into the data contained in this survey, broadening the analysis to other modules and subsequently interviewing focus groups of students for more in-depth analysis. More investigation is necessary to determine best practices for library policies, collections and services in light of particular needs of student groups. This analysis could be repeated at any institution that performs the Ithaka S+R Graduate Student Survey. Although no student body is exactly the same, the methods can be broadly applied to public institutions with large international and STEM student populations in order to supplement or challenge the findings in this initial study.

Notes
1. The authors did not include the question “When you think about the type of job or career that you hope to have, how useful do you think each of the following factors will be in helping you get your desired job or career,” for it served as a follow-up question to the question (HE14) that preceded it.

2. This study did not include six role of the library module questions because these six questions were either yes/no questions or multiple answer questions. As such, data collected through these questions were not suitable for intended analysis.

References


Further reading


(The Appendix follows overleaf.)
## Appendix 1

### Variable Name Questions

| HE1 | Having advanced academic knowledge about a specific subject, field or major |
| HE2 | Studying abroad or participating in an international program for credit |
| HE3 | Taking general courses on many different topics |
| HE4 | Building my resume or CV with career-related experiences |
| HE5 | Improving my ability to find sources of information on a range of topics |
| HE6 | Collaborating on research projects with professors or advisors |
| HE7 | Having a specific GPA |
| HE8 | Getting involved in organized extracurricular activities, such as clubs, sports, campus leadership or committees, etc. |
| HE9 | Developing a professional network |
| HE10 | Participating in social events |
| HE11 | Choosing a career or post-graduation plan |
| HE12 | Collaborating on group projects or in teams with other students |
| HE13 | Enrolling in an additional degree program (such as a second bachelor’s, master’s, doctoral or professional degree) |
| HE14 | Getting a job upon graduation |
| HE16 | Overall, how would you rate your experience at this college or university so far? |
Appendix 2

Variable Name | Questions
--- | ---
ROL1 | How useful is it to you personally that your campus library provides each of the services listed below?
ROL2 | The library stores, organizes and keeps track of books, articles, data, images or other resources
ROL3 | The library pays for resources that I need for my coursework or research projects, from academic journals to books to electronic databases
ROL4 | The library supports and facilitates my learning or studying activities
ROL5 | The library helps students develop research skills
ROL6 | How useful is it to you personally that your campus librarians or library staff provide each of the services listed below?
ROL7 | Librarians or library staff provide assistance or guidance in finding sources for coursework or research projects (such as books, articles, databases, websites, etc.)
ROL8 | Librarians or library staff provide assistance or guidance on managing citations of books, articles, data, images or websites for coursework or research projects (such as for a bibliography, works cited or index section)
ROL9 | Librarians or library staff provide assistance or guidance on using information ethically (such as to avoid plagiarism)
ROL10 | Librarians or library staff provide support in learning and using online search engines or databases
ROL11 | How often do you go inside a library building on campus at this college or university? If you are currently employed in a campus library, please do not include work-related times when answering this question
ROL12 | Scale range from 1 (More than twice a week) to 6 (N/A I have never been inside a library building at this college or university)
ROL13 | How often do you interact with librarians or library staff members at this college or university (either in person or via e-mail or an online chat platform)? If you are currently employed in a campus library, please do not include work-related interactions when answering this question
ROL14 | Scale range from 1 (More than twice a week) to 6 (N/A I have never interacted with a librarian or library staff member)
ROL15 | How often do you access information or resources for your coursework or research projects online from an off-campus location (such as through a proxy server, VPN, or by logging in through your college or university account)?
ROL16 | Scale range from 1 (Regularly) to 4 (Never)
### Variable name  ISG Mean ($m_{ISG}$)  Non-ISG Mean ($m_{non-ISG}$)  $p$-value

**Higher education objectives variables**

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**Role of the library variables**

<table>
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</tr>
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</table>

**Table AIII.**
Results from the Mann–Whitney–Wilcoxon Test (ISG vs non-ISG)

Notes: *$p < 0.05$; **$p < 0.01$; ***$p < 0.001$
### Variable name

<table>
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<th>Non-ISG Mean (m₂)</th>
<th>p-value</th>
<th>STEM Mean (m₁)</th>
<th>Non-STEM Mean (m₂)</th>
<th>p-value</th>
<th>International Mean (m₁)</th>
<th>Non-International Mean (m₂)</th>
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### Notes:

The higher mean values are presented in italic; Lower scores are better; See the scale range in Table AII.

* *p < 0.05; **p < 0.01; ***p < 0.001

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### Corresponding author

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Reading, writing, and … running? Assessing active space in libraries

Kristina A. Clement, Sian Carr, Lauren Johnson, Alexa Carter, Brianne Ramsay Dosch, Jordan Kaufman and Rachel Fleming-May

Department of Information Sciences, University of Tennessee Knoxville, Knoxville, Tennessee, USA, and Regina Mays and Teresa Walker University Libraries, University of Tennessee Knoxville, Knoxville, Tennessee, USA

Abstract

Purpose – The University of Tennessee Knoxville’s Libraries has set aside space and stocked it with treadmill desks, standing desks, cycling desks and balance chairs to encourage physical activity while using library space to promote active learning. The purpose of this paper is to assess the impact of this innovative space on library users through a study conducted by a research team using observations and short surveys to gather information about usage trends and user perceptions of this “active learning space.”

Design/methodology/approach – This study used both ethnographish observation and self-selected survey. Researcher observation notes were used to gather usage rates of the space and equipment in the space, and survey responses were coded for themes to identify user perceptions around the space.

Findings – The findings strongly suggest that users find mental and physical health value in the “active learning space” and many would find value in the expansion and improvement of the space.

Research limitations/implications – The limitations of this study include a shorter observation period compared to the survey collection period and limited demographic collection to shorten the survey instrument.

Originality/value – However, this study was able to assess how an active learning space in an academic library can influence and have a significant impact on student success.

Keywords Academic libraries, Library assessment, Student success, Active workstations, Space assessment, Student wellness

Paper type Research paper

There has been a paradigm shift of library design from “book centered” to “learning centered.” Meaning “the design challenge is less with the interaction of readers and books and more with the connection between space and learning” (Bennett, 2009, p. 188). To foster this “connection,” libraries have had to become deliberate about space allocation and space assessment, rather than relying on users coming to the library for the traditional reasons of studying or borrowing resources (Nitecki, 2011). Examples of this deliberate and evolving space allocation in libraries can be found in space assessment-focused essays and literature reviews, and space assessment studies. In Nitecki’s (2011) essay, she introduces space assessment as the means to identify “the paradigm of what the library is intended to be” for the ever changing and evolving twenty-first century Library user (p. 31). Farmer’s (2016) literature review explores the fact that library space assessment can include everything from physical library spaces (i.e. reference desk; research commons) to virtual spaces (i.e. library catalog, online instruction) and that is up to the academic librarian’s

This research project is a component of the IMLS-funded Experience-Assessment (UX-A) cohort. UX-A leverages an interdisciplinary team and robust facilities to provide education and experience to future leaders in library assessment and user experience testing at the University of Tennessee.
understanding of her users to prioritize which spaces to assess (p. 97). Beard and Dale’s (2010) observation-based space assessment study found the answer to users’ changing space needs is to create malleable and innovative spaces that change with the users’ needs without having to wait for librarians to change the space. Khoo et al.’s (2016) mixed methods space assessment found there are two main models users employ when thinking about library space: the traditional model of books, research, and individual study; and the emerging and more prevalent model of “technologically-supported group study” (p. 51). The study concluded both models needed to be supported by the Library, but that more space assessment studies were needed to better support the emerging model of group study for their users. Hillman et al.’s (2017) mixed methods space assessment discovered some library users’ space needs are task dependent (i.e. for individual study, users want quiet spaces, but for group study, users want collaborative spaces) and that more library space assessment studies need to be conducted and published in order to identify the emerging trends of library space usage in users as space assessment studies are still underrepresented in library research as a whole (p. 50).

A library’s physical space is one of its most valuable and most restricted resources. Finding new physical space can be impossible for some institutions; for those institutions that can expand their space, the monetary and opportunity costs of renovation can be too high. Exploring new ways to work with a library’s existing space is essential, though, at times, intimidating. It is essential to first determine how space is being used, and the most efficient way to do this is through space assessment. Conducting space assessment studies allows library administrators to understand how and why a space is used so improvements can be made to the space, contributing to user success and the overall value of the library. This study’s objective is to examine the usage of active learning equipment and its space allocation in an academic library in order to better understand students’ needs and preferences as defined by their use and opinions of the active learning space.

Active learning spaces in the library

Sedentary behavior is a chief health concern in the USA posing significant health risks (Matthews et al., 2008, p. 875). In response to this growing concern, there has been a considerable amount of study regarding the obesity crisis and the benefits of active workstations in the workplace and the classroom (Mobley and Fisher, 2014; Ohlinger, et al., 2011). However, there have been relatively few studies about active learning workstations and active learning space in public or academic libraries. Libraries, both public and academic, are beginning to assess their space to better meet the needs of users. This is also part of an effort to repurpose current space for current needs, given that the trend of designating valuable space within academic libraries to specific purposes is gaining ground. However, according to Applegate (2009), most space assessment studies focus primarily on renovation, new construction or development of a commons space (p. 342). Applegate (2009) makes an important point about libraries as place:

> It is a mistake to think of the library as only a place where services such as reference, instruction, and computer use are provided. The library is a campus space, one uniquely suited to meet important student needs for space as well as services and resources. (p. 345)

Space assessment of equipment for specific purposes has been less common, though there is evidence that a small handful of college and university libraries have not only adopted the use of active learning equipment in their libraries, but some have also studied the usage and perceived benefits of the equipment.

Clemson University in South Carolina, Troy University in Alabama and Kent State in Ohio have all added active learning equipment and workstations to their libraries. Having added FitDesk cycling stations, Troy University has conducted an informal study in which...
they decided to order more equipment based on their perceived popularity (Shaffer, 2016). At this time, their assessment of the equipment remains informal. Similar to Troy University, Kent State has also added active learning workstations to their library. The addition of these workstations stemmed from a student think tank focused on improving library services and spaces for students (Young, 2014). According to Young (2014), students enjoy the space and attest that it is nice to have a moment to get up and move around to clear their minds. Young also reports that the Dean of Libraries at Kent State seems to be in favor of the new equipment and is willing to add more if they get enough use; however, there is no mention of a study to generate data to support the purchase of more equipment and the development of this space at Kent State (para. 7).

These two news articles demonstrate that university libraries are starting to notice this idea of active learning equipment and active learning spaces, but also that there is relatively little study being done about these spaces. Clemson University is a small exception to this statement because there is an active study in place there about the benefits of the active learning equipment that has been recently added to the library. This study, rather than being conducted by librarians, is being conducted by a professor in the psychology department (Chant, 2013). Chant’s brief article from the Library Journal indicates that the study is still in progress, and there are no data to report as of March 2018.

There are two significant and more complete studies of active learning equipment in libraries that help make the case for further studies of this type. The first was conducted by Maeda et al. (2014) and sought to “investigate the feasibility of incorporating portable pedal machines in a university library to reduce sedentary behaviors […] [because] […] libraries are an inherently sedentary environment, but are an understudied setting for sedentary behavior interventions” (p. 525). The study sought to measure the effectiveness and use of an array of portable pedaling devices placed throughout the library with various prompts to encourage use. Timers and sensors on the equipment measured usage and were compared against library gate count data. The effectiveness of the equipment was measured via survey sent to a randomly generated selection of 5,000 students who used the library during the course of the study. The study concluded that the concept was good but required further testing and study to truly determine the benefits of active learning equipment, but that such further studies could result in the general improvement of public health (p. 525). The second study situated in an academic library was conducted by Goodson (2016) at the University of California, San Diego’s university library. Goodson’s poster presents the results of two micro-assessments (as they are described by the author) conducted on WalkStations (treadmill desks) that were installed in 2014 in the library’s 24-hour study space. The WalkStations were purchased after the library received numerous requests for active seating options; the micro-assessments, which consisted of an initial feedback poster at the time of installation where students could write their opinions on the equipment and suggestions for the space, and follow-up survey cards at the one-year mark to gauge user satisfaction with equipment & location, frequency of use, length of sessions and wait time, were done to solicit student feedback and suggestions on the WalkStations (Goodson, 2016). The results of both micro-assessments were overwhelmingly positive with 76 percent of respondents reporting high levels of satisfaction with the equipment (2016).

These two studies demonstrate not only the importance of conducting proper library assessments of space, equipment and usage to accurately gauge patron needs, but also illustrate the slowly growing body of literature supporting inclusion of active learning spaces and equipment in academic libraries. The literature also clearly supports further investigation of the role that active learning equipment and spaces play when it comes to space allocation and any effect that the use of such equipment may have on student success.
Research setting
This research was conducted at Hodges Library at the University of Tennessee Knoxville, the flagship, land-grant campus for the UT system. The objective of this project was to examine the usage of active learning equipment and space on the second floor of the Hodges Library, the whole of which is considered to be the Learning Commons. The Learning Commons primarily consists of the Commons North and Commons South, with campus partners, such as Tutoring Services, the Writing Center and the Office of Information Technology occupying the Commons North, and library services such as equipment check out and multimedia workstations occupying the Commons South. The active learning space area is located in the Commons South and is enclosed by glass windows on three sides (Plate 1).

The main glass wall faces toward the large main walkway/lobby area of Hodges Library. It is partially open to the rest of the Commons South, an area combining traditional workstations and various service points, on the opposite side. This area includes four standing desk workstations and accompanying tall chairs, four stationary bike workstations, two treadmill desks and four balance-ball chairs. Because the majority of the furniture in the Learning Commons is intended to be movable, it should also be noted that other non-active equipment and furniture occasionally makes its way into the active learning space.

Methodological approach
This study followed a mixed methods approach using qualitative and quantitative methods to assess how users interacted with the space and the equipment and to determine user perceptions of the space. Two major methods were employed for this research, which was conducted between April 2017 and September 2017: ethnographic observations and a survey administered over five months.

Observations \( (n = 11) \)
Ethnographish observations were conducted over a two-week period in April and May leading up to the University’s final exam period. It should be noted that the use of the term “ethnographic observation” in the context of this paper (and in the context of librarianship) would be misleading, for ethnography takes on different meanings depending on the academic field in which the studies are done. The term “ethnographish” used frequently by
Lanclos and Asher (2016) helps to distinguish what librarians consider ethnographic study (shorter-term, narrow context, easily replicable) as opposed to what anthropologists consider to be ethnographic study (longer-term, full scope of participants’ lives) and is more representative of this study. Participants were observed in one-hour intervals at varying times of day, including mornings, afternoons, early evenings and late evenings. No overnight observations were conducted. Data were recorded on an observation sheet (Figure A1) and the position of equipment was diagramed at the beginning of the observation and participants were counted in total and based on what equipment was being used at the beginning, middle and end of the observation. Observations were intentionally non-obtrusive so that researchers could observe participants use patterns of the active learning equipment in a more natural way. Because of this, researchers attempted to find ways to observe in the space where they were not using any of the active equipment themselves. This proved difficult in some observations, since the active learning space is small and primarily contains the active learning equipment. Researchers responded to this challenge by sitting in seated desks and non-active chairs to conduct the observations. Seated desks and non-active chairs are not intended to be part of this space, but often make their way into the space, and therefore having the researchers use these for their observations was deemed unobtrusive. Data from the observation sheets was coded in Excel for patterns and themes. The most common theme across all observations was confusion over the purpose of the space. The observation notes frequently noted students entering the space, looking around and immediately walking out again.

Table I shows the distribution of equipment use based on 11 hours of observation recorded over 14 days. It should be noted that the most popular equipment in the active learning space was actually the seated tables that can be found all around the Learning Commons and are not intended to be a part of this part of the library. However, observations noted that students would often move the regular sitting tables and chairs into the active learning space where they would then sit and study for longer periods of time.

Of the active equipment, standing desks were the most popular and were observed being used 34 percent of the time. On average, two users per hour were observed using the active learning space.

**User survey (n = 138)**

A pen and paper survey was prominently placed in the active learning space to capture the self-reported usage and opinions of the active learning space by those who were using it. The survey was collected for five months, from April 2017 to September 2017. Self-selected participants were asked if they were first-time users of the space, or how often they used the space if they were not first-time users. Participants were also asked if the space had enough equipment, if it helped them study and if it contributed to their overall well-being. There was also a space for comments. Participants were encouraged to take the survey by offering an incentive: a drawing for two $50 Starbucks gift cards.

<table>
<thead>
<tr>
<th>Type of active equipment</th>
<th>Instances of use</th>
<th>Percentage of use (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standing desks</td>
<td>23</td>
<td>34</td>
</tr>
<tr>
<td>Tall chairs</td>
<td>10</td>
<td>15</td>
</tr>
<tr>
<td>Walking desks</td>
<td>5</td>
<td>7</td>
</tr>
<tr>
<td>Cycling desks</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Balance ball chairs</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Types of inactive equipment</th>
<th>Instances of use</th>
<th>Percentage of use (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seated desks</td>
<td>29</td>
<td>43</td>
</tr>
</tbody>
</table>

Of the active equipment, standing desks were the most popular and were observed being used 34 percent of the time. On average, two users per hour were observed using the active learning space.
To ensure anonymity, participants were able to write their name and university e-mail on the bottom, detachable portion of the survey form and place it in the return box to be entered into the drawing. The survey was intentionally kept short and done via pen and paper to encourage participation and remove barriers, such as having to navigate via computer or mobile device to a survey webpage. A conscious decision was also made to not collect demographic data for this survey in order to keep the survey as short as possible while still collecting the most important information about usage patterns and the benefits of the space itself. Other than the advertised incentive, participants were not approached by researchers to take the survey. Surveys were collected approximately once a week and responses were input into a Qualtrics form for data analysis.

Over the five-month survey period, 138 completed surveys were collected, 79 of which had written comments. Quantitative data were analyzed in Qualtrics, and qualitative data were analyzed and coded inductively using Excel. Of the completed surveys, 57 percent of respondents identified themselves as first-time users of the active learning space and, of those who were repeat users, 25 percent indicated that they use the space one to two times per week (Figure 1).

There were three questions about user perceptions of the active learning space:

- if the amount of active equipment in the space was sufficient;
- if the space and equipment helped with studying; and
- if the space and equipment contributed to respondents’ overall well-being.

Figure 2 shows that respondents were overwhelmingly positive about the amount of equipment and the effects of the space on studying and well-being.
Discussion

Both the observations and the survey generated useful findings about the addition of the active learning space in the Library Commons that will facilitate evidence-based decisions about the future of this space. Observation notes revealed some confusion over the purpose of the space, with observers noting multiple times per observation that students would enter the space, look around with some apparent confusion and then exit the space in search of a table or booth at which to study. This is due in large part to the lack of advertisement of the active learning space as well as lack of signage within the space indicating to the user the purpose of the space. Observations also revealed that students frequently brought non-active equipment into the active learning space. And while observations only noted an average of two users per hour in the space, the survey responses indicate that nearly half of all users visit the space and use the equipment multiple times per week. The survey specifically demonstrated that users perceive the space as beneficial to their health, wellness and studying habits. Coding of the survey comments revealed three prevalent and actionable themes: studying and health, physical space and equipment.

Of the 79 comments received on the survey, 36 comments directly related to studying. Respondents generally reported that moving while working contributed to their ability to study. Along with a majority of these comments, respondents indicated gratitude for the space and the equipment:

- I love this space! I was so much more productive while walking and I didn’t have to feel guilty for choosing to work out or work on my dissertation. I was able to at least get some exercise and write/read. I feel like I was able to accomplish more because of the walking.
- I love this space. It allows me to study more hours I wouldn’t be able to just sitting.
- Cool space – love the idea of combining healthy activities w/ studying.
- I love it. Never knew they would have something like this. It helps me to not be so idle while I study.
- This is a super cute little place and helps when I can’t focus on work.

A significant number of respondents who made comments about studying also made comments related to health and/or fitness. The overlapping comments indicated respondents appreciated the ability to study and exercise. Two respondents indicated dissatisfaction with the active learning space, stating that they did not enjoy being active while studying:

- Can’t really study and work out.
- I learn more effectively in a stationary position without sweat beads falling on my laptop/paper.

In total, 32 comments related to the physical space. Common themes within this category included the desire for more electrical outlets, observations on how much or how little respondents used the space and comments indicating gratitude and thanks for the space. The most common theme related to the physical space was requests for more spaces like this in the libraries and around campus (7 of the 32 comments):

- Would love to have more of these on other floors (QUIET FLOORS!) and in other buildings.
- More equipments (sic) as well as equipments (sic) in the quiet study floors.
- I would love to see the space expanded. There’s definitely enough equipment for the size of the area.
- This area has been the single greatest thing for my studies & well-being at [the University]. A similar area on a quiet floor would be nice.
I think there should be more spaces to work with active chairs rather than a full bike or treadmill that way you’re still able to write/type but are able to fidget.

If there were more power outlets that would be better.

Love the Active Learning Space!! More treadmills would be nice and electric outlets so computers can charge while walking.

Several respondents also indicated that they thought that the space was underutilized and not marketed well enough:

- If the space was publicized and larger, I feel like more people would use it.
- Make this area more well-known! Advertise it!

Some of the comments about the physical space overlapped with comments about the equipment in the space. In total, 32 comments related to the equipment in the space. The most common themes within this category were requests for additional equipment of the same kind that is already in the space, suggestions for adjustments to the existing equipment and requests for new kinds of equipment:

- It might be better if there are more height adjustable tables in this place.
- More equipment add fans!
- Need more treadmills.
- Could you move one piece of equipment to face outside? Also, what about adding meditation pillows?

Two respondents also indicated that better care of the equipment was needed, and two separate respondents requested instructions on how to use and adjust certain equipment.

Limitations and further study

There are limitations to this study. More observations and more data collection would have informed a better understanding of usage patterns. Further study of this kind of space is also recommended. A second phase in study should aim to collect more detailed demographics to capture a more accurate picture of who the users of the space actually are. Additionally, because it was not possible to accurately determine the percentage of the population who use the active learning space based on gate count information, the second phase of study should utilize sensors on the equipment to automatically collect detailed information on equipment use all hours that the Library is open. This, when compared to more accurate gate counts, it would give a better picture of daily usage.

Conclusion

This assessment study has provided initial qualitative and quantitative data that support the continued use of valuable Learning Commons space for the active learning equipment. With library space at a premium, thorough and quality assessments are necessary to undergo new initiatives with spaces. This is a useful study, whose results indicate that some users value the space, and though the Library is still evaluating the outcomes of the assessment study, it has been enough to convince them to keep the active learning space for the time being. The Library administration recognizes the necessity for spaces like this and is continuing to assess the viability of the space through ongoing assessment, as ongoing assessment is a necessity to ensure library space remains relevant and useful to users in the rapidly-changing and evolving information environment.
References


Appendix

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Assessing active space in libraries

Figure A1. Observation sheet

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Input resources indicators in use for accreditation purpose of higher education institutions

Yazid Mati
Qassim University, Buraidah, Saudi Arabia

Abstract
Purpose – Higher education is a complex system that involves multiple inputs and outputs, where various activities and processes are performed. The purpose of this paper is to monitor the input resources used for executing various activities of higher education institutions. These resources are classified into three types: human resources, physical resources and financial resources.

Design/methodology/approach – The author examines various national and international accreditation standards to determine their requirements for key performance indicators (KPIs) to monitor input resources. Moreover, the author uses implications proposed by previous research and best practices.

Findings – A set of appropriate and generic KPIs is developed for each type of these resources leading to a total of 72 key indicators. These indicators are easy to measure, which makes them practical to be adopted by a large scale of institutions.

Practical implications – The proposed indicators provide adequate information to administrators and policy-makers, accrediting bodies and stakeholders to identify the progress and achievements. These indicators are also used for benchmarking purposes by comparing the institution's performance against their comparable institutions counterparts. Moreover, they are used for marketing purposes to commercialize the institution by attracting prospective students and teaching faculty in addition to increasing current students' satisfaction.

Originality/value – The paper gives special attention to developing a set of generic KPIs for assessing the availability and quality of input resources used for carrying out various activities of higher education institutions for the aim of improving their performance and hence helping them comply with the requirements of accreditation standards.

Keywords Key performance indicators, Higher education, Performance measures, Indicators, Accreditation standards, Input resources

Paper type Case study

Introduction
Today’s increasingly global competition has led several companies to improve their operations and processes to reach the goals and objectives set out in their business strategy. These objectives may not be efficiently and quickly achieved without developing an effective management plan that emphasizes the significance of maintaining an efficient metric-oriented performance management system for measuring and controlling the performance of various activities.

Higher education is a complex system as it involves multiple inputs and outputs where various activities and processes are undertaken. This system can be described by the input-transformation-output model, a widely recognized model in operations management literature for improving processes (Slack et al., 2016). Inputs refer to the resources utilized for converting something, or being converted themselves. In higher education, the inputs can be classified into human resources, physical resources and financial resources. The outputs can be classified into three core components: graduates, research findings and community services. The transformation processes refer to work activities that convert inputs into outputs through value-added actions. These activities are management, teaching, learning, research and services. For example, the teaching activity uses the...
transforming resources (e.g. teaching faculty, facilities) to transform students to qualified graduates equipped with up-to-date knowledge and skills.

The inherent complexity of higher education institutions suggests an urgent need for establishing appropriate measurement systems for monitoring and controlling the performance of these institutions, especially those with limited resources. Nonetheless, meeting national and international standards of accreditation agencies requires developing well-defined key performance indicators (KPIs), based on which higher education institutions are evaluated and certified. Moreover, accreditation is also granted for higher education institutions based on the extent to which they adhere to a set of defined standards that reflect the quality of their activities. Therefore, the ultimate goal of accrediting agencies is to enhance the performance of higher education institutions by assessing and reviewing their activities in order to maintain continuous quality improvements to produce well qualified and competitive graduates.

There are a number of national and international accreditation agencies that grant accreditation in various disciplines. For example, the Association to Advance Collegiate Schools of Business (AACSB) accredits business colleges (AACSB, 2017). The Accreditation Board for Engineering and Technology (ABET) is an international non-profit organization that accredits higher education programs in the field of applied and natural sciences, computing, engineering and engineering technology (ABET, 2016). Furthermore, the Commission on English Language Program Accreditation (CEA) accredits post-secondary intensive English language programs and institutions (CEA, 2017). In addition, many countries have their own national accreditation standards that are applied at the institutional level and may also include academic programs within the institution. For example, the National Commission for Academic Accreditation and Assessment (NCAA) is a national accreditation agency that accredits Saudi higher education institutions and programs (NCAA, 2015).

Although, the purpose of accreditation agencies differs depending on the discipline to which the accreditation is granted, accreditation standards are relatively similar and generally tend to pay attention to input resources and processes (Chalmers, 2008). This is likely due to the assumption that assuring a high quality of inputs and processes will probably lead to high-quality outputs. Several accreditation agencies introduce their standards and guidance for documentation, but some of them do not explicitly elaborate on the KPIs on which higher education institutions can rely for evaluating their activities. Thus, the aim of this paper is to provide higher education institutions with a set of easily-measured KPIs for monitoring their inputs.

In the next section, the literature of KPIs in higher education is reviewed. The third section describes KPIs used for human resources including students, alumni, teaching and other staff. Moreover, the KPIs of physical resources are discussed in section five, while section six provides an in-depth discussion about financial resources KPIs. The final section provides some implications for future research.

Key performance indicators in higher education

Measurements employed in higher education institutions are often based on a set of metrics that can be classified as follows: indicators, performance indicators and KPIs. An indicator is defined as “a quantitative or qualitative factor or variable that provides a simple and reliable means to measure achievement, to reflect the changes connected to an intervention, or to help assess the performance of a development actor” (OECD, 2002, p. 25). In management, an indicator is a measure that relates actual performance or results achieved to the desired objectives. A performance indicator is an indicator that is aligned with the business strategy. It embodies a strategic objective and measures performance against a specific goal. Performance indicators used to measure core activities and processes are called KPIs.
The main purpose of using indicators in higher education institutions is to monitor and control the performance of their activities and processes. These indicators provide adequate information to administrators and policy-makers, accrediting bodies and stakeholders to identify progress and achievements. These indicators are also used for benchmarking purposes by comparing the institutions performance against their comparable institutions counterparts. Moreover, they are also used for marketing purposes to commercialize the institution by attracting prospective students and teaching faculty in addition to increasing current students’ satisfaction.

Educational indicators are often classified in the literature into input, process, output and outcomes (Borden and Bottrill, 1994). A number of indicators have been developed for assessing higher education institutions; yet, most of them concentrate merely on a certain activity without explicitly considering input resources. A list of indicators used in institutions across the USA is described in Terkla et al. (2012), where they are grouped into 11 categories ordered by frequency of use. Terkla (2011) also identified and analyzed another list of indicators used by 34 accredited colleges and universities in the USA. Furthermore, a list of 36,000 indicators for private and public institutions is described in Baroudi (2016). These indicators are grouped based on the following categories: organizations, governments and international. Chalmers (2008) provided a set of indicators for assessing teaching and learning processes in several Australian institutions. These indicators are classified into input, output, outcome and process indicators. The research activity is frequently assessed in the literature by outputs such as research productivity (Larivière, 2012) and research impact (Penfield et al., 2014).

In this paper, special attention is given to developing a set of generic KPIs for assessing the availability and quality of input resources used for carrying out various activities of higher education institutions for the aim of improving their performance and hence helping them comply with the requirements of accreditation standards. These indicators are easy to measure, which makes them practical to be adopted by a large scale of institutions.

KPIs for human resources
The three types of human resources considered by many accreditation agencies are students, teaching faculty and staff. These resources are engaged in various activities of any institution and should actively interact to achieve the institution’s mission. However, the umbrella under which human resources fall can be different from one accrediting agency to another. For example, AACSB labels the standards of these three types as participants, ABET groups staff under the institutional support standard, while CEA categorizes students under three main standards which are student services, student achievement and student complaints. In Saudi Arabia, the NCAAA includes teaching faculty and administrative staff in the recruitment standard, and groups students under standard number five entitled “student administration and support services”. This paper proposes adding alumni as a fourth type of human resources because they are perceived as inputs in some institutions activities such as teaching and community service.

Students
Students are perceived as a driving force in higher education institutions since they are involved in all teaching, research and community service activities. Higher education institutions therefore should ensure preparing a variety of high-quality students who are capable of contributing to institutions’ success. The proposed indicators laid out in Table I track and analyze the steps of the value chain (Porter, 1985) that students go through from application to graduation. These steps are application, admission, enrollment, retention, learning and satisfaction. It is noteworthy that the indicators of each step are the results of the previous activity in the value chain.
The first four indicators of the value chain relate to student application. More specifically, \( S_1 \) tracks the number and variety of students (e.g. gender, region, nationality), and \( S_2 \) measures the increase of applications over the last year. Indicators \( S_3 \) and \( S_4 \) reflect, respectively, the degree of attrition of the institution and the quality of transferred students. The three subsequent indicators describe the admission process where \( S_5 \) measures the quality of admitted students, \( S_6 \) indicates the growth of admission scores over the last year and \( S_7 \) tracks admission diversity (e.g. gender, region, nationality). The enrollment process is gauged by the next three indicators where \( S_8 \) is the number of enrolled students, \( S_9 \) is the percentage of enrolled to admitted students (or yield) and \( S_{10} \) is the yield growth over the last year. Special attention is given to international students in \( S_{11} \) since they play a vital role in advancing research, increasing incomes and promoting diversity (Jourdini, 2012). Although this indicator is more suitable to international institutions, it can contribute to fulfill the requirements of some accreditation agencies (e.g. AACSB) that explicitly state the achievement of diversity in the student body. Indicator \( S_{12} \) focuses on postgraduate students especially at the doctorate level as they contribute to improving an institution’s research outputs (Larivière, 2012).

Indicators \( S_{13} \) and \( S_{14} \) determine, respectively, the retention rate of newly enrolled students from year to year. The next three indicators are allocated for inputs that affect the learning process. Indicator \( S_{15} \) tracks the student workload per week which includes both time spent in class and student work outside of class (e.g. homework, projects). This indicator determines how long students actually spend studying, and also has a great impact on the quality of student learning (Chambers, 1992). Indicator \( S_{16} \) which deals with the number of students in a class, is a determinant of teaching strategies and time allocated by faculty members for student support purposes. This indicator affects students’ performance (Arias and Walker, 2004) and their satisfaction (Gannaway et al., 2018). Indicator \( S_{17} \) represents the time and energy students invest in the institution, which is calculated from surveys that consider student engagement in academic activities (e.g. class attendance, assignment completion, student interaction with peers and instructors), and non-academic activities such as participation in extra-curricular activities.

Indicator \( S_{18} \) evaluates how satisfied students are with their learning experiences in the institution and includes their perceptions of teaching quality and learning facilities (e.g. library, classrooms, laboratories), and support services (e.g. counseling, advising). Student satisfaction is defined as a student’s subjective evaluation of the various outcomes
and experiences associated with education. Student satisfaction is continually shaped by repeated experiences with campus life (Elliott and Shin, 2002, p. 198). Indicator \( S_{18} \) is obtained from surveys that should include questions about organization and management, teaching quality, learning resources, academic and non-academic supports, and personal development. Examples of such surveys include those of Bell and Brooks (2017) and Gruber et al. (2010) that were conducted at the undergraduate level, and Muijs and Bokhove (2017) which were conducted at the postgraduate level.

**Alumni**

Alumni are a group of students who have completed an academic program successfully. A strong relationship between an institution and its alumni should be established for the sake of both parties. Alumni contribute to achieving an institution’s mission by providing thoughtful insights into the institution’s future directions toward the job market and assisting current students in career planning. Table II proposes indicators that concern alumni commitment to institution activities.

Alumni are classified in this paper into three categories based on the level of their commitment to institutional activities. These categories are associated with the first three indicators \( A_1 \)–\( A_3 \) that are easy to track due to the growing use of websites and social media networks. An alumnus is well connected if he/she keeps up with the institution news posted on the institution website and social media. An active alumnus is an individual who provides effective services for the institution from which he/she graduated such as participating in an event organized by the institution. An engaged alumnus constantly serves its institution by providing mentorship to the institution’s current students and giving donations. Indicator \( A_4 \) describes the number and variety of committed alumni, which can be computed in term of gender, nationality, employment location and number of years after graduation. Indicator \( A_5 \), which is calculated from satisfaction surveys, is used to improve the relationship and collaboration between the institution and its alumni.

**Faculty**

Faculty members are the main component responsible for carrying out the institution’s activities. In this paper, faculty indicators are classified into three categories: sufficiency, qualification and satisfaction. These indicators are illustrated in Table III. Furthermore, indicators \( F_1 \) and \( F_2 \) can help reflect the institution’s academic environment including class size and how much attention students will receive. The three indicators \( F_3 \)–\( F_5 \) affect several processes and outputs of the institution including teaching quality, student support and research productivity. For instance, a research-oriented institution will have better research productivity compared to a teaching-based institution because faculty members have limited time to perform research in the latter as opposed to the former. Indicator \( F_6 \) has an effect on an institution’s research productivity since PhD students contribute to a high percentage of research activities (Larivière, 2012). Indicator \( F_7 \) describes the variety of faculty members in terms of their gender, nationality, age and academic ranks.

<table>
<thead>
<tr>
<th>Code</th>
<th>Indicator</th>
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<tbody>
<tr>
<td>( A_1 )</td>
<td>Percent of connected alumni</td>
</tr>
<tr>
<td>( A_2 )</td>
<td>Percent of active alumni</td>
</tr>
<tr>
<td>( A_3 )</td>
<td>Percent of engaged alumni</td>
</tr>
<tr>
<td>( A_4 )</td>
<td>Alumni diversity</td>
</tr>
<tr>
<td>( A_5 )</td>
<td>Alumni satisfaction</td>
</tr>
</tbody>
</table>

**Table II.** Alumni indicators
The quality of faculty members is measured by four qualification indicators. Indicator $F_8$, which is relevant to new faculty, is obtained from student satisfaction surveys by evaluating their teaching activities and student support. It is also obtained from administration satisfaction surveys that mainly concentrate on teaching, research and service. Indicator $F_9$ is used by most of the accreditation agencies as an essential standard of faculty qualification. The use of indicator $F_{10}$ is related to faculty with higher academic positions as being the most productive faculty in any institution (Rorstad and Aksnes, 2015). In addition, indicator $F_{11}$ is proposed because a research fellow generally demonstrates greater research productivity.

The remaining indicators focus on faculty satisfaction, where indicators $F_{12}$ and $F_{13}$ measure the extent to which an institution is successful in retaining the current faculty. This can be very useful for different performance levels (e.g. program, discipline and department) to obtain a valuable insight. The idea behind indicator $F_{14}$ is that an engaged faculty will actively contribute to achieving the institution’s mission. Livingston (2011, p. 11) defined faculty engagement as “perpetual focused attention, enjoyment and enthusiasm for the activities associated with faculty work through which the individual finds purpose, senses congruence with personal values and talents, is challenged to use knowledge and skills, and experiences productivity even during difficult times.” Indicator $F_{15}$ can be obtained from surveys which assess faculty’s perception of the work environment and work activities in teaching, research and service (Livingston, 2011, p. 158). Finally, indicator $F_{15}$ can be obtained from any survey that includes workplace environment, teaching and learning, students, research activities, facilities, support services, in addition to collecting qualitative data through different methods such as conducting interviews (Ambrose et al., 2005).

**Staff**

Professional and technical staff provide support services for faculty members and students to enhance the quality of the institution’s various activities including teaching support, student admissions, career advising and alumni relationships. Staff indicators that measure the sufficiency, qualification and satisfaction are described in Table IV.

Indicator $T_1$ is used to identify the number of staff an institution employs to ensure sufficient services for its students. Indicator $T_2$ measures the demographics of staff in terms of gender, age, education and assignment to the institution various activities. Staff qualifications are obtained from student surveys $T_3$, teaching faculty surveys $T_4$ and administration

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<thead>
<tr>
<th>Area</th>
<th>Code</th>
<th>Indicator</th>
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</thead>
<tbody>
<tr>
<td>Sufficiency</td>
<td>$F_1$</td>
<td>Percent of full-time faculty</td>
</tr>
<tr>
<td></td>
<td>$F_2$</td>
<td>Student to faculty ratio</td>
</tr>
<tr>
<td></td>
<td>$F_3$</td>
<td>Average faculty teaching workload</td>
</tr>
<tr>
<td></td>
<td>$F_4$</td>
<td>Number of courses per faculty</td>
</tr>
<tr>
<td></td>
<td>$F_5$</td>
<td>Percent of time allocated to research</td>
</tr>
<tr>
<td></td>
<td>$F_6$</td>
<td>PhD students to faculty ratio</td>
</tr>
<tr>
<td></td>
<td>$F_7$</td>
<td>Faculty variety</td>
</tr>
<tr>
<td>Qualification</td>
<td>$F_8$</td>
<td>Evaluation of new faculty members</td>
</tr>
<tr>
<td></td>
<td>$F_9$</td>
<td>Percent of faculty with doctoral degrees</td>
</tr>
<tr>
<td></td>
<td>$F_{10}$</td>
<td>Percent of senior faculty</td>
</tr>
<tr>
<td></td>
<td>$F_{11}$</td>
<td>Percent of research fellow</td>
</tr>
<tr>
<td>Satisfaction</td>
<td>$F_{12}$</td>
<td>Retention rate</td>
</tr>
<tr>
<td></td>
<td>$F_{13}$</td>
<td>Average working years</td>
</tr>
<tr>
<td></td>
<td>$F_{14}$</td>
<td>Faculty engagement</td>
</tr>
<tr>
<td></td>
<td>$F_{15}$</td>
<td>Faculty satisfaction</td>
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</tbody>
</table>

Table III. Faculty member indicators

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satisfaction surveys $T_5$. These surveys evaluate the availability and quality of support services provided by staff. The next three indicators measure staff satisfaction. Indicators $T_6$ and $T_7$ measure the extent to which an institution is successful in retaining the current staff. Finally, indicator $T_8$ measures staff satisfaction using surveys that include items about orientation and training, supervision, working environment, compensation and benefits.

KPIs for physical resources

Although higher education institutions rely on a number of physical resources, some of these resources do not meet the requirements of the main three activities of an institution which are teaching, research and community service. This paper focuses on the resources that only influence the three activities. These resources, which are investigated in Table V in terms of their sufficiency and adequacy, are classrooms, laboratories, libraries and offices.

The first two physical resources indicators track classroom availability and effectiveness, which have an impact on the management process of academic programs scheduling and class sizes. Indicator $P_1$ calculates the ratio of classrooms to full-time students while indicator $P_2$ tracks the capacity of these classrooms in term of the number of seats. It is suitable to have a repartition by calculating; for example, the percentage of classrooms with less than 20, 40 and more than 40 seats in order to have a more precise idea about the available classrooms. Indicator $P_3$ pays special attention to laboratories as they are necessary for almost all types of institutions. Indicator $P_4$ measures how well students have access to computers, whereas indicator $P_5$ evaluates the availability of software used in teaching and research activities, which can be obtained by using students and faculty satisfaction surveys. The next four indicators focus on the library, as it is the main source of learning resources, by tracking the availability of working seats in $P_6$, of hard copies of books in $P_7$ and $P_8$ and electronic books

<table>
<thead>
<tr>
<th>Area</th>
<th>Code</th>
<th>Indicator</th>
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<tbody>
<tr>
<td>Sufficiency</td>
<td>$T_1$</td>
<td>Student to staff ratio</td>
</tr>
<tr>
<td></td>
<td>$T_2$</td>
<td>Staff variety</td>
</tr>
<tr>
<td>Qualification</td>
<td>$T_3$</td>
<td>Student satisfaction</td>
</tr>
<tr>
<td></td>
<td>$T_4$</td>
<td>Faculty satisfaction</td>
</tr>
<tr>
<td></td>
<td>$T_5$</td>
<td>Administration satisfaction</td>
</tr>
<tr>
<td>Satisfaction</td>
<td>$T_6$</td>
<td>Retention rate</td>
</tr>
<tr>
<td></td>
<td>$T_7$</td>
<td>Average working years</td>
</tr>
<tr>
<td></td>
<td>$T_8$</td>
<td>Staff satisfaction</td>
</tr>
</tbody>
</table>

Table IV. Staff indicators

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<tr>
<th>Area</th>
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<th>Indicator</th>
</tr>
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<tbody>
<tr>
<td>Sufficiency</td>
<td>$P_1$</td>
<td>Classrooms to full-time students ratio</td>
</tr>
<tr>
<td></td>
<td>$P_2$</td>
<td>Classrooms capacity</td>
</tr>
<tr>
<td></td>
<td>$P_3$</td>
<td>Laboratories to students ratio</td>
</tr>
<tr>
<td></td>
<td>$P_4$</td>
<td>Computers to students ratio</td>
</tr>
<tr>
<td></td>
<td>$P_5$</td>
<td>Software availability</td>
</tr>
<tr>
<td></td>
<td>$P_6$</td>
<td>Working seats in the library</td>
</tr>
<tr>
<td></td>
<td>$P_7$</td>
<td>Books to students ratio</td>
</tr>
<tr>
<td></td>
<td>$P_8$</td>
<td>Number of copies of textbooks</td>
</tr>
<tr>
<td></td>
<td>$P_9$</td>
<td>Electronic databases</td>
</tr>
<tr>
<td></td>
<td>$P_{10}$</td>
<td>Offices to faculty ratio</td>
</tr>
<tr>
<td></td>
<td>$P_{11}$</td>
<td>Average space per office</td>
</tr>
<tr>
<td></td>
<td>$P_{12}$</td>
<td>Student, faculty and staff satisfaction</td>
</tr>
</tbody>
</table>

Table V. Physical resources indicators
and periodical in $P_9$. It has been shown that library resources impact the teaching and learning activity (Appleton, 2006) and enhance academic research achievement (Noh, 2012). Note that indicator $P_8$ can be determined for each academic program or even for each course. In addition, indicator $P_{10}$ provides information about the average seats per office, which may affect the quality of counseling services provided to students. Indicator $P_{11}$ measures the average space per office which should be within the established norms. Finally, indicator $P_{12}$ measures the adequacy of physical resources using stakeholder satisfaction surveys, which include students, teaching faculty and staff.

**KPIs for financial resources**

Financial resources are essential for meeting the requirements of teaching and learning, supporting research and community service activities and offering an adequate environment for human resources by providing academic advising to students, support services for alumni, professional development for staff and research equipment for faculty members. The proposed indicators for financial resources are categorized into income and expenditure in order to track their sufficiency and appropriateness. These indicators are well illustrated in Table VI.

Indicator $F_1$ measures the institution’s amount of income that must be obtained from various sources to minimize the risks as pointed out by indicator $F_2$, which calculates the percentage of each source of revenue such as grant-in-aid from state, students’ tuition and fees, international collaborations and donations. The institution’s income should be managed and allocated in a proper manner to fund the institution’s various activities in accordance with the institution’s mission as described by indicator $F_3$.

Institution’s expenditures are analyzed in depth in the next eight indicators $F_4$–$F_{11}$. Indicator $F_4$ is used in some countries to determine budgets of government universities. Indicator $F_5$ is used to measure the amount of money spent to improve the quality of teaching and learning processes. Meier and O’Toole (2002) stated that indicator $F_5$ may influence student’s achievement. The indicator $F_5$ can be examined in depth by other sub-indicators such as number of teaching awards for faculty, number of learning awards for students and student support courses such as training and e-learning courses. Furthermore, indicator $F_6$ measures the amount of money allocated to support and promote research activities such as research grants given to faculty, travel funding and establishing international collaborations. Moreover, different sub-indicators can be derived from indicator $F_6$ to track the appropriateness of budget allocations such as the percent of faculty members receiving an internal grant and number of

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<th>Indicator</th>
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<td></td>
<td>$F_2$</td>
<td>Revenue diversity</td>
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<td>Expenditure</td>
<td>$F_3$</td>
<td>Expenditure repartition</td>
</tr>
<tr>
<td></td>
<td>$F_4$</td>
<td>Expenditure per full-time student</td>
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<td></td>
<td>$F_5$</td>
<td>Teaching and learning expenditure</td>
</tr>
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<td></td>
<td>$F_6$</td>
<td>Research expenditure</td>
</tr>
<tr>
<td></td>
<td>$F_7$</td>
<td>Community service expenditure</td>
</tr>
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<td></td>
<td>$F_8$</td>
<td>Library expenditure</td>
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<tr>
<td></td>
<td>$F_9$</td>
<td>IT support expenditure</td>
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<td></td>
<td>$F_{10}$</td>
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</tr>
<tr>
<td></td>
<td>$F_{11}$</td>
<td>Social activities expenditure</td>
</tr>
<tr>
<td></td>
<td>$F_{12}$</td>
<td>Degree of alignment</td>
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<td></td>
<td>$F_{13}$</td>
<td>Student satisfaction</td>
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<tr>
<td></td>
<td>$F_{14}$</td>
<td>Faculty satisfaction</td>
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</table>

Table VI. Financial resources indicators
conferences attended per faculty. This indicator influences research output and contributes to increasing faculty satisfaction and retention. Indicator $F_7$ tracks the amount of money allocated for providing services to the local community with the aim of linking the institution with the external stakeholders. These services include training courses and voluntary activities.

Indicator $F_8$ concentrates on the sufficiency of money needed to equip the library with books, periodicals and infrastructure. Indicator $F_9$ measures the money allocated for improving the IT infrastructure including software licenses, security, maintenance and distance learning platforms. Indicator $F_{10}$ measures the extent to which students are provided with support services such as counseling and guidance, and professional advising. In addition, indicator $F_{11}$ tracks the sufficiency of money allocated to support social and extra-curricular activities for human resources. The last two indicators $F_{10}$ and $F_{11}$ do not directly impact the teaching and learning, research, and community services activities; nonetheless, they may contribute to increasing stakeholder satisfaction and retention.

All of the previous expenditure indicators are used in $F_{12}$ as a proxy for verifying the extent to which all expenditures are aligned with the institution's mission. For example, a mission statement that emphasizes research should lead to a greater value of $F_6$ as opposed to other indicators. Finally, indicators $F_{13}$ and $F_{14}$ are obtained through surveys that are designed on the above-mentioned types of expenditures in order to determine stakeholder satisfaction, particularly students and faculty members.

**Conclusion**

This paper proposes a set of suitable KPIs for monitoring the input resources of higher education institutions. These indicators are classified into human, physical and financial resources, and were selected to comply with the requirements of accreditation standards. Moreover, they were also selected based on the implications proposed by previous research and best practices. As for future research, the findings of this paper will contribute to developing indicators for measuring and controlling the transformation activities performed at an institution, and the outputs of these activities which are graduates, research findings and community services.

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A meta-analysis of service quality of Iranian university libraries based on the LibQUAL model

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**Abstract**

**Purpose** – The purpose of this paper is to assess the quality of Iranian university libraries.

**Design/methodology/approach** – This first systematic review and meta-analysis were based on the PRISMA guidelines by searching in national and international databases from 2003 to January 2017 with standard Persian and English keywords. Data searching, extracting and quality appraising were completed by two researchers, independently. Any unexpected documents were assessed by a third expert researcher. Data were extracted in accordance with the “Strength of the Reporting of Observational Studies in Epidemiology” checklist after the final selection of appraised documents. Random effects size based on Cochrane test and $I^2$ were used for combining the obtained results from different studies together by considering the heterogeneity of studies.

**Findings** – Based on the meta-analysis conducted in 25 (6.42 percent) included studies, the total sample size was estimated. According to three dimensions of LibQUAL, findings of current information control, affect of service and the library as a place were estimated as 5.37 [CI95%: 5.02, 5.73], 6.91 [CI95%: 5.56, 6.26], and 5.46 percent [CI95%: 5.2, 5.73], respectively. Also, mean of service adequacy and superiority gap are equal to 0.07 [CI95%: −0.22, 0.36] and −2.06 [CI95%: −2.89, −1.23], respectively. There was a significant correlation between three dimensions of service quality and service superiority gap of LibQUAL and geographical regions of Iran ($p < 0.01$). Also, a significant correlation was found between the gaps of services and three aspects of LibQUAL model and published years through a meta-regression test ($p < 0.01$).

**Practical implications** – The results obtained from the present study showed that users are relatively satisfied with the quality of services provided by Iranian university libraries. An improvement in the quality of library services can promote the scientific level of universities.

**Originality/value** – The results of the present systematic review and meta-analysis study demonstrate a vital connection between primary research studies and decision-making for policymakers in Iranian university libraries to increase quality services.

**Keywords** Iran, Perception, Customer satisfaction, Quality assessment, LibQUAL, Library service quality

**Paper type** Literature review

**Introduction**

Measuring service quality is a necessity when it comes to planning in the respect of and improving the quality of the organizational services. University libraries are especially important since they are regarded as centers where a country’s specialized information is provided. The universities of Iran are planning to improve the quality of their library services,
by measuring the quality of services and being aware of the gap of users’ expectations. Measuring service quality provides information necessary to identify the strengths and weaknesses of library services. Thus, such assessment provides opportunity for strategic planning and improving the quality of various domains of information-related services (Esmaeilpour Bandboni et al., 2015). According to the studies of Association of Research Libraries (ARL), LibQUAL is the most commonly used method for measuring the quality of library services as far as issues such as identifying the expectations of library users and reviewing and analyzing the gap between their expectations and their interpretation of the received services (Cook et al., 2016). This model is specifically used for measuring the quality of library services. This tool has been used widely in the libraries of 31 different countries all around the 5 continents and it has been translated into 21 various languages (Town, 2016). According to the results obtained from studies focused on this method, which have been conducted over the past few years, has been an adequate model for measuring the quality of library services (Isfandyari-Moghaddam et al., 2013; Neshat and Dehghani, 2013). This model aims (Association of Research Libraries, 2017):

- to create an excellent culture and prepare a tool for assessing the quality of library services;
- to help libraries have a better understanding of their users’ expectations;
- to collect and interpret users’ feedbacks in a principal way at any point in time;
- to provide a substrate for similar libraries to prepare a mechanism and a protocol for comparison and evaluation; and
- to specify the best measures to be taken regarding library services.

In addition to demographic specifications, the LibQUAL study survey includes 22 items designed in three dimensions including five, nine and eight questions in the dimension of the library as a place (LP), affect of service (AS) and information control (IC), respectively (Miller, 2008). These 22 questions have been prepared for respondents to answer for three purposes: to assess the minimum level of expectation from library services, to assess the maximum level of expectation from library services and to determine the interpretation of current library users regarding the quality of these services, respectively. The users under investigation could select numbers 1 to 9 in order to answer. If number 9 was selected, it would be indicative of the highest level of expectations. In this method, both the users’ expectations and their interpretation of the quality of the services were measured to calculate the gap between users’ expectations and the quality of services (Voorbij, 2012; Esmaeilpour Bandboni et al., 2015). This gap has come to be known as both service adequacy gap (SAG) and service superiority gap (SSG) (Cook et al., 2016).

Over the past two decades, the LibQUAL model has been used in the universities of Iran for measuring the quality of library services. This tool can be used as a model for assessing the quality of libraries services as well as for presenting information which can be used for facilitating the improvement of targeted services in libraries of Iranian universities (Isfandyary-Moghaddam et al., 2013; Neshat and Dehghani, 2013).

One of the most important objectives of meta-analyses is to properly combine the existing studies to enlarge the sample size. Due to the increasing number of relevant studies, by creating a meta-analysis, the differences between the existing parameters would be decreased and also, there would be lower confident intervals. Because of all of the above-mentioned results, ultimately, all of the problems of using the previous methods will be solved (Yekta Kooshali et al., 2016; Mansouri et al., 2017; Zaker Jafari and Yekta Kooshali, 2018).

Due to the variety in reporting the mean of service quality of Iranian academic libraries (Isfandyari-Moghaddam et al., 2013; Esmaeilpour Bandboni et al., 2015), this systematic review of all documentation, and combining them by using meta-analysis method, was
conducted to assess the overall quality of Iranian university libraries. Due to the high importance quality of university libraries and lack of knowledge by the global community of service expectations in Iran, it is important to report the final conclusions to policymakers and properly manage planning at the country level.

**Background in Iran**

Iranian universities are operating under the supervision of two ministries, The Ministry of Science, Research and Technology (include 137 public and 494 private universities), and the Ministry of Health and Medical Education (include 51 universities). Over the past three decades, the number of students taught and the number of graduates have increased. Higher education institutions in Iran have enrolled more than 3m students. Also, Iranian universities graduate almost 750,000 students annually (Karimi et al., 2010; Da Wan et al., 2016; Naderi, 2016). Each of the Ministries has specific criteria to establish and develop its library services (Farajpahlou, 1994; Davarpanah, 2001, 2003). In addition, university library standards in Iran have been developed since 1995 and used as a guideline to all universities. Given the dispersion of the economic resources of Iranian universities and the allocation of different budgets, the quality of service provisions in libraries is also affected, such that, different geographical regions have various allocation of budgets (Ilali et al., 2010; Seifouri et al., 2018; Janafzaei and Hossein Khorshidi, 2012; Davarpanah and Dadkhah, 2012; Ansari, 2008).

**Methods**

The present study is the first meta-analysis and systematic overview aimed to review the studies which have investigated the quality of library services from the perspective of users of Iranian university libraries that used LibQUAL™ in the time interval of 2003 to the January of 2017. The present meta-analysis study was conducted according to the PRISMA guidelines (Moher et al., 2009).

**Inclusion and exclusion criteria**

The main criterion for entering the study was related to the subject of evaluation of a library using the LibQUAL™ tool. If the studies had the following criteria, they would be eliminated from the current study: studies that evaluated general libraries or a target population of a library outside of a university; reviews that had incomplete information and not representing the standard deviation; studies that used the pre-2003 edition of LibQUAL; studies with subjects that were not relevant to the subject; studies with a non-random sample size; letters to editor; and repeated articles.

**Search strategy and study selection**

All of the results obtained came from documents published in international and national databases such as the national databases: ISC, SID, Magiran, Irandoc, Noormags, Elmnet, and Medlib and also, international databases and publishers such as Web of Sciences, Scopus, Google Scholar, PubMed, Embase, ProQuest, Sage, ScienceDirect, CINAHL WILEY, Taylor & Francis, Springer, Emerald, JSTORE, EBSCO and ERIC. In addition, specialized databases, for example, Library and Information Science Abstract; Library Literature & Information Science; Library, Information Science, and Technology Abstract; and Library & Information Science Source were searched.

The Persian keywords and their English equivalents were used to search the subject, including: “quality assessment,” “service quality assurance,” “LibQUAL model,” “LibQUAL+™,” “gap analysis,” “library quality service,” “library users (faculty members and students),” “customer satisfaction,” “Iran” and all of the probable combinations of words. A combination of Boolean operators was used for databases which were in English. Additional articles were found by searching the cited references of articles within the study (Figure 1).
After that, the titles of collected articles were imported into EndNote™ software to find duplicated papers. To prevent bias, all of the stages of conducting the research, including searching, selecting studies, qualitative evaluation of studies and data extraction were done by two independent researchers (“M.H.YK” and “A.R”). A third expert researcher (“F.A”) decided the last decision in the case of any disagreement between the two researchers.

Quality assessment
In the next stage, researchers used The Strength of the Reporting of Observational Studies in Epidemiology (STROBE) checklist (Von Elm et al., 2007) to determine the quality of each of the papers. The STROBE checklist has 22 sections and evaluates the methodological aspects of the selected articles, including research population and sampling method, statistical analysis and study objectives. The articles that obtained a minimum score of 16, according to this checklist, were entered for the meta-analysis stage (ZakerJafari and YektaKooshali, 2018; Amiri-Andy et al., 2018; Badfar et al., 2018).

Data extraction
At first, a checklist was designed based on aim of the study and reading other available and gathered papers. The designed checklist had the following items: author’s name, published year, location, sample size, targeted group, mean and standard deviation of the LibQUAL model information extraction (IC, AS, LP, SAG and SSG). This information was extracted by two researchers independently and blind in the name of the author, institution and journal. The researchers asked the third expert researcher (“F.A”) to reach out to the relevant author if more information and raw data were necessary (by contacting via e-mail, phone or fax to the first author, corresponding author or the department of authors).
**Statistical analysis**

The mean scores of each dimension and its gaps are analyzed using the LibQUAL tool. Based on binomial distribution analysis, Cochran and $I^2$ indices were used to evaluate the heterogeneity of the studies. As the mean of three dimensions of LibQUAL is a quantitative variable, normal distribution was used to estimate the standard error in each study. Due to the high inconsistency of the studies, the random effects model was used with 95% confidence interval. To examine the publication bias, funnel chart and the Egger and Begg's test were used.

Data were analyzed using the meta-analysis specialized software comprehensive meta-analysis. The significance level was considered less than 0.05. Standard errors were estimated automatically using the formula: \[ \text{SE} = \frac{\text{Standard deviation}}{\sqrt{\text{Sample size}}} \] (Altman and Bland, 2005). There was 95.33 percent heterogeneity in this study which means that there was high inhomogeneity.

**Results**

**A brief explanation of entered studies**

In the systematic review, 389 probable relevant articles were identified. After reviewing the titles, 45 articles were eliminated because of duplication. In total, 344 probable relevant articles were thoroughly reviewed. After assessing the criteria for entering/exiting the study and measuring the quality of articles, 25 (6.42 percent) qualified studies conducted in the time span from 2003 to January 2017 entered the meta-analysis (Table I, Figure 1). The first meta-analysis and systematic review studied 7,484 people. Also based on three dimensions of LibQUAL, findings of current IC, AS and LP were described in five geographical regions of Iran.

**A meta-analysis of three aspects of the LibQUAL model for Iranian university libraries**

1. The mean of IC (library as a set of sources) is equal to 5.37 [CI95%: 5.02, 5.73]. The means of this factor in south and east were 5.99 [CI95%: 3.55, 8.42] and 5.06 [CI95%: 3.77, 6.34], respectively; which are the maximum and minimum means. In a comparative review of the regions, a significant relationship was reported ($p = 0.0001$). The mean of IC in the center region was equal to 5.36 [CI95%: 4.91, 5.82] which was closest to the all-around reported value of this factor for Iran (Table II; see supplementary figures at: www.researchgate.net/publication/327744250_A_meta-analysis_of_service_quality_of_Iranian_university_libraries_based_on_the_LibQUAL_model).

2. The mean of AS (library as a set of employees) is equal to 6.91 [CI95%: 5.56, 6.26]. The means of this factor in north and south were 5.69 [CI95%: 3.93, 7.45] and 6.72 [CI95%: 4.3, 9.14], respectively; which are the minimum and maximum means. In a comparative review of the regions, a significant relationship was reported ($p = 0.0001$). The mean of AS in the south was equal to 6.72 [CI95%: 4.3, 9.14] which was closest to the all-around reported value of this factor for Iran (Table II; see supplementary figures at: www.researchgate.net/publication/327744250_A_meta-analysis_of_service_quality_of_Iranian_university_libraries_based_on_the_LibQUAL_model).

3. The mean of the LP (library as a set of locations) is equal to 5.46 [CI95%: 5.2, 5.73]. The means of this factor in the west and south were 5.21 [CI95%: 4.54, 5.89] and 6.67 [CI95%: 4.93, 8.41], respectively; which are the minimum and maximum means. In a comparative review of the regions, a significant relationship was reported ($p = 0.0001$). The mean of LP in the north was equal to 5.39 [CI95%: 3.84, 6.93] which was closest to the all-around reported value of this factor for Iran (Table II; see supplementary figures at: www.researchgate.net/publication/327744250_A_meta-analysis_of_service_quality_of_Iranian_university_libraries_based_on_the_LibQUAL_model).
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<th>Sample type</th>
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<th>Effect of service</th>
<th>Library as place</th>
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<th>Service superiority gap</th>
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<td>Iran University of Medical Sciences</td>
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<td>Stu and Fac</td>
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<td>Stu</td>
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<td>0.35 ± 0.34</td>
<td>-2.47 ± 0.29</td>
</tr>
</tbody>
</table>

(continued)
<table>
<thead>
<tr>
<th>References (sorted by date)</th>
<th>Place of libraries</th>
<th>Regions</th>
<th>Sample type</th>
<th>SS</th>
<th>Information control</th>
<th>Effect of service</th>
<th>Library as place</th>
<th>Service adequacy gap</th>
<th>Service superiority gap</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nooshinfard and Tahmasebi (2014)</td>
<td>Islamic Azad University (IAU) branches of east and center, Mazandaran province</td>
<td>N</td>
<td>Stu</td>
<td>225</td>
<td>4.71±0.29</td>
<td>4.80±0.86</td>
<td>4.60±0.21</td>
<td>−1.88±1.49</td>
<td>−2.08±0.56</td>
</tr>
<tr>
<td>Sotudeh and Mirlohi (2015)</td>
<td>Shiraz University</td>
<td>S</td>
<td>Stu</td>
<td>365</td>
<td>5.30</td>
<td>6.10</td>
<td>5.75</td>
<td>−0.44±0.34</td>
<td>−1.63±0.40</td>
</tr>
<tr>
<td>Azimi Vaziri et al. (2015)</td>
<td>Kermanshah Razi University</td>
<td>W</td>
<td>Stu &amp; Fac</td>
<td>325</td>
<td>5.07±1.75</td>
<td>5.97±1.77</td>
<td>4.88±2.01</td>
<td>−0.35±0.39</td>
<td>−1.60±0.35</td>
</tr>
<tr>
<td>Bahari Movafagh et al. (2015)</td>
<td>Hamedan University of Medical Sciences</td>
<td>C</td>
<td>Stu &amp; Fac</td>
<td>400</td>
<td>na</td>
<td>na</td>
<td>na</td>
<td>na</td>
<td>na</td>
</tr>
<tr>
<td>Ahmadi Moghadam et al. (2015)</td>
<td>University of Science &amp; Culture</td>
<td>C</td>
<td>Stu &amp; Fac</td>
<td>328</td>
<td>6.27±0.65</td>
<td>7.33±0.48</td>
<td>3.58±1.06</td>
<td>1.70±1.55</td>
<td>−2.54±1.21</td>
</tr>
<tr>
<td>Esmaeilpour Bandbani et al. (2015)</td>
<td>Guilan University of Medical Sciences</td>
<td>N</td>
<td>Stu</td>
<td>135</td>
<td>5.89±0.21</td>
<td>6.59±0.21</td>
<td>6.18±0.24</td>
<td>0.31±0.24</td>
<td>−1.76±0.20</td>
</tr>
<tr>
<td>Yaghobifar et al. (2016)</td>
<td>Sabzevar University of Medical Sciences</td>
<td>E</td>
<td>Stu &amp; Fac</td>
<td>296</td>
<td>5.80±0.25</td>
<td>6.59±0.25</td>
<td>5.76±0.36</td>
<td>0.98±0.23</td>
<td>−1.67±0.47</td>
</tr>
<tr>
<td>Pourahmad et al. (2016)</td>
<td>Universities of North Khorasan</td>
<td>E</td>
<td>Stu &amp; Fac</td>
<td>372</td>
<td>3.29±0.65</td>
<td>5.22±0.44</td>
<td>4.98±0.57</td>
<td>−1.56±0.76</td>
<td>−2.33±0.65</td>
</tr>
</tbody>
</table>

**Notes:**
- SS, sample size; Stu, students; Fac, faculty member;
- regions: N, north; S, south; W, west; E, east; C, center.
A meta-analysis of the gap of services based on LibQUAL model for Iranian university libraries

(1) The mean of SAG is equal to 0.07 [CI95%: −0.22, 0.36]. The means of this factor in the north and center were −0.78 [CI95%: −2.93, 1.36] and 0.27 [CI95%: −0.15, 0.69], respectively; which are the minimum and maximum means. In a comparative review of the regions, no significant relationship was reported (p = 0.873). The mean of SAG in the east was equal to 0.06 [CI95%: −1.68, 1.81] which was closer to the reported value of this factor all around Iran (Table III; see supplementary figures at: www.researchgate.net/publication/327744250_A_meta-analysis_of_service_quality_of_Iranian_university_libraries_based_on_the_LibQUAL_model).

(2) The mean of SSG is equal to −2.06 [CI95%: −2.89, −1.23]. The means of this factor in center and south were −2.26 [CI95%: −3.49, −1.04] and −1.47 [CI95%: −2.34, −0.61], respectively; which are the minimum and maximum means. In a comparative review of the regions, a significant relationship was estimated (p = 0.0001) (Table III; see supplementary figures at: www.researchgate.net/publication/327744250_A_meta-analysis_of_service_quality_of_Iranian_university_libraries_based_on_the_LibQUAL_model).

Meta-regression
The meta-regression for the gaps in services and the three aspects of the LibQUAL model for Iranian university libraries according to the years of the study was done and p-value was estimated to be 0.0001. The slope is ascending in AS (B), SAG (D) and, SSG (F) and descending in IC (A) and LP (C) (see supplementary Figure S11 (A–F) at: www.researchgate.net/publication/327744250_A_meta-analysis_of_service_quality_of_Iranian_university_libraries_based_on_the_LibQUAL_model).

Table II.
A meta-analysis of three aspects of LibQUAL model for Iranian university libraries

<table>
<thead>
<tr>
<th>Information control</th>
<th>Figure S1 Region</th>
<th>Mean [confidence interval 95%]</th>
<th>I² (%)</th>
<th>p-value</th>
<th>Online supplementary</th>
</tr>
</thead>
<tbody>
<tr>
<td>North</td>
<td>5.30 [4.14, 6.45]</td>
<td>99 (p = 0.0001)</td>
<td>99</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Center</td>
<td>5.36 [4.91, 5.82]</td>
<td>99</td>
<td>99</td>
<td></td>
<td></td>
</tr>
<tr>
<td>East</td>
<td>5.06 [3.77, 6.34]</td>
<td>99</td>
<td>99</td>
<td></td>
<td></td>
</tr>
<tr>
<td>West</td>
<td>5.54 [4.6, 6.48]</td>
<td>96</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Figure S2 Total</td>
<td>5.37 [5.02, 5.73]</td>
<td>96</td>
<td>96</td>
<td></td>
<td>–</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Affect of service</th>
<th>Figure S3 Region</th>
<th>Mean [confidence interval 95%]</th>
<th>I² (%)</th>
<th>p-value</th>
<th>Online supplementary</th>
</tr>
</thead>
<tbody>
<tr>
<td>North</td>
<td>5.69 [3.93, 7.45]</td>
<td>99 (p = 0.0001)</td>
<td>99</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Center</td>
<td>5.77 [5.26, 6.27]</td>
<td>99</td>
<td>99</td>
<td></td>
<td></td>
</tr>
<tr>
<td>East</td>
<td>6.13 [5.34, 6.92]</td>
<td>99</td>
<td>99</td>
<td></td>
<td></td>
</tr>
<tr>
<td>West</td>
<td>5.72 [5.21, 6.23]</td>
<td>86</td>
<td>86</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Figure S4 Total</td>
<td>6.91 [5.56, 6.26]</td>
<td>99</td>
<td>99</td>
<td></td>
<td>–</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Library as place</th>
<th>Figure S5 Region</th>
<th>Mean [confidence interval 95%]</th>
<th>I² (%)</th>
<th>p-value</th>
<th>Online supplementary</th>
</tr>
</thead>
<tbody>
<tr>
<td>North</td>
<td>5.39 [3.84, 6.93]</td>
<td>99 (p = 0.0001)</td>
<td>99</td>
<td></td>
<td><a href="http://www.researchgate.net/publication/327744250_A_meta-analysis_of_service_quality_of_Iranian_university_libraries_based_on_the_LibQUAL_model">www.researchgate.net/publication/327744250_A_meta-analysis_of_service_quality_of_Iranian_university_libraries_based_on_the_LibQUAL_model</a></td>
</tr>
<tr>
<td>South</td>
<td>6.67 [4.93, 8.41]</td>
<td>99</td>
<td>99</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Center</td>
<td>5.27 [4.68, 5.85]</td>
<td>99</td>
<td>99</td>
<td></td>
<td></td>
</tr>
<tr>
<td>East</td>
<td>5.59 [5.26, 5.91]</td>
<td>99</td>
<td>99</td>
<td></td>
<td></td>
</tr>
<tr>
<td>West</td>
<td>5.21 [4.54, 5.89]</td>
<td>91</td>
<td>91</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Figure S6 Total</td>
<td>5.46 [5.2, 5.73]</td>
<td>99</td>
<td>99</td>
<td></td>
<td>–</td>
</tr>
</tbody>
</table>
Publication bias
Publication bias was also examined by Begg and Egger’s tests and was determined as $p = 0.69$ and $p = 0.28$, respectively. In this test, the probability of publication bias was not statistically significant (Figure 2).

Discussion
The present study is the first document using the LibQUAL model through the meta-analysis method in Iran. In these studies, the universities, fields of study in various levels, type of sampling and the number of samples have been distributed among libraries of different universities all over the country. Also, the mean of scores of the three dimensions of the LibQUAL model is an indication of the difference in the quality of services in different universities. The findings presented in Table II show the five regions of geographical
distribution of studies focused on quality of services provided by universities libraries in Iran. In some of them, like universities located in the south of the country, the mean score of the service quality has been higher (Farajpahlou and Shams Ejieh, 2009; Bairanvand et al., 2013; Sotudeh and Mirlohi, 2015). According to the findings, it is possible that users’ expectations have been influenced by research and educational facilities in these areas might have affected the level of users’ expectations (Town, 2016). According to Miller’s opinion, users of large libraries have high expectations would decrease the scores of LibQUAL (Miller, 2008).

Mean score of the current level of quality of the services provided by libraries of different universities in Iran in the three dimensions of LibQUAL is quite different from similar studies, conducted in libraries outside of Iran by ARL in consecutive years (Cook et al., 2016). The mean score of IC, AS and PL in ARL users’ expectations are an average of 7.15, 7.32 and 6.92 in past seven years, while in Iranian user expectations were 5.37, 6.91 and 5.46, respectively through this meta-analysis study(Association of Research Libraries, 2017).

In the review conducted by Isfandyari-Moghaddam et al. (2013), it was reported the 18 university libraries had used LibQUAL for evaluating the quality of services. To analyze LibQUAL studies, three levels of quality were determined: less than a minimum, at least and slightly above the minimum. Four libraries: the Central Library of Tabriz University, Library of Medical Sciences of Yazd University, Libraries of Islamic Azad University of ShahreKord and Library of Mashhad’s Ferdowsi University provided services under the minimum level of expectation in AS dimensions. The level of services provided by the other 14 libraries was minimum or slightly higher. In dimensions of the IC factor, there were only two libraries that had provided services with a higher quality than expected, which were libraries of Imam Sadeq University and University of Medical Sciences of Kermanshah.

The service quality of the other 16 libraries was lower than expected or minimum. In terms of the LP factor, only four (out of 18) university libraries provided services that had a quality level higher than minimum, libraries of Imam Sadeq University, Ilaq University, University of Medical Sciences of Kermanshah and Central Library of Tabriz University and the other libraries had provided services with minimum-level quality or lower (Isfandyari-Moghaddam et al., 2013). The quantitative findings of this study are similar in three dimensions especially “IC”.

According to the results obtained from the meta-analysis, the AS dimension was better than the other two dimensions in the dimensions of quality. These findings show that librarians of the aforementioned libraries have been able to provide services with a higher level of quality than the level expected by library users. Therefore, it is better than other dimensions of library services. The staff of the libraries can play an effective role when it comes to AS. Librarians located in the south (Farajpahlou and Shams Ejieh, 2009; Bairanvand et al., 2013; Sotudeh and Mirlohi, 2015) and east (Ali-Ramezany et al., 2008; Yaghobifar et al., 2016; Pourahmad et al., 2016) of the country have been able to get the highest mean in this dimension, respectively. An increase in the level of education caused by the increase in the number of opportunities for studying librarianship at the graduate level over the past few years and the improvement of professional skills of librarians in Iran are the reason why the level of satisfaction of library users with library services have been exponentially increased (Davaran, 2003). On the other hand, with the launch of provincial branches of Iranian Library and Information Science Association (www.ilsa.ir/) for librarians all over the country, numerous specialized educational workshops and scientific assemblies are now held, which can help the effectiveness of the quality services provided by libraries (Esmaeilpour Bandboni et al., 2015).

The IC dimension considers the collection library sources. The mean of users’ satisfaction of university libraries located in east (Ali-Ramezany et al, 2008; Yaghobifar et al., 2016; Pourahmad et al., 2016) and north (Esmaeilpour Bandboni et al., 2015; Nooshinfard and Tahmasebi, 2014) areas of Iran has been lower than other areas and this
might depend on the level of research and scientific activities in universities and education of librarians of these areas in comparison with other areas (Farajpahlou, 1994; Davarpanah, 2001; Davarpanah, 2003). Although the system of library has changed from traditional to online software, which can make the library sources more visible and accessible for users (Bruce et al., 2009; Hall et al., 2014). However, according to the findings of this study, it seems that the quality of the electronic and published sources available in libraries of universities in Iran does not meet the minimum level of expectations of users in comparison with other LibQUAL dimensions.

Three years in a row (2014–2016), in studies conducted by ARL, the mean of expectations from the dimension of the library as the place was lower than other LibQUAL dimensions (Association of Research Libraries, 2017). The findings of the present study also indicated that despite the renovation and development of the space of universities of the country, from the perspective of users, the library is not considered as a proper environment for studying. In addition, the mean score of users’ satisfaction has not increased in this time interval and, therefore, the mean of minimum expectations of users is low. Nonetheless, the findings showed that libraries located in the south (Farajpahlou and Shams Ejieh, 2009; Bairanvand et al., 2013; Sotudeh and Mirlohi, 2015) and east (Ali-Ramezany et al., 2008; Yaghobifar et al., 2016; Pourahmad et al., 2016) areas of the country have had the highest mean of satisfaction with the LP.

Since the issue that is considered by the mean of adequacy gap is meeting the expectations of users (Town, 2016), in the present study it has been attempted to discuss the variations of adequacy gap in the findings section. The findings of the present study showed that libraries of universities in Iran have met the minimum level of expectation of their users when it comes to all of the services provided by libraries (with an adequacy gap of 0.07). Since libraries of different universities located in central (Hariri and Afnani, 2008; Hariri and Afnani, 2009; Hariri and Shahvar, 2010; Asemi et al., 2010; Omidifar and Mousavizadeh, 2010; Neshat and dehghani, 2011; Hashemian et al., 2012; Mardani and Sharif mohgadam, 2012; Razmi Shendi et al., 2013; Ahmadimirgaed et al., 2015; Ashrafi Rizi and Kazem Pour, 2014; Ashrafi Rizi et al., 2008; Bahari-Movafagh et al., 2015) and east (Ali-Ramezany et al., 2008; Yaghobifar et al., 2016; Pourahmad et al., 2016) areas of Iran have provided services with a higher quality than expected by users, these aforementioned libraries have been relatively more successful when it comes to providing services. Also, the users of these libraries have been satisfied with these services at a minimum level. After reviewing the findings of similar studies conducted outside of Iran, it became clear that services provided by libraries reviewed in this study have a relatively lower quality than similar foreign libraries. Adequacy gap of services has been usually positive in foreign studies and library services having a higher quality than the level that is acceptable to the users (Cook et al., 2016; Town, 2016).

According to the ARL organization reports (Cook et al., 2014, 2016), in 2014 and 2016 in Europe, IC were estimated 7.10 ± 1.27 and 7.7 ± 1.34, respectively; AS were estimated 6.85 ± 1.39 and 7.24 ± 1.41, respectively; LP were estimated 6.68 ± 1.61 and 6.74 ± 1.64, respectively; SAG were estimated 0.55 ± 1.36 and 0.66 ± 1.44, respectively; and SSG were estimated −0.85 ± 1.19 and −0.7 ± 1.24, respectively. The current status of Iranian libraries in gaps and dimensions of LibQUAL (IC, LP, SSG and SAG) is very different in comparison with ACR studies. Inappropriate infrastructure and non-compliance with international standards, lack of suitable cultural and social platforms and aged libraries and their resources which were caused by inappropriate budget allocations, have reduced reading per capita and the overall average of the LibQUAL dimensions and gaps in Iran (Krashen et al., 2012; Kibirige, 1977; Chia et al., 2012).

Other findings showed that quality of services provided by libraries of Iranian universities were lower than the most desirable level (maximum level) that is expected by
users (with a SSG of −2.06) and libraries have not been able to improve the quality of their services to the desired level that is expected by the users. The same result has been obtained in all of the studies conducted in foreign universities and the findings have been indicative of a negative gap between library services and the most desirable level of quality expected by users (Shorb and Driscoll, 2004; Jankowska et al., 2006; Roszkowski et al., 2005). According to the obtained results, the qualitative level of services is not desirable to users and there is a gap between users’ perceptions and expectations. As it is clear, the observed gap in libraries of the universities studied in this meta-analysis is larger than that of the libraries of foreign universities (Association of Research Libraries, 2017). Given the gap between current services and expectations of their users, these libraries can plan for improving the quality of services more cautiously by accurately prioritizing their attempts. In addition to the necessity of consideration of all of the aspects of services, given the weakness of libraries in association with the dimensions of IC and LP, the libraries must attempt to provide the necessary space, facilities and sources for the users to have access to the information they are needed. In terms of location of the library, by taking into consideration the opinions of users, it is essential to predict proper spatial and environmental conditions for beginning the study, learning and researching in a library (Hariri and Afani, 2008).

In the present study, the degree of heterogeneity ($I^2$) has been calculated to be equal to 95.33 percent which means that this study has high heterogeneity (an $I^2$ index of lower than 25 percent is indicative of low heterogeneity, an $I^2$ index of between 25 and 75 percent shows middle heterogeneity and an $I^2$ index of higher than 75 percent shows high heterogeneity). It has been assumed that the observed differences have been resulting from using various sampling methods and the difference in the measured parameter in various societies (Yekta Kooshali et al., 2016; Mansouri et al., 2017; Zaker Jafari and Yekta Kooshali, 2018).

**Limitation**

1. Because of the variety of writing those research findings conducted by the LibQUAL, data extraction is difficult.
2. In most studies, average LibQUAL dimensions were reported without standard deviation.
3. The researchers had limited access to databases and full text of articles.

**Conclusion**

The results obtained from the present study show that users are relatively satisfied with the quality of services provided by Iranian university libraries. However, in order to increase the quality of library services, a better and more cohesive plan is needed. An improvement in the quality of library services can promote the scientific level of universities.

**Recommendations**

1. Since the reviewed libraries were not even close to the desired level of services that are expected by the users, it is necessary to consider all of the aspects of library services. Given the gap between the level of quality of current services and the level of quality expected by the library staff in the findings of Iranian studies in comparison with foreign studies, it is better for university administrators to plan modern educational courses for library staff and employ responsible, qualified and skilled employees with sufficient amount of knowledge so that they would accurately guide users and meet their informational needs.
Moreover, in order to improve the quality of the services provided by the aforementioned libraries and to reduce the gap between users’ expectations and services, three suggestions have been presented including development of the library space and allocation of a proper space for forming scientific groups and further, creation and expansion of electronic library sources for the users to have access to information sources at any time and place and ultimately, the assessment of users’ expectations of online tools such as The “LibQUAL+® Lite and TechQual+” be provided.

By taking into account the results obtained from studies, it becomes clear that using LibQUAL+ as a tool is of help when it comes to reviewing the quality of services and its improvement, changing organizational culture and library service marketing. The commercial version of this tool is used all around the world for evaluating all of the university libraries that depend on the Ministry of Science, Research and Technology and Ministry of Health and Medical Education as a cooperation/consortium so that comprehensive data would be obtained as a consortium that would be shared for education, procedures, results and interpretations.

Acknowledgments
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Respective authors’ contributions for this paper are as follows: the conceptualizing and refining research ideas were presented by Aboozar Ramezani and Mohammad Hossein Yekta Kooshali. Literature search was conducted by Aboozar Ramezani and Mohammad Hossein Yekta Kooshali. The included studies were selected by Aboozar Ramezani, Mohammad Hossein Yekta Kooshali, Seyed Javad Ghazimirsaeed and Fereydoon Azadeh (as an Expert). The research design was created by Mohammad Hossein Yekta Kooshali and Aboozar Ramezani. The checklist was designed by Seyed Javad Ghazimirsaeed, Aboozar Ramezani, and Fereydoon Azadeh. Quality appraisal of the finalized studies was performed by Aboozar Ramezani, Mohammad Hossein Yekta Kooshali, Seyed Javad Ghazimirsaeed and Fereydoon Azadeh. The selection of statistical tests/analyses was done by Mohammad Hossein Yekta Kooshali and Aboozar Ramezani. The statistical analyses and computations (including computer work) were performed by Mohammad Hossein Yekta Kooshali. The interpretation of statistical analyses was done by Mohammad Hossein Yekta Kooshali and Aboozar Ramezani. The manuscripts were drafted by Aboozar Ramezani and Mohammad Hossein Yekta Kooshali. The first draft was prepared by A.R, M.H.YK; whereas the second draft was prepared by Aboozar Ramezani, Mohammad Hossein Yekta Kooshali, Mohammad Esmaeilpour-Bandboni, Seyed Javad Ghazimirsaeed, Fereydoon Azadeh. Redraft of a page (on later drafts) was done by Aboozar Ramezani and Mohammad Hossein Yekta Kooshali. The manuscript was edited by Aboozar Ramezani, Mohammad Hossein Yekta Kooshali, and Fereydoon Azadeh. Proofreading of the text was done by Aboozar Ramezani, Mohammad Hossein Yekta Kooshali, Mohammad Esmaeilpour-Bandboni, Seyed Javad Ghazimirsaeed, and Fereydoon Azadeh. Aboozar Ramezani and Mohammad Hossein Yekta Kooshali contributed equally to this work.

Glossary
IC Information control
AS Affect of service
Note

1. To the point of completion of the stages of the survey of the year 2003, LIBQUAL is comprised of four dimensions and 25 items. After the 2003 survey, with validity measurement analyses, according to the findings of numerous surveys, two dimensions of information access and personal control were combined and after that, the LIBQUAL tool, with 22 items or components, measures library services in three dimensions.

References


Meta-analysis of service quality


Abstract

Purpose – As libraries are required to become more accountable and demonstrate that they are meeting performance metrics, an assessment website can be a means for providing data for evidence-based decision making and an important indicator of how a library interacts with its constituents. The purpose of this paper is to share the results of a review of websites of academic libraries from four countries, including the UK, Canada, Australia and the USA.

Design/methodology/approach – The academic library websites included in the sample were selected from the Canadian Association of Research Libraries, Research Libraries of the United Kingdom, Council of Australian University Libraries, Historically Black College & Universities Library Alliance, Association of Research Libraries and American Indian Higher Education Consortium. The websites were evaluated according to the absence or presence of nine predetermined characteristics related to assessment.

Findings – It was discovered that “one size does not fit all” and found several innovative ways institutions are listening to their constituents and making improvements to help users succeed in their academic studies, research and creative endeavors.

Research limitations/implications – Only a sample of academic libraries from each of the four countries were analyzed. Additionally, some of the academic libraries were using password protected intranets unavailable for public access. The influences of institutional history and country-specific practices also became compelling factors during the analysis.

Originality/value – This paper seeks to broaden the factors for what is thought of as academic library assessment with the addition of qualitative and contextual considerations.

Keywords Australia, Academic libraries, Canada, United Kingdom, United States, Value, Websites, Library assessment, Library associations, Assessment websites

Paper type Research paper

Introduction

The purpose of this study was to conduct an analysis of assessment websites from a sample of academic libraries from four countries, including the UK, Canada, Australia and the USA, to determine how assessment and related information is conveyed through websites and how this information may help to demonstrate value to constituents. During the review, it was discovered that the number of academic libraries in the sample with actual library assessment websites was only 55 out of a possible 326, which was low. Therefore, it became necessary to also evaluate each academic library’s main website for assessment and other related information.

In a recent article about “best practices” for assessment committees (Brannen et al., 2016), it was recommended that more investigation be done regarding the impact and use of assessment websites. Recently, a working group was formed at the Florida Atlantic University Libraries to try to identify “best practices” as found on assessment websites of academic libraries. This working group was also charged with recommending assessment websites that report in a user-friendly way the results of assessment studies and other related information and to look for common practices or any trends and innovations. As former members of this working group,
the endeavor peaked our interest from some of the things we found and discussions we had, and
this has inspired us to further investigate a wider sample base and types of academic libraries.
Universities that fall under other organizational structures, such as vocational or for-profit
universities were not addressed in this study, and the gathering of data and the analysis of
findings was conducted between January and June 2017.

Review of the literature
Analysis of academic websites
Analysis of websites for libraries has been previously conducted for an array of content,
primarily for how these websites show the type of resources and search-ability of an
institution (Dewey, 1999; Agingu, 2000) and for design elements and content (King, 1998;
Tolppanen et al., 2005). Websites have now more so become the new “face of the library” as
they simultaneously demonstrate what a library offers and how resources can be found,
particularly for academic libraries to be successful. According to Ryan (2003), a website
should be: a reflection of user needs, and a demonstration of the adherence to the university’s
website guidelines. Lombard and Hite (2007) investigated the influences of the parental
institutional policies on the construction of the library website and suggested an in-depth
analysis of core terminology for library and for administration as it applies to context.

To further acknowledge the importance of websites for academic libraries for the access
they allow and content they provide, Hill (2012) revisited Agingu’s study of Historically Black
College & Universities (HBCUs) academic library websites to find that there had been much
improvement from the initial 2000 study. Agingu had found in her comparative study between
a sample of HBCUs and peer non-HBCUs that the library websites of HBCUs were lagging in
content and resources offered on their websites, as compared to the peer non-HBCUs. Fast
forward 12 years, Hill (2012) shows the importance of having a digital presence as “HBCUs
have invested time and resources toward improving technology on their campus” (p. 11).

Detlor and Lewis (2006), in their study of ARL academic library websites, eschew libraries
to build “robust library websites” as portals of collaboration between academic and research
libraries and their users. These websites should provide a wide range of disparate information
and services that maintains a “conversation” between the library and its users, in addition to
potentially encouraging collaboration between the library users themselves. And, although
their focus is on making searching options the centrality of websites instead of administrative
information, consideration may now want to be given with the rise of accountability and
transparency. One such way to show this type of accountability has been the move toward
academic libraries demonstrating an external exhibition of their organizational intent to their
stakeholders. The provision of mission statements has become a staple, and as Kuchi (2006)
observed, mission statements and their placement on an academic library’s website can be a
gauge for how important a library thinks of informing its constituents of its purpose.

Library assessment
According to a review of the literature on assessment of academic libraries published in 2013
(Hufford, 2013), much of the literature published prior to 2005 about assessment dealt with
input (e.g. number of books purchased) and output (e.g. interlibrary loan requests processed)
Education published a report that emphasized the need for more accountability and
transparency. This report greatly influenced the regional accreditation organizations to make
changes in their standards, which directly impacted academic libraries (Hufford, 2013).

As previously mentioned, initial attempts at library assessment emphasized input and
output statistics with the focus being inwards, but from the mid-1990s, library assessment
became more outward focused with the emphasis on the user as the central point of concern
(Nitecki et al., 2015). It became important to engage stakeholders about library performance
and to hear directly from them about successes and failures (Albert, 2014) so that decisions could be made to make improvements.

There are various survey instruments and organizations that have also come to focus on assessment for academic libraries over the last two decades to measure user needs, expectations and satisfaction. Surveys like LibQUAL+, ClimateQual or organizations like the Association of Research Libraries (ARL) or the Association of College & Research Libraries make it a major part of their mission to measure service quality. The assessment of student learning outcomes in information literacy classes and sessions has also become a very important issue.

**Demonstrating value**

Communicating assessment findings is an important and necessary step toward showing value. Although an objective form of analysis is proposed by Albert (2014) of, “a consistent behavior of communicating the library’s value within the larger institution which will then change attitudes about the library and its services,” (p. 634) certain influences can hamper undertaking assessment as a regulatory practice. Things like staffing, funding and varying priorities are just a few aspects that could make the best of intentions at supplying value a little difficult. Describing “value” also is based on the interpretation of the institution. But, at the heart of assessment is the engagement of academic libraries with students, faculty and the wider institutional community that can and will make use of the facility and services. Quantitative evidence of this engagement is a strong way to communicate assessment results to stakeholders and “[...] through transparency and collaboration, librarians can demonstrate library value to all campus stakeholders by determining what matters to each group, and targeting that group with specific notions about how the library can and does help them fulfill their goals, outcomes and mission” (Albert 2014, p. 637). Informing constituents of the mission has become an integral part of how academic libraries gauge value. It is a way to “express to internal and external constituencies what the library aspires to achieve in response to the support and expectations” (Kuchi 2006, p. 149) to its larger parental body.

As indicated in Tenopir’s (2012) paper on examining methods for demonstrating the value derived from academic libraries, qualitative methods provide a more complete picture in measuring the value of academic libraries. Qualitative comments that are collected using surveys can help to provide strong evidence for communicating assessment results to stakeholders. A recent qualitative case study conducted at an Australian university measured the library and information use of first-year undergraduate international students (Hughes et al., 2017). The findings helped to provide evidence to develop library spaces and to provide information literacy assistance appropriate for the transitioning of international students. In a recent review of quality frameworks for assessing “goodness” of Australian academic libraries it was stated that “qualitative and quantitative methods can be used to effectively collect evidence of the quality, value and impact of the library” (Sputore and Fitzgibbons, 2017).

**Methodology**

In order to determine the types of assessment and related information being displayed on websites and how library value is demonstrated, a total of 326 academic library websites from four countries were reviewed. The sample included US libraries from the ARL list. However, to include a more representative sample of the academic libraries from the USA, given the USA’s complex historical germination of tertiary institutions, a sample of academic libraries from the lists of the HBCU Library Alliance, along with the American Indian Higher Education Consortium (AIHEC) were also reviewed. In the case of Canada, the UK and Australia, libraries were included from the lists of the Canadian Association of Research Libraries (CARL), the Research Libraries of the United Kingdom (RLUK) and the Council of Australian University Librarians (CAUL), respectively. A list of the associations chosen for the sample from the four countries and the number of academic libraries whose...
websites were evaluated within each association, along with a brief description about each association (see Table I).

This review of assessment websites of academic libraries was meant to be exploratory, and not meant to create a list of “best practices.” It was conducted to help begin a conversation about how websites of academic libraries, and not just the larger more well-funded institutions, may convey value. The nine categories were identified through the process of doing the review and were found to be in common within a sample of academic libraries. The categories were also selected based on the results of our prior investigation of websites, as members of the FAU Libraries working group, to provide a list of recommended assessment websites.

As previously stated, the review was enlarged to include not just assessment websites, but also an academic library’s main website. In many cases, assessment information could be located by searching the “About” page for a particular library, but sometimes the information was difficult to find and not readily accessible, and keyword searches of the site needed to be employed.

An Excel spreadsheet was created to group the libraries within a particular association. We chose a checklist of nine individual factors/characteristics as markers (performance measures) of the library’s self-awareness of being in some way responsible to their users by providing very particular information: a type of provision of transparency to show a “conversation” between the library and its stakeholders. An analysis of each library was conducted to look for the presence (or absence) of each category and for specific information

<table>
<thead>
<tr>
<th>Association name and brief description</th>
<th>Number of libraries</th>
</tr>
</thead>
<tbody>
<tr>
<td>American Indian Higher Education Consortium (AIHEC)</td>
<td>37</td>
</tr>
<tr>
<td>Formed by the tribal college leaders as a consortium in 1972 to help keep the colleges in the forefront of Washington for funding. The consortium spearheaded the lobbying and receipt of the stable funding through the Tribally Controlled Community College Assistant Act of 1978. Additionally, it provided training for faculty and students at the colleges.</td>
<td></td>
</tr>
<tr>
<td>Historically Black College &amp; Universities (HBCU) Library Alliance</td>
<td>87</td>
</tr>
<tr>
<td>HBCU is a consortium of libraries and their directors that was started in 2001. The organization’s mission is the preservation of HBCU’s tertiary institutions and their libraries and it offers an array of services from professional development to project based initiatives for collecting and conserving the history of these institutions.</td>
<td></td>
</tr>
<tr>
<td>Association of Research Libraries (ARL)</td>
<td>101</td>
</tr>
<tr>
<td>ARL was founded in 1932 and is comprised of research libraries at comprehensive research institutions in the USA and Canada. ARL seeks to play a leadership role in public and information policy for institutions of higher education and to promote a culture of assessment through its library assessment conferences.</td>
<td></td>
</tr>
<tr>
<td>Canadian Association of Research Libraries (CARL)</td>
<td>29</td>
</tr>
<tr>
<td>CARL was established in 1976 and its members are research libraries throughout Canada. CARL is committed to advancing research and higher educations and to enabling broad access to scholarly information. CARL is also committed to assessment and has its own Assessment Committee.</td>
<td></td>
</tr>
<tr>
<td>Council of Australian University Librarians (CAUL)</td>
<td>39</td>
</tr>
<tr>
<td>CAUL plays a leadership role in higher education and seeks to enhance the value and capacity of Australian university libraries by influencing scholarship and learning and information policies and practices.</td>
<td></td>
</tr>
<tr>
<td>Research Libraries of the United Kingdom (RLUK)</td>
<td>33</td>
</tr>
<tr>
<td>RLUK is comprised of the leading and most significant research libraries in the UK and Ireland. The RLUK plays a leadership role in shaping the collections and services of research libraries to help promote research excellence and demonstrate the value of research libraries.</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>326</td>
</tr>
</tbody>
</table>
that would indicate assessment was being done. These nine categories are displayed, along with a brief definition for each category (see Table II).

In addition to the predetermined nine categories of assessment and related information, any innovative and distinctive ideas contrasting the current assessment culture in how assessment information is being conveyed through websites or how academic libraries are showing value were identified and noted.

**Limitations**

Only a sample of academic/research libraries from each of the four countries, including the UK, Canada, Australia and the USA, was analyzed for this review of websites. In addition, it appeared that some of the academic libraries were using intranets to display their assessment information, which we were not able to access because they were password protected.

Additionally, historical context as a major factor has a place as a limitation for this study when considering any analysis of the findings. As an example of this, the complex history of land-grant institutions in the USA falls into this area. Though institutions belonging to ARL, AIHEC and the HBSCU Library Alliance are inter-woven into this governmental funding resource, their differing focuses and reasons for existence need to be carefully considered. Furthermore, the histories of country-specific university requirements and national codes may reflect distinctive results. In the case of the UK and Australian research universities, annual student surveys to gauge student satisfaction with their undergraduate schooling, which also assesses library services, have become common practice.

**Findings**

Based on the 326 academic libraries that were evaluated, it was determined that the highest number of academic libraries, 231, used social media to display and collect information, followed by the presence of a mission statement at 201, and strategic plans/goals at 168. As previously stated, only 55 of the academic library websites evaluated had an actual assessment website and only 14 had an assessment plan. The results of the website evaluation are reported in Figure 1.

In evaluating the top categories for each of the academic library associations, “Social Media” was found in the top three for all six library associations, which is a way that institutions, even ones that are not heavily funded, can have an ongoing conversation with their stakeholders. Also found in the top three for four library associations was “Mission Statement” and “Strategic Plan/Goals” with “Comments/Feedback.” Since communication with library users on a continuous basis is important, it could be considered as a "best practice," with “Social Media” and “Comments/Feedback” box/page as methods that can be

<table>
<thead>
<tr>
<th>Category name</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mission statement</td>
<td>A statement about the library’s purpose or goals</td>
</tr>
<tr>
<td>Vision</td>
<td>A statement about what the library would like to achieve</td>
</tr>
<tr>
<td>Social media</td>
<td>A library’s websites and applications that enable social networking and encourage the sharing of information (e.g. Facebook, Twitter)</td>
</tr>
<tr>
<td>Strategic plan/goals</td>
<td>A plan that outlines the Library’s strategic goals</td>
</tr>
<tr>
<td>Facts and figures</td>
<td>Statistics about the library (e.g. number of volumes) displayed in some format, such as an infographic</td>
</tr>
<tr>
<td>Assessment website</td>
<td>A website used specifically to display and report the library’s assessment information, such as best practices and results of studies</td>
</tr>
<tr>
<td>Assessment plan</td>
<td>A plan that outlines the library’s assessment goals, objectives and best practices</td>
</tr>
<tr>
<td>Assessment studies/reports</td>
<td>The results of assessment studies (e.g. LibQUAL)</td>
</tr>
<tr>
<td>Comments/feedback</td>
<td>A request for comments and feedback from users about the library somewhere on the library’s website</td>
</tr>
</tbody>
</table>

**Table II.** Nine categories selected for the review with their definitions
used to collect data by most libraries. Additionally, “Vision” and “Assessment Studies/Reports” appeared in the top three for two library associations. The following table gives the complete list of the top three categories for each association.

Three highest assessment or related categories by association:

(1) AIHEC:
- mission statement;
- vision; and
- social media and strategic plan/goals and assessment studies/reports.

(2) HBCU Library Alliance:
- mission statement;
- social media; and
- vision.

(3) ARL:
- social media;
- mission statement; and
- strategic plan/goals.

(4) CARL:
- social media;
- strategic plan/goals; and
- mission statement

(5) CAUL:
- social media and comments/feedback;
- strategic plan/goals; and
- assessment studies/reports.

(6) RLUK:
- social media;
- strategic plan/goals; and
- comments/feedback.

Figure 1. Number of academic libraries displaying assessment or related information on their websites by category

Note: $n=326$
Considerations as to “best practice”

As King (1998) earlier stated in his study of ARL library website front-end design, it was not meant to offer or show what is being done right, but simply to show what and how it was being done. Similarly, this analysis bears the same sentiment for the current offerings of academic libraries from four countries in the way each institution indicated “value” through assessment. Because of the varying histories and aims of the associations we included in our review, showing value, in part, is part of the historical, economic and social context of the institution(s). Although libraries are identified as places for information, they are not exempt from social conditions, economic influences and, in general, “life happening around them.” These are living institutions and, particularly in the case for academic libraries, built as the supporting foundations of tertiary educational institutions for a continually growing complexity of users.

Other ways of assessing and showing value

In the review of the websites, we discovered that “one size does not fit all” and found several innovative ways institutions are listening to their constituents and making improvements with the way they help users succeed in their academic studies, research and creative endeavors. We also discovered innovative library buildings that make a distinctive statement and demonstrate value and websites that promote ease of navigation and encourage engagement. Here are some examples of innovative and distinctive ways academic libraries are demonstrating value:

- Oxford University Libraries – you said, we did;
- University of Saskatchewan University Library People Plan 2017–2021;
- UCLA’s strategic plan on video on their website that was also being used as a marketing tool for the university library;
- The Dine College in Arizona environmentally and culturally lovely library building found on their website;
- The ultra-modern Morgan State University’s Earl S. Richardson Library, which “has become a signature building of the campus”; and
- Purdue University’s very simple to navigate website[1].

Furthermore, a variety of factors can influence assessment depending on what is seen as value within the library and its wider institution. Value does not necessarily have to be measured in statistical quantities of numbers or “bums on seats” or in how much financial support is in place. In the case of Dine College, cultural concerns have resulted in what Sharon Grey Weiner refers to as “an example of […] resilience and creativity” (page 8) particularly for the manner in collecting and storing cultural material that has been predominantly delivered orally. Other aspects of culture can be highlighted, such as tribal cultural traditions regarding space and the natural environment. The Senator John Pinto Library at Shiprock, New Mexico, is a branch library of the Kinyaa’áani Library of the Dine College and it was opened on November 18, 2011[2]. Its construction combines the form of a traditional Navajo Hogan with other representations from the Navajo worldview. McCombs (2012) observes that “as seen in the arched forms and walls, the design expresses the cultural value of a gentle and welcoming spirit. Spaces created between the large, curved forms direct the vision toward sacred points of connection in landmarks and the celestial relationships that define the world of the Diné.” The manner for showing “worth” or “value” is the acknowledgment and continuation of tribal knowledge and cultural practices.
Conclusions

Some of what we learned are as follows:

- There are other ways that academic libraries are demonstrating value as evidenced by physical environments: the Dine College's Senator John Pinto Library, and the ultra-modern Morgan State University library building, which “has become a signature building of the campus.”

- Multimedia, such as the UCLA strategic plan on video, can be used to effectively market a library’s resources and services and to show value.

- An option for comments/feedback on a library's home page is the most direct way of knowing how effective you are at meeting user needs.

- Social media has a very prominent place as a communication mechanism between libraries and their constituents.

- Searching and navigating academic library websites for assessment information can be very difficult. The usability of a majority of the sites for finding assessment information was not as intuitive as expected.

As libraries are required to become more accountable and demonstrate that they are meeting performance metrics for funding and accreditation, a website can be a tool for displaying data for evidence-based decision making and to show improvement and for reporting other strategic information. An online presence can also be an important indicator of how a particular academic library views assessment.

Based on the results of the review, it appears that most academic libraries realize the value of ongoing communication with users and the value of conveying assessment information in its various forms. The area of assessment is still evolving and a website can potentially be used as a valuable tool to help demonstrate a library’s value and promote the library as an integral part of the university. Each academic library is unique and needs to decide how best to engage constituents in an ongoing conversation and to demonstrate value.

Recommendations for future research

As a result of our review, we discovered that there is a potential for promoting a library, and its value through how assessment or related information is displayed on a website. Therefore, we recommend the following for future research:

- examine more closely the potential for using websites (assessment or otherwise) to convey assessment information, promote a continuous conversation with users, demonstrate value to the academic communities and market their resources and services; and

- conduct more research to establish “best practices” for academic library assessment websites and for displaying assessment and related information.

Notes

1. Subsequent to the conference presentation at the 12th International Conference on Performance Measurement in Libraries – Communicating value and leadership: from strategic to micro assessment, the authors were contacted by a representative of the Purdue University library concerning points about their website’s ease of use.

2. www.tribalcollegejournal.org/dine-college-dedicates-library-shiprock/
References


Further reading


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- Library and information service value
- The library role in the measurement of learning and in organisational accreditation
- The impact and value of using social media in information services
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